METAL RECOVERY FURNACE
TSCA COMPLIANCE TEST PLAN

PREPARED FOR:

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TONKAWA, OKLAHOMA 74653

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Appendix A Quality Assurance Project Plan

List of Acronyms

acfm	actual cubic feet per minute
ASTM	American Society for Testing and Materials
Btu	British thermal unit
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CFR	Code of Federal Regulations
cm^2	square centimeters
DF	polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans
DRE	destruction and removal efficiency
dscf	dry standard cubic foot
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meter
dscmm	dry standard cubic meter per minute
EPA	U.S. Environmental Protection Agency
ft	foot
ft^2	square feet
ft^3	cubic feet
g	gram
g/cc	grams per cubic centimeter
GC	gas chromatography
GC/MS	gas chromatograph/mass spectrometry
gr	grain
hr	hour
HRGC/HRMS	high resolution gas chromatography/high resolution mass spectrometry
in	inch
inwc	inches water column
kg	kilogram
l	liter
lpm	liters per minute
lb or lbs	pounds
mg	milligram
ml	milliliter
MM Btu/hr	million British thermal units per hour
MS	mass spectroscopy
NDIR	non-dispersive infrared
NO_X	Oxides of Nitrogen
NO_2	Nitrogen Dioxide
ODEQ	Oklahoma Department of Environmental Quality
PCB	polychlorinated biphenyls
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
pg	picogram
ppm	parts per million
ppmv	parts per million by volume
PM	particulate matter
psig	pounds per square inch, gauge
QA	quality assurance
QC	quality control
RCl	total chlorinated organic content
scf	standard cubic feet
scfm	standard cubic feet per minute
sec	second
SO_2	sulfur dioxide
VOC	volatile organic compound

vol%	volume percent
VOST	Volatile Organic Sampling Train
w.c.	water column
wt%	weight percent
μg or ug	microgram
ηg or ng	nanogram
pg	picogram

1.0 INTRODUCTION

1.1 GENERAL

A-Line T.D.S., Inc. (A-Line) operates a transformer disposal service facility located in Tonkawa, Oklahoma. Transformers, capacitors, bushings, and other electrical equipment components contaminated with polychlorinated biphenyls (PCB) are thermally treated to remove and destroy the PCB. All items are drained of free-flowing liquid and dismantled. The PCB-bearing liquid drained from these items may be chemically treated on-site to destroy the PCB via de-chlorination or may be shipped off-site for treatment in a Toxic Substances Control Act (TSCA) permitted commercial hazardous waste incinerator. The metal, cores, and dunnage from dismantling the electrical items are thermally treated in the Metal Recovery Furnace (MRF). The MRF thermally desorbs the residual PCB contamination from the metal and non-metal solid components. The desorbed PCB are thermally destroyed in the secondary chamber. The thermally treated metal is recovered for recycling. Ash and other non-metal, non-combustible residuals (e.g., ceramic components) are containerized for off-site disposal at a TCSA permitted landfill. Drained liquids less than 3,000 mg/kg may be treated in the on-site chemical process. The MRF and chemical treatment process operate under a TSCA permit issued by the Environmental Protection Agency (EPA) Region 6 and an Air Permit issued by the Oklahoma Department of Environmental Quality (ODEQ). This Test Plan is submitted as part of the TSCA permit renewal. The Test Plan delineates the protocol and procedures to demonstrate compliance of the MRF with the TSCA requirements. Compliance testing of the chemical process is covered under a separate test plan.

1.2 FACILITY ADDRESS AND CONTACT INFORMATION

The street address of the facility is:

A-Line T.D.S., INC.
1500 NORTH MAIN STREET
Tonkawa, Oklahoma 74653.

All correspondence should be directed to the following facility contact:

Mr. Lynn Fritz
319-504-7934
lynn@alineeds.com.

1.3 SYSTEM CONFIGURATION AND GENERAL OPERATION

The MRF is a batch operated furnace that complies with the operating requirements of 40 CFR 761.72 *Scrap Metal Recovery Ovens and Smelters*. The MRF includes two chambers, each equipped with natural gas fired burners. PCB-contaminated solid components are treated in the primary chamber. The gases from the primary chamber are thermally treated in the secondary chamber to destroy the desorbed PCB.

Thermally treated gases are discharged to the atmosphere via the MRF stack; there are no additional emissions controls.

Dismantled solid electrical components for treatment are loaded in a burn tray. The secondary chamber burners are started. Once the secondary chamber has reached the TSCA Permit required minimum operating temperature of 1,100°C (2,012°F) as required by 40 CFR 761.72(a)(5), the loaded burn tray is placed in the MRF primary chamber. The primary chamber burners are then started. The MRF operates for a time and temperature cycle/protocol consistent with the current TSCA Permit. Once the MRF cycle is complete, the primary chambers burners are shut off. After a cooling period, the primary chamber is opened and the burn tray with the treated materials is removed. The metals parts are allowed to continue to cool to ambient temperature at which point they can be wipe sampled and the samples analyzed to confirm the absence of PCB. The ash and other non-recycle materials in the burn tray can then also be removed. The decontaminated metal is made available for recycling. The ash and other non-recycle materials are containerized for eventual disposal in a TSCA permitted landfill.

1.4 APPLICABLE PERFORMANCE STANDARDS

The MRF is a *"scrap metal recovery oven"* under the TSCA regulations and is subject to the following emissions standards at 40 CFR 761.72(a)(8):

- Particulate matter (PM) $\leq$0.015 grains per dry standard cubic foot (gr/dscf)
- Sulfur dioxide (SO_2) $\leq$35 parts per million volume (ppmv)
- Nitrogen oxide (NO_X) $\leq$150 ppmv
- Carbon monoxide (CO) $\leq$35 ppmv
- Hydrogen chloride (HCl) $\leq$35 ppmv.

As required by the current TSCA Permit, MRF operation includes continuous calculation and compliance with 99.9% combustion efficiency as measured via a continuous emissions monitoring system (CEMS):

$$[CO_2] / ([CO_2] + [CO]) * 100\% \geq 99.9\%.$$

Where: $[CO_2]$ = Stack gas concentration of carbon dioxide (CO_2)
$[CO]$ = Stack gas concentration of carbon monoxide (CO).

As part of the TSCA Permit renewal, EPA is requiring the MRF to demonstrate 99.9999% destruction and removal efficiency (DRE) of PCB normally required for an *"incinerator"* as defined at 40 CFR 761.3 of the TSCA regulations.

The MRF test program will also demonstrate compliance with the following emissions limits delineated in the ODEQ-issued Air Permit:

- Total PCDD/PCDF 7.079E10^{-8} lb/hr
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalents (TEQ) 7.463E10^{-9} lb/hr
- Molecular chlorine (Cl_2) 0.129 lb/hr
- Semi-volatile organic compounds (SVOC) 1.737E10^{-4} lb/hr
- Volatile organic compounds (VOC) 1.742E10^{-3} lb/hr.

These Air Permit emissions limits are based on stack tests measured at 8,400 ACFM at 2,000^{o}F.

1.5 TEST OPERATING AND SAMPLING PROTOCOLS

The test protocol consists of three (3) test runs. Each test run will consist of two (2) complete MRF cycles as previously described. During each cycle, the MRF will be operated at the times and temperatures specified in the current TSCA Permit. Sampling during each MRF cycle will consist of the following:

- Cycle 1: Sampling will be performed to measure PCB DRE and PM emissions. CEMS will measure SO_2, NO_X, CO, CO_2, and O_2 emissions.
- Cycle 2: Sampling will be performed to measure HCl emissions. CEMS will measure CO, CO_2, and O_2 emissions.

EPA is also requiring the following emissions to be measured during MRF testing:

- Polychlorinated dibenzo-p-dioxins and polychlorinated dibenzofurans (DF or PCDD/PCDF) during Cycle 1
- Semi-volatile organic compound (SVOC) total chlorinated organic content (RCI) during Cycle 1
- Volatile organic compound (VOC) RCI during Cycle 2, and
- Chlorine (Cl_2) during Cycle 2.

There are no specific numerical standards established in the TSCA regulations for these emissions. Compliance with the current Air Permit limits for PCDD/PCDF, SVOC, VOC, and Cl_2 will be demonstrated for these emissions.

1.6 CURRENT TSCA PERMIT OPERATING LIMITS

The current TSCA Permit operating limits based on 40 CFR 761.(a) are:

- Minimum secondary chamber operating temperature of 1,100^{o}C (2,012^{o}F)
- Minimum 3.0% excess oxygen (O_2)
- Minimum secondary chamber retention time of 2.0 seconds
- Minimum combustion efficiency of 99.9%
- Minimum primary combustion chamber temperature 800-1,200 ^{o}F for two (2) hours during each batch cycle, and 1,200 ^{o}F once during each batch cycle

- Heating of primary chamber shall not commence until the secondary chamber temperature has reached 1,100°C (2,012°F)
- The MRF shall operate at negative pressure. Combustion zone pressure is monitored and recorded on a continuous basis.
- Batch PCB feed may not be introduced unless the backup generator is in good working order so that the MRF will continue to operate under required conditions in the event of an electrical power failure.
- CEMS and recorders for stack gas CO_2, CO, and O_2
- Continuous temperature recording for the primary and secondary chambers
- Batch Feed Limits: The maximum stacked height of four (4) feet of drained PCB items may be disposed during each batch feed to the MRF, with a burn tray net weight not to exceed 6,300 pounds (lbs). The PCB items shall be drained of all free-flowing liquid, removed from its housing, and chopped to achieve the maximum amount of surface area exposure practicable before being placed into the burn tray. No more than one (1) 55-gallon drum, or its equivalent, of contaminated debris, and no more than one (1) contaminated wooden pallet may be disposed per batch feed. The following information will be recorded for each batch feed and kept at the facility for five (5) years from the date each charge is introduced:
  - Serial number and manufacturer of each PCB item placed on each batch burn tray
  - Date and time batch burn tray was placed into the primary chamber
  - Temperature of the secondary chamber at the time each batch burn tray was placed into the primary chamber
  - Time each batch burn tray was removed from the primary chamber, and the temperature in the primary chamber at the time the burn tray was removed, and
  - Name and signature of the operator recording the data listed above.

Testing will be conducted to demonstrate compliance with the TSCA emissions and performance standards for *"scrap metal recovery oven"* at 40 CFR 761.72(a)(8) and Air Permit emissions limits.

1.7 TEST PLAN ORGANIZATION

This Test Plan is prepared in a chapter format. The major sections of the Test Plan are as follows:

- Section 1.0 - Introduction
- Section 2.0 - Engineering Description and System Operation
- Section 3.0 - Test Design and Protocol
- Section 4.0 - Test Schedule
- Section 5.0 - Test Report and Operational Limits

1.8 DEVELOPMENT OF TSCA PERMIT LIMITS

The test results will be used to confirm the adequacy of the current TSCA Permit MRF operating limits and operating protocol to assure ongoing compliance with the TSCA emissions limits and operating standards. The test is not designed to establish new operating limits or changes in the operating protocol. However,

Section 5.0 proposes methodology for establishing new TSCA Permit operating limits from this test program.

1.9 REFERENCE DOCUMENTS

Reference documents that have been used in developing this Test Plan include the following:

- American Society for Testing and Materials, "Annual Book of ASTM Standards", latest annual edition.
- EPA, "New Source Performance Standards, Test Methods and Procedures," Appendix A, 40 CFR 60.
- EPA, "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)", Third Edition, 1986 and updates (December 1997).
- EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5 EPA/240/B-01/003), March 2001
- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)
- Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990.

2.0 ENGINEERING DESCRIPTION AND SYSTEM OPERATION

2.1 GENERAL

Figure 2-1 provides a schematic of the MRF system. The MRF is a batch treatment system consisting of primary and secondary chambers. The MRF is used to thermally treat disassembled transformer metal and non-metal solid components to desorb and destroy the PCB contaminants. The treated metal is sorted and made available for recycling. Any ash and non-combustible, non-recyclable residues are containerized for disposal in a TSCA-permitted landfill. The MRF configuration and operation are described in the following sections.

2.2 MANUFACTURER'S NAME AND MODEL NUMBER

The MRF was originally custom designed and manufactured by Blair-Alexander Engineering Co., Inc. of Denver, Colorado circa 1996/1997. The MRF is a two-chamber design with commercial natural gas used as auxiliary fuel. The MRF has been maintained since its original construction via repairs, upgrades, and in-kind replacement parts to assure and improve compliant operability.

The primary chamber, secondary chamber, and system stack are constructed of carbon steel and lined with nominal 8-inch insulating brick. The inner brick dimensions of the rectangular primary chamber 7-feet-10 inches tall, 6-feet-3 inches wide, and 14-feet-2 inches long. The primary chamber is equipped with four (4) 2-inch Maxon Kinemaz Medium Velocity Burner, Size 2C burners each having a rated heat input of 1.0 MMBtu/hr.

The inner brick dimensions of the cylindrical secondary chamber are 9-feet-4 inches diameter and 16-feet tall. The secondary chamber is equipped with two (2) 6-inch Maxon burners each rated at a maximum of 8.0 MMBtu/hr.

The inner brick dimensions of the system stack extending from the secondary chamber are 11-feet tall and 2-feet-6-inches diameter. The furnace is specifically manufactured for the purpose of reclaiming metals such as copper and aluminum from industrial power transformers and similar electrical items that have been discarded by the electrical power industry.

2.3 MRF OPERATION

The MRF consists of two enclosed, negative draft (no fugitive emissions) interconnected chambers as required by 40 CFR 761.72(a)(1). The startup sequence for the MRF is designed to prevent fugitive emissions of uncombusted PCB. To do this, the secondary chamber natural-gas fired burners are electronically ignited and the temperature allowed to stabilize at the required minimum temperature of 1,100^{o}C. A burn tray containing electrical equipment components, with all free-flowing liquid removed and dismantled, is then loaded into the primary chamber. A forklift is used to handle and move the burn trays. The furnace loading process consists of a forklift placing the burn tray on the furnace transfer

car mounted on rails. The forklift forks are then used to push (roll) the furnace transfer car into the furnace. The primary chamber door is closed and the primary chamber burners with excess air supply are electronically ignited. The system draft provided by the secondary chamber burner firing is designed to prevent fugitive emissions of uncombusted PCB when the primary chamber door is opened. Once the operating cycle is complete, the burners in the primary chamber are shut down while the airflow and the secondary chamber continue normal operation. In this configuration, the material in the primary chamber is allowed to cool to approximately 250-482°F. At this point, the primary chamber door can be opened and the processed material removed. The material is removed by using the forklift forks to pull (roll) the furnace transfer car out of the furnace. Once out, the forklift can then lift the burn tray off the furnace transfer car and place it on a metal stand where it is allowed to continue to cool to ambient temperature.

The following are the specific steps of MRF cycle operation:

1. Verify that the CEMS passed the automatic daily calibration. If the system indicates that it did not pass, make the necessary repairs to the system until the system passes the calibration test.

2. Verify that the backup generator has been tested for automatic operation within the last 30 days. If it has not been tested within the last 30 days, test the automatic operation of the generator.

3. Bring the secondary chamber to the minimum operating temperature of 1,100°C (2,012°F).

4. Prepare a burn tray with PCB materials drained of all free liquid. The maximum stacked height of PCB materials in the burn tray is four (4) feet with a maximum net charge weight of 6,300 pounds (lbs). Materials can include one 55-gallon drum, or its equivalent, of contaminated debris, and up to one (1) contaminated wooden pallet may be disposed per MRF cycle. PCB-free salt water removed from the Clean Oil Storage Tank of the PCB liquid de-chlorination process or process water may be added to the burn tray as well. The water is added to the burn tray to preclude warping during thermal processing. (NOTE 1: For the MRF testing, four to six (4-6) inches of salt water or process water shall be included in each burn tray processed.) (NOTE 2: For the MRF testing, three (3) wipe samples of the three (3) distinctly different feed items will be collected from each burn tray to confirm the presence of PCB. The following batch information shall be recorded and retained for a minimum of 5 years:
   - Serial number and manufacture of each PCB item in the burn tray
   - Date and time the burn tray was placed in the primary chamber.
   - The temperature of the secondary chamber when that burn tray was placed in the primary chamber.
   - The time the primary chamber reached 1,200°F.
   - The time and temperature of the burn tray was removed from the primary chamber.
   - Name and signature of the operator recording the data list above.

5. Open the door to the primary chamber, place a loaded burn tray in the primary chamber, close the door to the primary chamber.

6. Bring the primary chamber to a minimum of 800°F for a minimum of 2.5 hours. During the initial 2.5 hour cycle the primary chamber must reach 1,200°F at least once. After the 2.5-

hour cycle has been completed, if the temperature in the primary chamber has not started to drop continue the burn cycle until the temperature begins to drop.

7. When the burn cycle has been completed and the primary chamber drops to 482°F, the primary chamber door may be partially open to visually determine if smoke is visible. If smoke is visible the door will be closed. When the temperature drops in the primary chamber to 360°F, the primary chamber door may be partially open to visually determine if smoke is visible. If smoke is visible the door will be closed. When the temperature drops to 250°F or no smoke is visible when the primary chamber door is opened, the burn tray is removed and placed in the holding area until the burn tray reaches ambient temperature. NOTE: The secondary chamber is maintained at or above required minimum temperature and the MRF is under negative draft conditions when materials are present in the primary chamber. These operating conditions preclude any personnel or the environment being exposed to PCB fugitive emissions when the primary chamber door is opened.

8. The typical time to complete a burn cycle (from cold starting of the secondary chamber burners) to withdraw of the burn tray from the primary chamber ranges from 4 to 7 hours depending on the PCB material being processed. (Note: With the secondary chamber burners remaining on and maintaining the required minimum temperature, subsequent MRF cycles may be 4 hours or less.)

9. Once the burn tray reaches ambient temperature, any ash, ceramic, or non-recyclable material will be removed from the burn tray and placed in a roll off for disposal at a TSCA landfill.

10. For the decontamination demonstration, after cooling to ambient temperature three (3) wipe samples of the three (3) distinctly different treated items will be collected from each burn tray to verify that PCB are no longer present on the recyclable metal materials. The materials will be separated by type, copper, aluminum, brass, etc. and placed in storage until the PCB test results are completed. If the sample results are <10 micrograms (ug) per 100 centimeters squared (cm^2), the metal may be sent for recycling in a normal shipment. If the results are $\geq$ 10 ug per 100 cm^2, the metal will be held for additional treatment (re-processing in the MRF) or disposed of at a TSCA-permitted landfill.

The following compares the MRF TSCA Permit required operating protocol with the requirements of 40 CFR 761.72(a)(3)-(6) of the TSCA Rule:

Operating Requirement	TSCA Permit	TSCA Rule
Loading and Heating of the Primary Chamber	When Secondary Chamber reaches 1,100°C (2,012°F)	When Secondary Chamber reaches 1,100±100°C (2,012±180°F)
Primary Chamber Temperature Operation	500-1,200°F for a minimum of 2.0 hours and reach a minimum temperature of 1,200°F once during each cycle	537-650°C (999-1,202°F) for a minimum of 2.5 hours
Secondary Chamber (Afterburner) Operation	1,200°C (2,192°F), at least 3% excess oxygen, 2.0 seconds residence time and 99.9% combustion efficiency $[CO_2]$ / ($[CO_2]$ + [CO]) * 100%	1,200°C (2,192°F), at least 3% excess oxygen, 2.0 seconds residence time and 99.9% combustion efficiency $[CO_2]$ / ($[CO_2]$ + [CO]) * 100%
Continuous emissions monitors (CEMs) and recorders	CO_2, CO, and O_2	CO_2, CO, and O_2

The MRF is a batch operation; there is no continuous "feed system" and consequently no "automatic waste feed cutoff" (AWFCO) system; once a tray is loaded into the furnace, it remains there unit the treatment cycle is completed. The burn trays are loaded manually by operators dressed in Tyvek suit, rubber boots, chemical resistant gloves, hard hat, and safety glasses. The burn tray is loaded within the weight and stack height limits in the current TSCA permit. The tray is placed in the into and removed from the MRF using a forklift. The forklift operator wears general PPE as that person is not touching the material: hard hat, safety glasses, cut resistant gloves, and steel toed boots. All material handling is performed within a building with secondary containment. The MRF is operated at induced (negative) draft to preclude fugitive emissions from thermal treatment.

2.4 RETENTION TIME DETERMINATION

The internal volume of the secondary chamber is approximately 1,094 cubic feet (ft^3):

$$\Pi * (9.33 \text{ feet diameter} / 2)^2 * 16 \text{ feet tall} = 1{,}094 \text{ ft}^3$$

Based on the 1997 test stack flow of 10,122 acfm at 1,853°F, the secondary gas retention time at 2,012°F (1,100°C) is:

$$10{,}122 \text{ acfm} * (2{,}012 + 460^{o}\text{R})/(1{,}853 + 460^{o}\text{R}) = 10{,}925 \text{ acfm through the secondary chamber}$$

$$1{,}094 \text{ ft}^3 / 10{,}925 \text{ acfm} * 60 \text{ sec/min} = 6.0 \text{ seconds.}$$

Secondary chamber residence (dwell) time calculations will be performed as part of testing and included in the final test report.

2.5 CONTINUOUS PROCESS MONITORING SYSTEM

Table 2-1 lists the MRF major process and CEMS instruments. Figure 2-1 shows the general monitoring locations for temperature, pressure, and CEMS measurements. One-minute values for process measurements are recorded and electronically retrievable for regulatory inspection for any operating period.

2.6 FIRE SUPRESSION SYSTEM

The areas adjacent to the MRF include a standard industrial fire suppression system. The system is continuously pressured with water. The fire suppression sprinkler system is mechanically activated when the linkage is melted by fire heat. The design activation temperature is 286°F. <u>There is no sprinkler system in the room with the MRF.</u> The local fire marshal specifically forbids installation of a sprinkler system in this room. The reason is spraying water on the hot exterior of the MRF could result in a catastrophic failure of the metal shell and/or refractory.

Table 2-1. MRF Process Instrumentation

Parameter	Location	Figure 2-1 Location	Units	Scale	Accuracy	Instrument Type
Primary Chamber Temperature	Exit of Chamber	T1	°F	-326 to 2200	±4°F	Type K thermocouple
Secondary Chamber Temperature	Exit of Chamber	T2	°F	-326 to 2200	±4°F	Type K thermocouple
MRF Pressure	Duct from Primary Chamber to Secondary Chamber	P1	inwc	-9 to 9	±2% of scale	Pressure Transmitter
Natural Gas Usage	Natural Gas Line to MRF	Not Pictured	scf	NA; totalizer	±0.1%	Rotary Gas Meter
Stack Gas CO Concentration	Stack	A1	ppmv, dry	0 to 200	±2% of scale	Non-dispersive Infrared (NDIR)
Stack Gas CO_2 Concentration	Stack	A2	%vol, dry	0 to 20	±2% of scale	NDIR
Stack Gas O_2 Concentration	Stack	A3	%vol, dry	0 to 25	±2% of scale	Paramagnetic

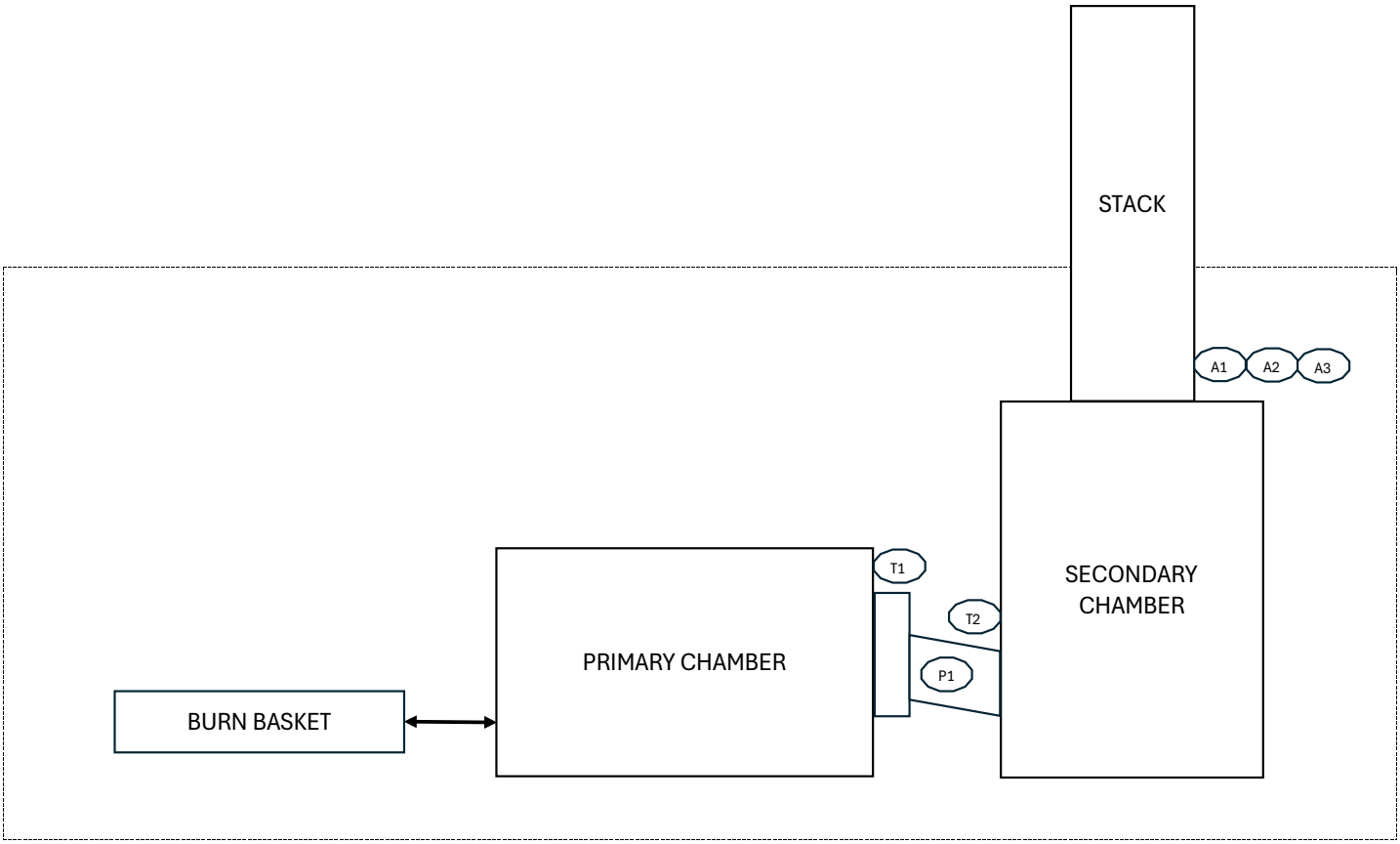


Figure 2-1. MRF Process Flow Schematic

3.0 TEST DESIGN AND PROTOCOL

3.1 TEST OBJECTIVES

The MRF test will demonstrate compliance with following appliable emissions standards for "*scrap metal recovery ovens"* at 40 CFR 761.72(a)(8):

- Particulate matter (PM) $\leq$0.015 grains per dry standard cubic foot (gr/dscf)
- Sulfur dioxide (SO_2) $\leq$35 parts per million volume (ppmv)
- Nitrogen oxide (NO_X) $\leq$150 ppmv
- Carbon monoxide (CO) $\leq$35 ppmv
- Hydrogen chloride (HCl) $\leq$35 ppmv.

As required by the current TSCA Permit, MRF operation includes continuous calculation and compliance with 99.9% combustion efficiency as measured via CEMS:

$$[CO_2] / ([CO_2] + [CO]) * 100\% \geq 99.9\%.$$

Where: $[CO_2]$ = Stack gas concentration of carbon dioxide (CO_2)
$[CO]$ = Stack gas concentration of carbon monoxide (CO).

As part of the TSCA Permit renewal, EPA is requiring the MRF to demonstrate 99.9999% destruction and removal efficiency (DRE) of PCB normally required for an *"incinerator"* as defined at 40 CFR 761.3 of the TSCA regulations.

EPA is also requiring the following emissions to be measured during MRF testing:

- Polychlorinated dibenzodioxins and dibenzofurans (DF or PCDD/PCdf)
- Semi-volatile organic compound (SVOC) total chlorinated organic content (RCl)
- Volatile organic compound (VOC) RCl, and
- Molecular chlorine (Cl_2).

There are no specific numerical standards established in the TSCA regulations for these emissions. Compliance with the following current Air Permit limits for PCDD/PCDF, SVOC, VOC, and Cl_2 will be demonstrated for these emissions:

- Total PCDD/PCDF 7.079E10^{-8} lb/hr
- 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) toxicity equivalents (TEQ) 7.463E10^{-9} lb/hr
- Cl_2 0.129 lb/hr
- Semi-volatile organic compounds (SVOC) 1.737E10^{-4} lb/hr

- Volatile organic compounds (VOC) $1.742E10^{-3}$ lb/hr.

3.2 TEST PROTOCOL

The test protocol includes demonstrating compliance with the TSCA regulation and Air Permit emissions and performance limits via a single operating condition. There are limited number of sampling ports on the stack: one set of two ports configured for isokinetic sampling, and a third port for non-isokinetic or temporary CEMS sampling. To complete the sampling and obtain representative emissions, two (2) MRF cycles will be necessary per test run, with three (3) test runs [six (6) MRF cycles] total performed to complete the test program. The emissions sampling for each MRF cycle is:

- Cycle 1: Sampling will be performed to measure PCB DRE and PM emissions. PCB, DF, and SVOC RCl emissions will be sampled concurrently using a single EPA Method 23 sampling train. Filterable and condensable PM emissions will be measured using an EPA Method 5/202 sampling train. The PCB liquid spike will be sampled to determine the PCB and chlorine contents and feed rates. Temporary CEMS will measure SO_2 (EPA Method 6C) and NO_X (EPA Method 7E). Installed CEMS will measure CO, CO_2, and O_2 emissions.
- Cycle 2: Sampling will be performed to measure HCl/Cl_2 and VOC RCl emissions. HCl/Cl_2 emissions will be measured using an EPA Method 26A sampling train. VOC RCl emissions will be measured using a SW-846 Method 0030 sampling train. The PCB liquid spike will be sampled to determine the chlorine content and feed rate. Installed CEMS will measure CO, CO_2, and O_2 emissions.

3.3 MATERIALS TREATED DURING TESTING

For each MRF cycle, burn trays will be prepared with transformer and other electrical components per the current TSCA permit operating conditions previously described. To the extent possible, each burn tray will i be prepared using a similar mix of materials that could include pieces of capacitors, bushings, transformers, and other contaminated electrical equipment. The burn tray may also include some packaging debris (e.g., wooden pallet pieces) and salt water removed from the PCB liquid de-chlorination process (approximately 4-6 inches in the burn tray). A-Line will attempt to prepare each burn tray as similar as practicable for each test cycle.

The MRF operates as a batch process. However, the EPA sampling methods are generally designed around sampling continuous processes. Therefore, to accurately measure DRE and emissions from thermal destruction of PCB, A-Line plans to meter PCB liquid continuously to the secondary chamber during the MRF test sampling periods. Dismantled electrical components constitute a multitude of geometries and surfaces, that often include narrowly-spaced laminated metal sheets with hairline spacing between each sheet and some porous surfaces. Therefore, it is not possible to accurately measure the net amount of PCB on or in the solid materials charged to the primary chamber in the burn tray. Previous testing (1998) did include pre-test wipe samples of burn tray items which provides a general measure of surface contamination. The wipe samples were apparently used to develop estimates of PCB mass with the burn tray items. These wipe sample measurements simply confirm the presence of PCB and are at best only

rough estimates of actual PCB mass. A-Line does not believe such characterization of burn tray materials serves as an accurate measure of PCB in the MRF charges. As requested by EPA, A-Line will perform pre-test and post-test PCB wipe sampling and analysis of the materials loaded into the burn tray. However, no credit for PCB mass with burn tray charges will be used or considered in the DRE calculation. PCB DRE will be based solely on the PCB feed rate to the secondary chamber and measured emissions.

A-Line does not currently feed PCB liquid to the MRF as is allowed by Section III.B.4 of the current TSCA Permit. In fact, the piping to do so has long since been removed. However, for PCB DRE demonstration purposes, the location where PCB liquids was previously injected to the secondary chamber will be used to meter PCB liquid during MRF testing. For testing purposes, PCB liquid available will be transferred to 55-gal drums (or similar containment) and reserved for the test. A-Line does not intend to seek burning of PCB liquid as part of the TSCA Permit renewal; the PCB liquid spiking injection point will be re-capped after testing is completed.

A metering pump and scale or mass flow meter system will be used to meter (spike) PCB liquid to the secondary chamber at a controlled rate. Compressed air may be used at the injection point to atomize the PCB liquid. Supporting calculations for the PCB feed rate and DRE are presented Section 3.6 of this Test Plan.

PCB liquid injection will begin just prior to loading the burn tray into the primary chamber. PCB liquid injection will be discontinued when emissions sampling for the cycle is completed.

3.4 SAMPLING AND ANALYSIS PROTOCOL

The sampling and analytical protocols are summarized in Table 3-1.

3.5 SAMPLING LOCATIONS AND PROCEDURES

The emissions sample collection points are shown on Figure 3-1. The following sections discuss the planned sampling and analyses.

3.5.1 Stack Gas Method 23 (PCB/DF/SVOC RCI)

The stack gas will be sampled isokinetically for PCB, DF, and SVOC RCI using a single EPA Method 23 sampling train. Sampling will be performed for 240 minutes (4 hours) per run to sample a target volume of 4.0 dry standard cubic meters of stack gas. The sampling train XAD-2 resins will be prepared with isotopically labeled sampling surrogate spikes for all three target compound groups. The laboratory will extract and split the extracts for the respective analyses. The Quality Assurance Project Plan (QAPP) delineates the sampling train recovery scheme, and the sample extraction scheme and associated QA/QC. The PCB will be analyzed for all 209 congeners using EPA Method 1668C. The PCDD/PCDF will be analyzed using SW-846 Method 8290A. The SVOC RCI will be analyzed using SW-846 Method 8270E.

The target PCB, PCDD/PCDF, and SVOC RCI compounds and expected detection limits are noted in Tables 9-1, 9-2, and 9-3 of the QAPP, respectively.

3.5.2 Stack Gas Method 5/202 (Particulate Matter)

The stack gas will be sampled isokinetically for filterable and condensable PM according to EPA Methods 5 and 202. Sampling will be performed for 120 minutes (2 hours) per run. The expected detection limits for PM are noted in Table 9-4 of the QAPP. Filterable PM data will be used to demonstrate compliance with the appliable PM emissions limit. Condensable PM emission data is collected for EPA use; no emissions standard is established for condensable PM.

3.5.3 Stack Gas Method 26A (Hydrogen Chloride and Chlorine)

Isokinetic sampling for HCl and Cl_2 is not required due to the absence of water droplets in the stack gas. However, the stack gas will be sampled isokinetically for HCl and Cl_2 according to EPA Method 26A. Sampling will be performed for 72 minutes (3 minutes per traverse point) per run. The expected detection limits for HCl and Cl_2 are noted in Table 9-5 of the QAPP.

3.5.4 Stack Gas Method 0030 (VOST)

To determine the VOC RCI emissions, the stack gas will be sampled using the SW-846 Method 0030, Volatile Organic Sampling Train (VOST). VOST is a non-isokinetic sampling method. VOST sampling will be performed at Port 3. Sampling will be performed at a nominal rate of 1.0 liters per minute (lpm) for 20 minutes per tube set. Four (4) pairs of VOST tubes representing nominally 80 liters of stack gas will be collected during each sampling run, but only three will be analyzed. The fourth tube pair will serve as an archive set in the case of breakage during shipment or laboratory handling. VOST analyses will be performed using SW-846 Method 5041A/8260D. The target volatile organic compounds and expected detection limits are noted in Table 9-6 of the QAPP. Stack gas flow rate, moisture, and stack gas molecular weight (Methods 2, 3A, and 4) data from the concurrently operated Method 26A train will be used to calculate VOC RCI emission rates.

3.5.5 Stack Gas CEMS

During the test, the stack gas concentrations of CO, CO_2, and O_2 will be monitored using the installed CEMS. Temporary CEMS, set up and calibrated by the sampling company, will be used to measure the stack gas concentrations of SO_2 and NO_X. The probe for the temporary CEMS will be placed in Port 3. The CO, NO_X, and SO_2 data will be used to demonstrate compliance with the applicable TSCA emissions standards. The CO, CO_2, and O_2 data will be used to demonstrate compliance with the TSCA combustion efficiency standard of 99.9%. Additionally, the stack concentrations of CO_2 and O_2 will be measured by the sampling company using EPA Method 3A for purposes of calculating the stack gas molecular weight.

3.5.6 Analytical Procedures

Analytical methods for the emissions samples are summarized in Table 3-1.

3.5.7 Pre- and Post-Treatment Wipe Samples

As noted in Section 3.2, with each MRF operational cycle wipe samples of three (3) distinctly different feed items will be collected before the tray is loaded into the furnace. Similarly, wipe samples of three (3) distinctly different treated items will be collected after the tray is removed from the furnace and the items have cooled to ambient temperature. These samples will be analyzed internally by A-Line's on-site laboratory and the results included in the MRF test report. These wipes samples are not included in Table 3-1 or the QAPP sample lists or counts. With two (2) burn cycles per test run and six (6) wipe samples per cycle, and three (3) test runs, a total of 36 wipe samples will be collected and analyzed. Wipe sampling will include collection one (1) unused wipe each test day as a proof blank sample bringing the total to 39 test program samples for analysis.

3.6 PCB DRE AND FEED RATE ANALYSIS

Samples of the reserved PCB liquid discussed in Section 3.1 will be taken prior to the test date and analyzed using EPA Method 1668C. This analytical method will provide speciation of all 209 congeners. This pre-test analysis will identify the total concentration of PCB. This information can then be used to estimate the PCB liquid feed rate necessary to demonstrate 99.9999% DRE. The DRE will be calculated based on the total PCB feed and total PCB emission rates

Table 9-1 of the QAPP summarizes the expected in-stack detection limit for each of the 209 PCB congeners. The in-stack PCB detection limit for each congener is based on the expected stack gas sampled volume of four (4) dry standard cubic meters (dscm) and the analytical detection limit for single analysis of the combined Method 23 fractions. To allow for operational and analytical variability, the PCB liquid feed rate will be based on demonstrating between 99.99995% to 99.99999% DRE, a 5X to 10X DRE target window.

Table 3-2 provides an example calculation of the potential PCB liquid feed rates necessary to effectively demonstrate 99.9999% DRE. A grab sample of the PCB liquid spike will be collected once during each test run for PCB concentration analysis by Method 1668C. This analysis method will provide the total PCB content based on full speciation of all 209 congeners. The DRE will be calculated based on the total as-fed PCB liquid sample analysis, PCB liquid feed rate, and total PCB emission rate.

3.7 QUALITY ASSURANCE AND QUALITY CONTROL PROCEDURES

Appendix A contains the QAPP that has been prepared according to EPA Guidance. The QAPP delineates the QA/QC procedures for the test sampling and analyses.

Table 3-1. MRF Test Sampling and Analysis

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [1]
MRF Run Cycle 1						
Stack Gas	Isokinetic Port	EPA Method 23 Sampling Train	EPA 23	240 minutes and target volume 4.0 dry standard cubic meters [2,3]	PCDD/PDCF PCB SVOC RCI	EPA Method 23 & SW-846-8290A & (PCDD/PDCF) EPA Method 1668C (PCB) SW-846-8270E (SVOC RCI)
Stack Gas	Isokinetic Port	Method 5/202	EPA Method 5/202	120 minutes [2,3]	Filterable and Condensable PM	EPA Method 5/202
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	PCB Total Chlorine	SW-846 1668C (PCB) SW-846 5050/9056A (Cl)
Stack Gas	CEMS Port	Temporary SO_2 CEMS	EPA Method 6C	Continuous	SO_2	40 CFR 60, Appendix A Method 6C
Stack Gas	CEMS Port	Temporary NO_X CEMS	EPA Method 7E	Continuous	NO_X	40 CFR 60, Appendix A Method 7E
MRF Run Cycle 2						
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	72 minutes [2,3]	HCl/Cl_2	EPA Method 26A
Stack Gas	Non-Isokinetic Port	VOST	SW-846 0030 (VOST)	20 L sample per tube set at 1.0 L/min; four tube sets, 80 L total sampled per run	VOC RCI	SW-846 5041A/8260D
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	Total Chlorine	SW-846 5050/9056A (Cl)
MRF Run Cycle 1 and Cycle 2						
Stack Gas	CEMS Port	Installed CO, CO_2, and O_2 CEMS	40 CFR 60, Appendix F	Continuous	CO and O_2	40 CFR 60, Appendix F

Table 3-1. MRF Test Sampling and Analysis

Notes:

[1] Reference Method Sources:

“SW-846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

“EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.

“EPA Method 1668C” refers to Method 1668C, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-820-R-10-005, April 2010.

[2] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[3] Isokinetic sampling trains include:

- Using CEMS for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3A)
- Performing stack gas velocity, pressure and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train sample (EPA Method 4).

Table 3-2. Example PCB DRE Analysis

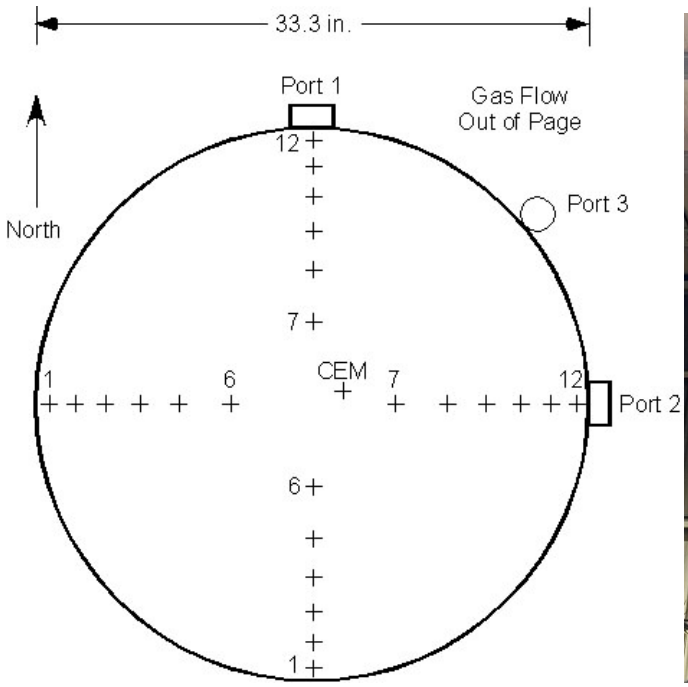
PCB Component	Expected In-stack Conc.	Emission Rate @ In-Stack Conc.	Emission Rate @ In-Stack Conc.	Feed Rate @ 99.9999% DRE	Feed Rate @ 99.99995% DRE	Feed Rate @ 99.99999% DRE
Congener	**ng/dscm**	**ng/hr**	**lb/hr**	**lb/hr**	**lb/hr**	**lb/hr**
Total RL, All 209 Congeners	26.2 (Refer to Table 9-1 of the QAPP)	89,022	2.0E-07	2.0E-01	3.9E-01	2.0E+00

PCB Oil Feed Rate @ 99.99995% DRE and Various Concentrations

PCB Liquid Conc., mg/kg	5,000	10,000	50,000
PCB Liquid Feed, lb/hr	79	39	7.9
PCB Liquid Feed, gph (est. @ 7.4 lb/gal)	11	5.3	1.1
Estimated Heat Input, MMBtu/hr	1.5	0.75	0.15

Stack Flow:	10,221	acfm
(1997 Test)	1,853	deg F
	11.32	%moisture
	2,002	dscfm
	56.68	dscm/min

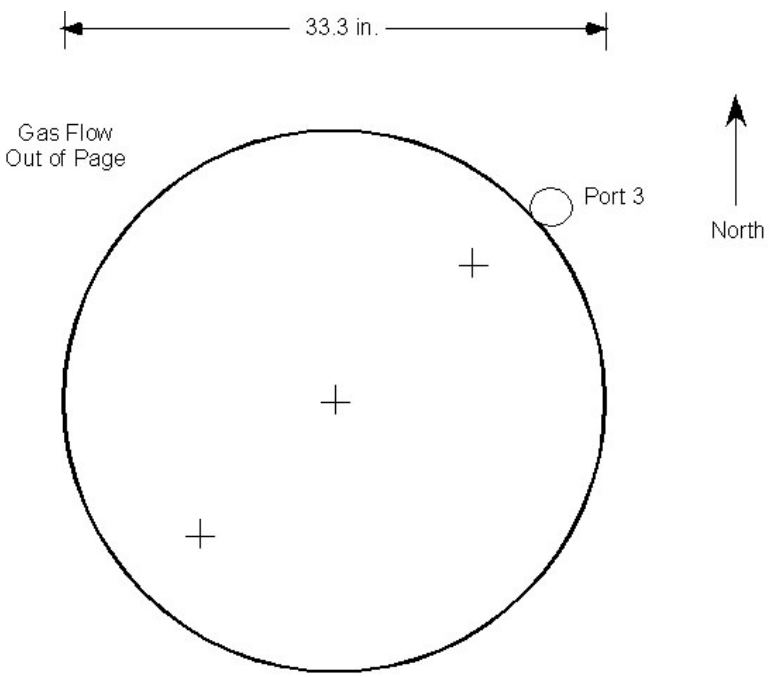
Figure 3-1. Isokinietic Stack Sample Point Layout (EPA Method 1)



Sampling Point	% of Stack Diameter	Port to Point Distance (inches)
1	97.9	32.3
2	93.3	31.1
3	88.2	29.4
4	82.3	27.4
5	75.0	25.0
6	64.4	21.5
7	35.6	11.9
8	25.0	8.3
9	17.7	5.9
10	11.8	3.9
11	6.7	2.2
12	2.1	1.0

Duct diameters upstream from flow disturbance (A): 3.6 Limit: 0.5
Duct diameters downstream from flow disturbance (B): 5.8 Limit: 2.0

Figure 3-2. Stack CEM Stratification Check Layout



Sampling Point	% of Stack Diameter	Port to Point Distance (inches)
1	83.3	27.7
2	50.0	16.7
3	16.7	5.6

Duct diameters upstream from flow disturbance (A): 3.6

Duct diameters downstream from flow disturbance (B): 5.8

End of Section

4.0 TEST SCHEDULE [40 CFR 63.1207(f)(1)(v)]

4.1 PLANNED TEST DATE

No date has been set for performing the MRF test. A-Line will notify ODEQ and EPA at least 60 days before the planned date for starting the test.

4.2 TEST DURATION

The MRF test will consist of three (3) replicate sampling runs. The anticipated general schedule of testing is as follows:

- Monday-Test team travels to test site, participates in on-site health and safety training, and begins test equipment setup.
- Tuesday-Complete testing set up; conduct Run 1 (two MRF cycles).
- Wednesday-Conduct Run 2 (two MRF cycles).
- Thursday-Conduct Run 3 (two MRF cycles).
- Friday-Contingency day, if needed.

Planned sequencing and timing of the sampling during each day of testing is presented in Figure 4-1.

4.3 TEST INTERRUPTIONS

MRF is a batch operated system. As such, there is a limited time window during each MRF cycle to collect representative emissions data. In the event of a test interruption, all stack gas sampling will be suspended immediately. Stack sampling pumps will be switched off, but probes may remain in the stack. Should the situation be resolved shortly (less than 60 minutes) and normal MRF operation is resumed, stack sampling may be resumed at the discretion of the test coordinator and after consultation with the MRF operations staff. Optionally, the test coordinator and MRF operations staff may elect to void the test run.

The TSCA Permit prescribed minimum MRF cycle time is 2.5 hours at greater than 800°F in the primary chamber. Should the situation that forced the pause in sampling take longer than 60 minutes to resolve, the test coordinator and MRF operations staff will likely elect to void the test run and reset the sampling trains for a new MRF cycle.

All test start/stop/resume/void decisions will be communicated to the regulatory observers present at the time of testing. Such decisions may include consultations between the test coordinator, the MRF operations staff, and the regulatory observers present.

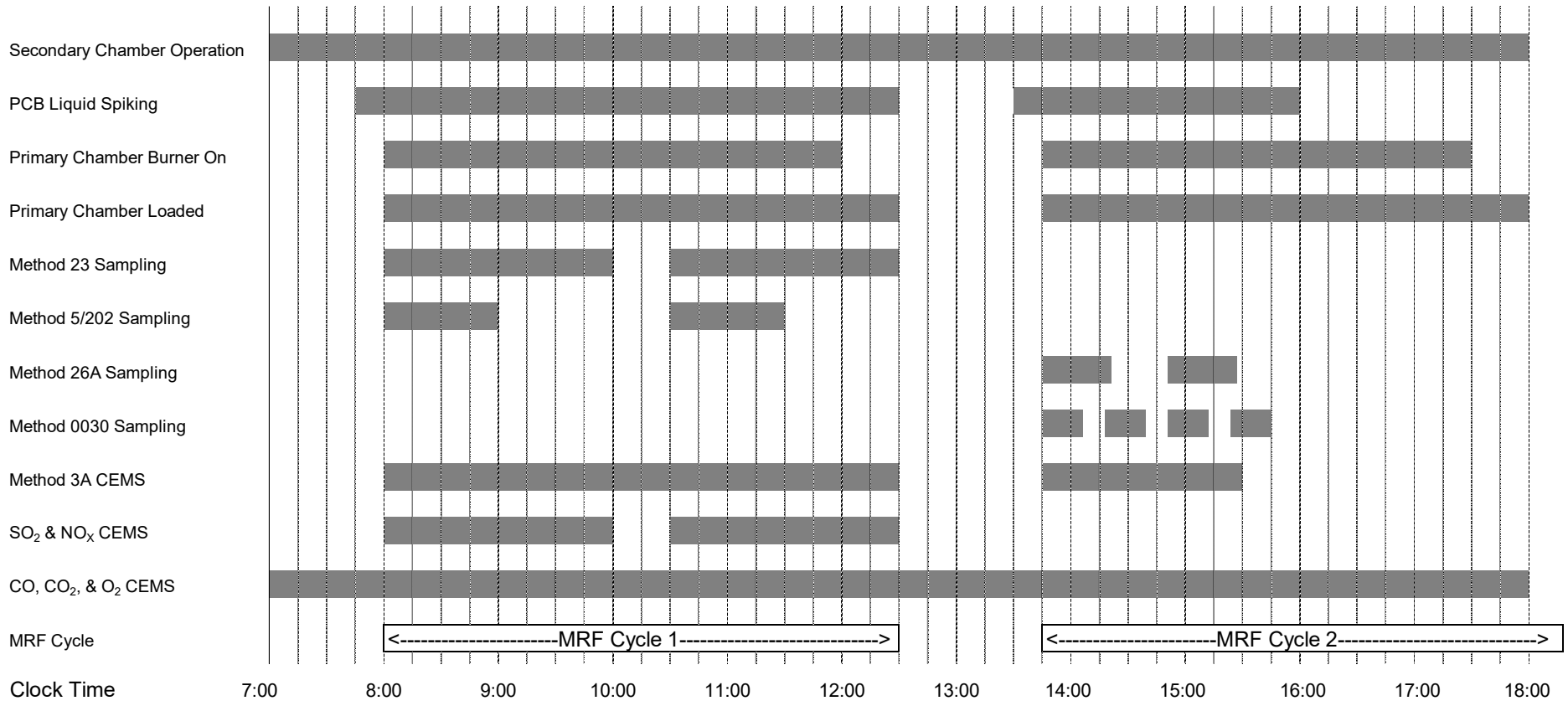


Figure 4-1. MRF TSCA Compliance Test Sampling Timeline

5.0 TEST REPORT AND OPERATIONAL LIMITS

5.1 TEST REPORT

The final test report will be submitted to EPA Region 6 and ODEC within 90 days after completion of the test unless a time extension is requested. The final test report will contain a discussion of the test objectives; sampling, analysis, and QA/QC activities performed; summaries of process operating conditions; and the results of the test determinations; and proposed/confirmed permit conditions. The proposed outline of the test report is shown in Table 5-1.

5.2 OPERATING LIMITS

The following sections propose a methodology for establishing TSCA Permit operating limits based on the MRF operation during the test program.

5.2.1 Minimum Primary Chamber Temperature

The current TCSA Permit required operating protocol for the primary chamber is 500-1,200°F for a minimum of 2.0 hours and reach a minimum temperature of 1,200°F once during each cycle. The current Air Permit requires the primary chamber to be operated at a minimum of 800°F except for brief periods when the chamber is charged (loaded). The TSCA regulations at 40 CFR 761.72(a)(3) require the primary chamber to be operated at 537-650°C (999-1,202°F) for a minimum of 2.5 hours and reach a temperature of 650°C (1,202°F) once during the cycle.

A-Line operates the primary chamber at a minimum of 800°F for 2.5 hours and reaches a minimum of 1,200°F once during each cycle. A-Line will follow this temperature/cycle process during testing. Primary chamber temperature will be monitored and recorded continuously during each test run/cycle. Provided the required PCB DRE is achieved during testing, A-Line proposes to retain the current TSCA permit primary chamber temperature/cycle process. Alternatively, A-Line proposes changing the minimum temperature limit to be consistent with the current Air Permit of 800°F.

5.2.2 Minimum Secondary Chamber Temperature

The current TCSA Permit and Air Permit operating requirement for the secondary chamber is 1,200°C (2,192°F), with at least 3% excess oxygen, 2.0 seconds residence time, and 99.9% combustion efficiency ($[CO_2] / ([CO_2] + [CO]) * 100\%$). Both permits are consistent with the TSCA regulations at 40 CFR 761.72(a)(4).

A-Line operates the secondary chamber at a minimum of 1,200°C (2,192°F), with at least 3% excess oxygen, and 99.9% combustion efficiency. Combustion gas residence time substantially exceeds the minimum 2.0 seconds requirement at these operating conditions. Secondary chamber temperature will be monitored and recorded continuously during each test run/cycle. Provided the required PCB

DRE is achieved during testing, A-Line proposes to retain the current TSCA Permit secondary chamber temperature limit and operating conditions.

5.2.3 PCB Material Charge Limits

The current TSCA Permit limits the PCB material charges to the primary chamber to:

- A maximum stacked tray height of four (4) feet of drained PCB items
- A maximum tray net weight of 6,300 pounds
- PCB items shall be drained of all free-flowing liquid, removed from the housing, and chopped to achieve the maximum amount of surface area exposure practicable
- No more than one (1) 55-gallon drum, or its equivalent, of contaminated debris
- No more than one contaminated wooden pallet, and
- Charging or heating of the primary chamber shall not commence until the secondary chamber has reached a temperature of 1,200±100 °C (2,192 ° ±180 °F) [40 CFR 761.72(a)(5)].

Materials that may be treated in the MRF include solid PCB items that have been drained and flushed of all free-flowing PCB liquids. Other materials allowed are incidental PCB solids such as rags, debris, or wood pallets that may have been contaminated with PCBs.

During testing, A-Line will operate the MRF consistent with these limitations. Provided the required PCB DRE is achieved during testing, A-Line proposes to retain the current TSCA Permit PCB charge material limiting conditions with the additional specific delineated allowance of adding de-chlorination system salt water to the burn trays up to six (6) inches depth.

5.2.4 Required Monitoring Systems

In accordance 40 CFR 761.72(a)(6), A-Line shall operate CEMS and recorders for carbon dioxide, carbon monoxide, and excess oxygen in the secondary chamber, and continuous temperature recorders in the primary and secondary chambers to assure the operating parameters operating limits specified at 40 CFR 761.72(a)(3) through (a)(5) are met. Additionally, A-Line shall operate continuous draft pressure recorders in the primary and secondary chambers to assure compliance with the fugitive emissions standard of 40 CFR 761.72(a)(1) is met.

5.2.5 Monitoring of Minimum Residence (Dwell) Time

Section 2.4 of the MRF test plan presents an example calculation of the secondary chamber combustion gas residence (dwell) time. The MRF is a batch treatment system. The materials treated are almost entirely non-combustible with only surface PCB contamination. As such, these materials contribute nearly nothing to thermal input or gas generation during the treatment cycle. MRF gas generation is almost exclusively from the natural gas fired burners which operate on mechanical air-to-gas ratio control. Combustion gas is

therefore directly related to burn firing rate. Firing rate varies as necessary to maintain minimum chamber temperatures.

Prior to the test, A-Line will install a meter on the natural gas feed line to the MRF. During each MRF test cycle, the natural gas meter value will be manually recorded at 15-minute intervals. These values will be used to document the total and peak natural gas usage during each cycle. The stack flow rate and temperature will be measured during each MRF test cycle via the isokinetic sampling trains. The stack data will be used to calculate and document the secondary chamber combustion gas residence time for each test cycle in like manner as presented in Section 2.4 of the test plan. The combustion gas residence time is expected to substantially exceed the minimum required 2.0 seconds.

A-line proposes a maximum total per cycle natural gas firing rate limit based on 1.5 times (1.5X) the average of the peak firing rate during the test run. The test report will provide additional calculations and mass and energy balance modeling to show the proposed firing rate limit cannot result in an exceedance of the minimum required 2.0 seconds residence time. The proposed firing limit allows for natural variation in MRF operation due to seasonal ambient temperature that will require more or less natural gas firing to maintain minimum chamber temperatures. To document compliance with this limit, A-Line will add natural gas usage to the MRF Burn Log used to document each treatment batch. The natural gas meter reading will be recorded at the beginning and end of each treatment cycle. The total per cycle natural gas use (scf) will be calculated by difference. The burn logs are maintained as part of the MRF operating record.

Table 5-1. Example MRF Test Report Outline

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  - **1.2.1** Actual vs. Planned Operations
  - **1.2.2** Data Quality Objectives
  - **1.2.3** Sampling and Sample Handling

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- **2.3** Test Responsible Parties
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- APPENDIX B EMISSIONS SAMPLING REPORT
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- APPENDIX D EXAMPLE CALCULATIONS
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- APPENDIX F SUMMARY ANALYTICAL DATA REPORT

QUALITY ASSURANCE PROJECT PLAN
METAL RECOVERY FURNACE
TSCA COMPLIANCE TEST

PREPARED FOR:

A-LINE T.D.S., INC.
P.O. BOX 428
1500 NORTH MAIN STREET
TONKAWA, OKLAHOMA 74653

REVISION: 4
MAY 2025
FOCUS PROJECT NO. P-001578

FOCUS ENVIRONMENTAL INC.
4700 PAPERMILL DRIVE
KNOXVILLE, TENNESSEE 37909
(865) 694-7517
http://www.focusenv.com

1.0 QUALITY ASSURANCE PROJECT PLAN APPROVAL FORM AND DISTRIBUTION LIST

Project Title: A-Line T.D.S., Inc. (A-Line)
Metals Recovery Furnace TSCA Compliance Test
Tonkawa, Oklahoma

Expected Test Date: To Be Determined

Project Approvals:

Name/Function/Organization	Signature	Date
Lynn Fritz Test Project Manager A-Line T.D.S., Inc.		
Chris McBride Test Coordinator Focus Environmental, Inc.		
TBD Stack Sampling Team Leader Clean Air Engineering		
Courtney Adkins Laboratory Project Manager Eurofins Knoxville		
Teresa Bales Quality Assurance Officer Focus Environmental, Inc.		

QAPP Approval Statement: The individuals listed above:

1) Have received, read, and agreed to the appropriate information pertaining to assigned project responsibilities listed and provided in this QAPP, and

2) Agree if there are modifications or deviations from the sampling and analytical methods as specified in the associated Test Plan, they are to be identified and explained in the sampling and analytical narratives, and discussed in the body of the test report.

QAPP Distribution List

Project Organization Title	Organization/Name
President	A-Line T.D.S., Inc.
Test Project Manager	A-Line T.D.S., Inc.
Health and Safety Manager	A-Line T.D.S., Inc.
Operations Manager	A-Line T.D.S., Inc.
Test Coordinator	Focus Environmental, Inc.
Stack Sampling Team Leader	Clean Air Engineering, Inc.
Spiking Manager	Superior Spiking Industries
Sample Custodian	Focus Environmental, Inc.
Laboratory Project Manager	Eurofins Knoxville
Quality Assurance Officer	Focus Environmental, Inc.
U.S. Environmental Protection Agency	EPA Region 6

The QAPP was distributed to these individuals, was read by the individuals, and they agree to the appropriate information pertaining to their project responsibilities as listed and provided in this QAPP.

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ACRONYMS AND ABBREVIATIONS

ASTM	American Society for Testing Materials
B.P.	boiling point
CAR	corrective action request
CCB	continuing calibration blank
CCC	calibration check compound
CCV	continuing calibration verification
CEM	continuous emissions monitor
CEMS	continuous emissions monitoring system
CF	calibration factor
cfm	cubic feet per minute
CFR	Code of Federal Regulations
Cl_2	molecular chlorine
CLP	Contract Laboratory Program
CO	carbon monoxide
CMS	continuous monitoring system
COC	chain of custody
DF	polychlorinated dibenzo-p-dioxin and polychlorinated dibenzofuran
DI	deionized (water)
DOT	U.S. Department of Transportation
DQO	data quality objective
DRE	destruction and removal efficiency
dscf	dry standard cubic foot
dscfm	dry standard cubic feet per minute
dscm	dry standard cubic meter
dscmm	dry standard cubic meters per minute
EDL	estimated detection limit
EPA	U.S. Environmental Protection Agency
GC	gas chromatography
GC/ECD	gas chromatography/electron capture detector
GC/FID	gas chromatography/flame ionization detector
GC/MS	gas chromatography/mass spectrometry
g	grams
gr	grains
HCl	hydrogen chloride (gas) or hydrochloric acid (aqueous)
HRGC/HRMS	high resolution gas chromatography/ high resolution mass spectrometry
IATA	International Air Transport Association
ICB	initial calibration blank
Cl^-	chloride ion
ICV	initial calibration verification
IDL	instrument detection limit
inwc	inches water column
kg	kilograms
L	liter

lpm	liters per minute
lb or lbs	pounds
LCS	laboratory control standard
LCSD	laboratory control standard duplicate
m^3/min	cubic meters per minute
MDL	method detection limit
mg	milligrams
mg/L or mg/l	milligrams/liter
μg or ug	micrograms
μg/m^3 or ug/m^3	micrograms/cubic meter
min	minute
mL or ml	milliliters
mm	millimeters
MS	matrix spike
MSD	matrix spike duplicate
NA	not applicable
NaOH	sodium hydroxide
ND	non-detect
NELAP	National Environmental Laboratory Accreditation Program
ηg or ng	nanograms
non-Hg	non-mercury
O_2	oxygen
OCl^-	hypochlorite
OSW	EPA Office of Solid Waste
OTS	Office of Toxic Substances
PCDD	polychlorinated dibenzo-p-dioxin
PCDF	polychlorinated dibenzofuran
PCB	polychlorinated biphenyl
PDS	post-digestion spike
PE	performance evaluation
pg	picograms
PIC	product of incomplete combustion
PID	product of incomplete destruction
PM	particulate matter
ppm	parts per million
ppmv or ppmdv	parts per million dry volume
QA	quality assurance
QAO	Quality Assurance Officer
QAPP	Quality Assurance Project Plan
QC	quality control
RCl	total chlorinated organic content
RDL	reliable detection limit
RF	response factor

RFA	request for analysis
RL	reporting limit
RPD	relative percent difference
RRF	relative response factor
RRT	relative retention time
RSD	relative standard deviation
RT	retention time
SPCC	system performance check
SOP	standard operating procedure
SRE	system removal efficiency
SQL	sample quantitation limit
SVOC	semi-volatile organic compound
SW-846	"Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)," Third Edition, 1986 and updates (December 1997).
TCL	target compound list
TSCA	Toxic Substances Control Act
wc	water column
WM	wide-mouth
VOA	volatile organic analysis
VOC	volatile organic compound
VOST	volatile organic sampling train

3.0 PROJECT DESCRIPTION

3.1 GENERAL

This Quality Assurance Project Plan (QAPP) is an integral part of the A-Line T.D.S., Inc. (A-Line) Metals Recovery Furnace (MRF) Toxic Substances Control Act (TSCA) Compliance Test Plan (Test Plan), and must be used in conjunction with this plan. This section provides a brief description of the test objectives, the unit operating protocol, the associated sampling and analytical protocol, and how they relate to testing of the MRF. Refer to the Test Plan for more detailed information on the scope of the testing.

3.2 QUALITY ASSURANCE PROJECT PLAN SCOPE

This QAPP presents the organization, objectives, functional activities, and specific Quality Assurance (QA) and Quality Control (QC) activities for test data collection. This QAPP also describes the specific QA/QC protocols that will be followed for sampling, sample handling and storage, chain-of-custody, and laboratory analysis during the test program.

All QA/QC procedures will be in accordance with applicable professional technical standards, government regulations and guidelines, and specific project goals and requirements. The Test Plan and this associated QAPP have been prepared in accordance with EPA hazardous waste thermal treatment system testing and QAPP guidance documents, in particular the following:

- EPA Requirements for Quality Assurance Project Plans (EPA QA/R-5 EPA/240/B-01/003), March 2001
- Interim Guidelines and Specifications for Preparing Quality Assurance Project Plans (QAMS-005/80)
- Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990.
- EPA, "New Source Performance Standards, Test Methods and Procedures," Appendix A, 40 CFR 60.
- EPA, "Test Methods for Evaluating Solid Wastes Physical/Chemical Methods (SW-846)", Third Edition, 1986 and updates.

3.3 FACILITY BACKGROUND INFORMATION

A-Line operates a transformer disposal service facility located in Tonkawa, Oklahoma. Transformers, capacitors, and other electrical equipment components containing polychlorinated biphenyls (PCB) are drained of free-flowing liquid and dismantled. The PCB-bearing liquid drained from these items may be chemically treated on-site to destroy the PCB via de-chlorination or may be shipped off-site for treatment in a Toxic Substances Control Act (TSCA) permitted commercial hazardous waste incinerator. The metal, cores, and dunnage from dismantling the electrical items are thermally treated in the MRF. The MRF thermally desorbs and destroys residual PCB contamination from the metal and non-metal solid components. The thermally treated metal is recovered for recycling. Ash and other non-metal, non-

combustible residuals (e.g., ceramic components) are containerized for off-site disposal at a TCSA permitted landfill. The chemical treatment process and MRF operate under a TSCA permit issued by the Environmental Protection Agency (EPA) Region 6 and an Air Permit issued by the Oklahoma Department of Environmental Quality (ODEQ). This test program is being performed as part of the TSCA permit renewal. The test program will demonstrate compliance of the MRF with the TSCA requirements.

3.4 UNIT CONFIGURATION AND GENERAL OPERATION

The MRF is a batch operated furnace that complies with the operating requirements of 40 CFR 761.72 *Scrap Metal Recovery Ovens and Smelters*. The MRF includes two chambers, each equipped with natural gas fired burners. Solid components are treated in the primary chamber. The gases from the primary chamber are thermally treated in the secondary chamber to destroy the desorbed PCB. Thermally treated gases are discharged to the atmosphere via the MRF stack; there are no additional emissions controls.

Dismantled solid electrical components are loaded in a burn tray. The secondary chamber burners are started. Once the secondary chamber has reached the TSCA Permit required operating temperature of 1,100^{o}C (2,012^{o}F), the loaded burn tray is placed in the MRF primary chamber. The primary chamber burners are then started. The MRF operates for a time and temperature cycle/protocol consistent with the current TSCA Permit. Once the MRF cycle is complete, the primary chambers burners are shut off. After a cooling period, the primary chamber is opened and the burn tray with the treated materials is removed. The metals parts are allowed to continue to cool to ambient temperature at which point they can be wipe sampled and the samples analyzed to confirm the absence of PCB. The ash and other non-recycle materials in the burn tray can then also be removed. The decontaminated metal is made available for recycling. The ash and other non-recycle materials are containerized for eventual disposal in a TSCA permitted landfill

3.5 TEST OPERATING AND SAMPLING PROTOCOLS

Table 3-1 summarizes the planned sampling and analysis protocol. There are limited number of sampling ports on the stack: one set of two ports configured for isokinetic sampling, and a third port for non-isokinetic or temporary CEMS sampling. To complete the sampling and obtain representative emissions, two (2) MRF cycles will be necessary per test run, with three (3) test runs [six (6) MRF cycles] total performed to complete the test program. The emissions sampling for each MRF cycle is:

- Cycle 1: Sampling will be performed to measure PCB destruction and removal efficiency (DRE) and particulate matter (PM) emissions. PCB, dioxin/furan (DF), and semi-volatile organic compound (SVOC) total chlorinated organic content (RCl) emissions will be sampled concurrently using a single EPA Method 23 sampling train. Filterable and condensable PM emissions will be measured using a EPA Method 5/202 sampling train. The PCB liquid spike will be sampled to determine the PCB and chlorine contents and feed rates. Temporary CEMS will measure sulfur dioxide (SO_2) (EPA Method 6C) and nitrogen oxides (NO_X) (EPA Method 7E). Installed CEMS will measure carbon monoxide (CO), carbon dioxide (CO_2), and oxygen (O_2) emissions.

- Cycle 2: Sampling will be performed to measure HCl/Cl_2 and volatile organic compound (VOC) RCl emissions. Hydrogen chloride/molecular chorine (HCl/Cl_2) emissions will be measured using a EPA Method 26A sampling train. The PCB liquid spike will be sampled to determine the chlorine content and feed rate. VOC RCl emissions will be measured using a SW-846 Method 0030 sampling train. Installed CEMS will measure CO, CO_2, and O_2 emissions.

To accurately evaluate the PCB destruction and removal efficiency (DRE) and characterize resulting emissions from PCB destruction, PCB liquid will be continuously metered to the secondary chamber during emissions sampling. The PCB liquid used will be sampled prior to the testing to determine the PCB content and set the PCB liquid feed rate necessary to demonstrate 99.9999% DRE. Dismantled electrical components constitute a multitude of geometries and surfaces, that often include narrowly-spaced laminated metal sheets with hairline spacing between each sheet and some pourous surfaces. Therefore, it is not possible to accurately measure the net amount of PCB in the solid materials placed in the burn tray charged into the primary chamber. Previous testing (1998) did include pre-test wipe samples of burn tray items which provides a general measure of surface contamination. The wipe samples were used to develop estimates of PCB mass with the burn tray items. These wipe sample measurements simply confirm the presence of PCB and are at best only rough estimates of PCB mass. A-Line does not believe such characterization of burn tray materials serves an accurate measure of PCB charges. A-Line does not plan to perform any PCB sampling and analysis of the materials loaded into the burn tray, and consequently no credit for PCB mass with burn tray charges will be considered in the DRE calculation. PCB DRE will be based solely on the PCB feed rate to the secondary chamber and measured emissions.

Table 3-1. MRF Test Sampling and Analysis

Sample Name	Sampling Location/ Access	Sampling Equipment	Sampling Reference Method [1]	Sample Size/Frequency	Analytical Parameters	Analytical Reference Method [1]
MRF Run Cycle 1						
Stack Gas	Isokinetic Port	Method 23 Sampling Train	EPA Method 23	240 minutes and target volume 4.0 dry standard cubic meters [2,3]	PCDD/PDCF PCB SVOC RCI	SW-846-8290A (PCDD/PDCF) EPA Method 1668C (PCB) SW-846-8270E (SVOC RCI)
Stack Gas	Isokinetic Port	Method 5/202	EPA Method 5/202	120 minutes [2,3]	Filterable and Condensable PM	EPA Method 5/202
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	PCB Total Chlorine	SW-846 1668C (PCB) SW-846 5050/9056A (Cl)
Stack Gas	CEMS Port	Temporary SO_2 CEMS	EPA Method 6C	Continuous	SO_2	40 CFR 60, Appendix A Method 6C
Stack Gas	CEMS Port	Temporary NO_X CEMS	EPA Method 7E	Continuous	NO_X	40 CFR 60, Appendix A Method 7E
MRF Run Cycle 2						
Stack Gas	Isokinetic Port	Method 26A	EPA Method 26A	72 minutes [2,3]	HCl/Cl_2	EPA Method 26A
Stack Gas	Non-Isokinetic Port	VOST	SW-846 0030 (VOST)	20 L sample per tube set at 1.0 L/min; four tube sets, 80 L total sampled per run	Volatile organic PICs	SW-846 5041A/8260D
PCB Liquid Spike	Tap on Spiking Line	250 mL Sample Bottle	ASTM D-4057, E-300-03	Single grab sample once per run	PCB Total Chlorine	SW-846 1668C (PCB) SW-846 5050/9056A (Cl)
MRF Run Cycle 1 and Cycle 2						
Stack Gas	CEMS Port	Installed CO, CO_2, and O_2 CEMS	40 CFR 60, Appendix F	Continuous	CO and O_2	40 CFR 60, Appendix F

Table 3-1. MRF Test Sampling and Analysis

Notes:

[1] Reference Method Sources:

“SW-846" refers to Test Methods for Evaluating Solid Waste, Third Edition, November 1986, and Updates.

“EPA Method" refers to New Source Performance Standards, Test Methods and Procedures, Appendix A, 40 CFR 60.

“EPA Method 1668C” refers to Method 1668C, Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, US Environmental Protection Agency, EPA-820-R-10-005, April 2010.

[2] The exact volume of gas sampled will depend on the isokinetic sampling rate.

[3] Isokinetic sampling trains include:

- Using CEMS for oxygen and carbon dioxide to determine stack gas molecular weight (EPA Method 3A)
- Performing stack gas velocity, pressure and temperature profile measurement for each sampling location (EPA Method 2)
- Determining the moisture content of the stack gas for each sampling train sample (EPA Method 4).

4.0 ORGANIZATION OF PERSONNEL, RESPONSIBILITIES, AND QUALIFICATIONS

4.1 GENERAL

The project organization for the MRF TSCA test program is summarized in Figure 4-1.

4.2 A-LINE TEST PROJECT MANAGER

The A-Line Test Project Manager is the corporate representative for A-Line. During the test, the A-Line Test Project Manager will be responsible for ensuring that the MRF operates properly and that the unit achieves the desired test conditions on each test day. As such, the A-Line Test Project Manager, working through the A-Line Operations Manager, will assign responsibilities the unit operations. The A-Line Test Project Manager will be responsible for ensuring all the applicable MRF operating data are collected during each cycle and test run. The A-Line Test Project Manager will also be the official communication link between A-Line and the respective contractors and regulatory observers.

4.3 A-LINE OPERATIONS MANAGER

The A-Line Operations Manager will be responsible for the operation of the MRF. The Operations Manager and MRF Operators' duties will include:

- Operating the MRF within current TSCA Permit protocol
- Maintaining logs of process data as required by the TSCA Permit
- Downloading and providing the MRF one-minute operating data to the Test Coordinator in Microsoft Excel format.

4.4 TEST COORDINATOR

The Focus Environmental, Inc (Focus) Test Coordinator is experienced in the technical coordination and QA/QC associated with the testing of combustion systems similar to the MRF. The Test Coordinator is responsible for the execution of the MRF Test Plan and associated QAPP, preparation of the final test report, and interpretation of the test results. During the test, the Test Coordinator is responsible for the overall implementation of the test program. The Test Coordinator will serve as the focal point between the A-Line Test Project Manager and the sampling contractors on testing related matters, and will coordinate activities among various project team members. Specific Test Coordinator responsibilities include:

- Ensuring compliance with the Test Plan and the QAPP by all project team members during the test
- Documenting testing activities in a field logbook
- Providing sample checklists, labels, and request for analysis (RFA) and chain of custody (COC) forms for use by the Stack Sampling Contractor

- Assisting the A-Line Test Project Manager in interfacing with the regulatory observers and/or oversight contractors during the test
- Providing coordination between the A-Line Test Project Manager and the sampling team during the test, especially regarding decisions to start/stop/void/repeat sampling runs
- Performing inspections of the process equipment, process controls, process operations, data acquisition and recording systems, and sampling activities for compliance with this QAPP and the test plan
- Providing field review of process operating logs, and completed sample collection sheets, stack sampling logs, COC forms, and RFA forms
- Interfacing with the Laboratory Project Manager while samples are being analyzed
- Interfacing with the other testing contractors while the stack sampling and other test data are being reduced
- Supervising production of the test report.

4.5 STACK SAMPLING TEAM LEADER

The Stack Sampling Contractor, Clean Air Engineering, Inc., is experienced in conducting the stack sampling called for in the test plan and will conduct the stack sampling for this project. The Stack Sampling Team Leader will have overall responsibility for the collection and handling of all stack gas related samples. The Stack Sampling Team Leader has the following oversight responsibilities:

- Preparing and shipping stack sampling equipment, and shipping containers to the test site
- Providing reagents necessary for assembling and recovering sampling trains
- Preparing and calibrating stack sampling equipment
- Directing and/or participating in stack sampling activities
- Recording field test data required by the test plan and stack sampling methods
- Reviewing and approving stack sample collection sheets and stack sampling field data sheets
- Overseeing recovery of stack sampling-related samples and preservation of those samples
- Notifying the Sample Custodian of all samples collected
- Reducing stack sampling data and performing all calculations and QA activities required by the stack sampling methods
- Preparing a draft and final report of stack sampling activities.

4.6 SPIKING MANAGER

The Spiking Manager will have responsibility for metering the PCB liquid to the secondary chamber during the test. The Spiking Manager has the following responsibilities:

- Preparing and shipping the spiking equipment and materials to the test site
- Preparing and calibrating the spiking equipment
- Spiking the PCB to the secondary chamber in accordance with the Test Plan

- Recording spiking system operating data
- Notifying the Test Coordinator immediately of any difficulties or interruption of the spiking system operations
- Reducing spiking data and performing the calculations required to report the spiking rates
- Preparing a draft and final report of spiking activities.

4.7 SAMPLE CUSTODIAN

A Sample Custodian will be appointed who will have overall responsibility for the collection and handling of all test samples. This person has the following responsibilities:

- Coordinating the preparation of the master sample list, sample media preparation, and shipment of the media to the test site
- Controlling the issuance of sample media and containers at the test site
- Packaging the test samples for shipment to the laboratory
- Reviewing the COC and RFA forms for all samples prepared by other test team members
- Coordinating the shipping of all samples to the laboratory.
- Monitoring the shipment of samples to the laboratory to ensure that all samples are received on schedule and with all preservation requirements being met.
- Reporting any sample handling discrepancies to the Test Coordinator and Quality Assurance Officer.

4.8 LABORATORY PROJECT MANAGER

The Eurofins Environment Testing, Inc., Knoxville, Tennessee Laboratory (Eurofins) is experienced with the sampling methods and analyses associated with the MRF testing. The Laboratory Project Manager will have overall responsibility for the analysis of the test samples. The Laboratory Project Manager has the following responsibilities:

- Preparation of the master sample list with input from the Test Coordinator
- Preparation of the pre-labeled sample recovery containers
- Preparation and providing the XAD resin traps and filters for the various sampling trains
- Preparation of the RFA/COC documentation for the sample collection
- Receiving, verifying, and documenting that incoming field samples correspond to the sample chain of custody information
- Notifying the Test Coordinator and A-Line Test Project Manager of any discrepancies or problems in the COC and RFA information, preservation, or sample condition
- Maintaining records of incoming samples
- Tracking samples through processing, analysis, and disposal
- Designating QC samples for analysis during the project
- Verifying that laboratory personnel are trained and qualified in specified laboratory QC and analytical procedures

- Verifying that laboratory QC and analytical procedures are being followed as specified in this QAPP, the laboratory specific QA/QC Plan, and the laboratory specific analytical standard operating procedures (SOPs)
- Reviewing QC and sample data during analysis and determining if repeat analyses are needed
- Submitting certified QC and sample analysis results and data packages to the Test Coordinator
- Notifying the Test Coordinator of any QC excursions during the preparation and analysis of the field samples or associated QC samples
- Archiving analytical data
- Preparing a statement of the analysis activities for inclusion in the final test report executive summary regarding if any of the test data are invalid or unusable.

4.9 QUALITY ASSURANCE OFFICER

The Quality Assurance Officer's (QAO's) responsibilities include the following:

- Assuring all individuals included in the QAPP Distribution List receive copies of the test plan and QAPP
- Reviewing the stack sampling and analytical reports for completeness and accuracy
- Conducting or coordinating any required audits of the data reduction or laboratory procedures to ensure compliance with the QAPP
- Reviewing the stack sampling report for completeness of the data including documentation of the required calibrations
- Conducting validation of the analytical data generated for completeness of the reports including documentation of the required QA/QC analyses and corrective actions
- Preparing a report of the QA/QC activities that summarizes the findings, including a statement for inclusion in the final the report executive summary regarding if any of the test data are invalid or unusable.

4.10 ENVIRONMENTAL SAFETY AND HEALTH MANAGER

The A-line Environmental, Safety, and Health (ESH) Manager is responsible for ensuring compliance of the personnel and facility with the industrial safety regulations and operating permits. ESH Manager reports independently to the President of A-Line. The EHS Manager will have communication to and with every test team member, including A-line employees, testing contractors, and visitors/observers, relative to compliance with the facility's environmental, safety, and health rules during the execution of the MRF test program. The EHS Manager has full authority to dismiss any person(s) or company from the site who is not adhering to facility EHS requirements.

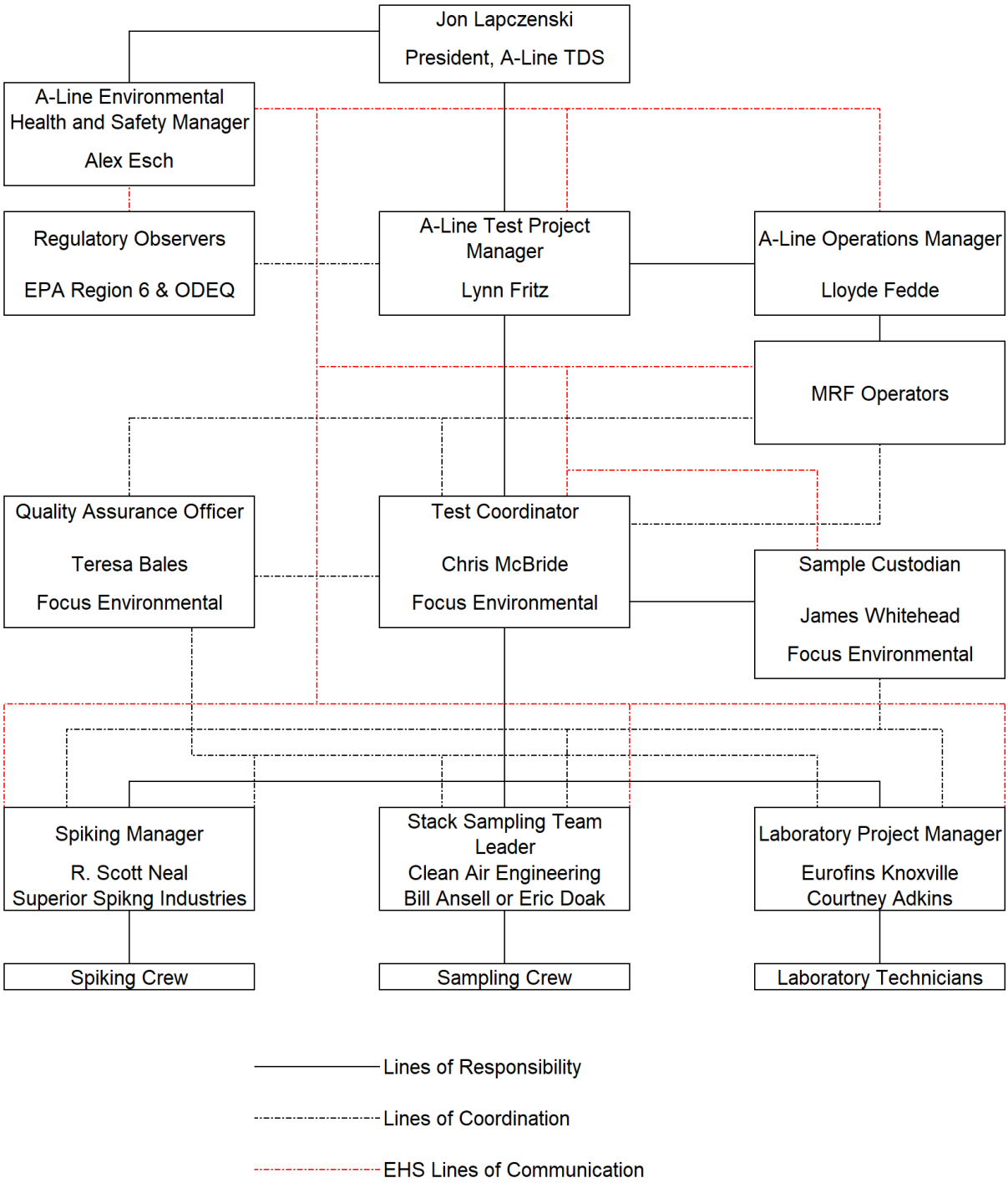

Figure 4-1. A-Line MRF Test Project Organization and Responsibility

5.0 QUALITY ASSURANCE OBJECTIVES AND QUALITY CONTROL OBJECTIVES

5.1 GENERAL

The project sampling and analysis scope is summarized in Section 3.0 of this QAPP. The selected stack sampling contractor and the contract laboratory are well experienced in the types of sampling and analyses represented by this test program. The analytical laboratory will provide method detection limits (MDL) and reporting limits (RL) for each analysis. The laboratory will provide the best and lowest detection limits for all testing parameters.

The overall quality assurance objective is to produce a complete data set that can be used to fully assess and validate the operation of MRF relative to the TSCA requirements. This includes a number of quality indicators necessary to assess the precision and accuracy of all the test data.

The field and laboratory data obtained during this test will be reviewed by the Test Coordinator and Quality Assurance Officer for compliance with data quality objectives (DQOs) and the overall project objective. Data that are outside of the target DQO limits will be evaluated relative to the impact(s) on the overall project objective of assessing the MRF's performance. The data evaluation narrative will be included in the final test report.

Table 5-1 presents target DQOs for precision and accuracy for each type of analysis that will be performed during the test program. QA/QC objectives for precision, accuracy, representativeness, completeness and comparability are defined in this section. Procedures and formulas for determining accuracy and precision are presented in Section 13.0 of this document. The following definitions briefly describe the meaning of each QA/QC objective:

Precision: A measure of mutual agreement among individual measurements of the same property, usually under "prescribed similar conditions". Various measures of precision exist depending on the prescribed similar conditions. If the number of samples is less than three, the precision is described as range percent or relative percent difference (RPD) from the average of replicate measured values for analysis of the same parameter. If the number of samples is three or greater, precision is best described in terms of relative standard deviation (RSD).

Accuracy: The degree of agreement of a measurement (or an average of measurements of the same parameter) X, with an accepted reference or true value, T. Accuracy is usually expressed as the difference between the two values, X - T, or the difference as a percentage of the reference or true value, 100 (X - T)/T, and sometimes expressed as a ratio, X/T. In some cases, accuracy is described as the percentage recovery of a known quantity of material added to a sample prior to analysis. Accuracy is a measure of the bias in a system.

Completeness: A measure of the amount of valid data obtained compared to the amount expected to be collected under normal conditions. Completeness is usually expressed as a percentage.

Representativeness: The degree to which data accurately and precisely represent a characteristic of a population, parameter variation at a sampling point, process condition, or an environmental condition.

Comparability: The confidence with which one set of data can be compared to another.

5.2 PRECISION AND ACCURACY

A number of procedures will be implemented to assess the precision and accuracy of the sampling and analytical data. All sampling and analytical activities will be conducted following referenced procedures. All reference materials used as calibration standards, surrogate compounds, or laboratory control samples will be of the highest purity commercially available. The calibration of instruments used during analysis will be verified each day that samples are analyzed as described in later sections of this QAPP. Assessment of data precision and accuracy will be accomplished by evaluating the results from multiple analyses of the same parameter, and analysis of standards, duplicates, and spiked samples. Field and laboratory contamination will be assessed through the analysis of reagent, instrument, method, and field and trip blanks.

Precision estimates presented in Table 5-1 represent variability for replicate measurements of the same parameters, expressed in terms of relative percent difference (RPD) for duplicate samples or relative standard deviation (RSD) for three or more measurements, as appropriate. For analyses of samples with detectable concentrations of the target analytes, precision is evaluated by conducting duplicate analyses of unspiked samples and assessing the RPD. In the evaluation of larger data sets (three or more data points), the RSD is assessed. When duplicate analyses are performed, the original analysis result will be used in test calculations. If the variances in the duplicate analyses bring into question the analytical precision, additional analyses, if allowed by the method, will be performed to better determine the actual value or to evaluate the potential reason(s) for the measurement variability.

For analytical results near the detection limit, precision can be impacted. For the cases where the original and duplicate results are a combination of detect and non-detect results at the method detection limit (MDL) where precision cannot be calculated, the data will be flagged as estimated.

Accuracy values in Table 5-1 include components of both random error and bias, expressed as a percentage of the “true” of “known” value (for reference materials) or percent analyte recovery (for spiked samples). The QA/QC program will focus upon controlling measurement error within the estimated limits of measurement uncertainty, as specified in Table 5-1. It should be noted that these limits are estimates that are, in most cases, described in the referenced analytical methods or in QA/QC guidance for hazardous waste thermal treatment. They represent the range of results that can be expected from these methods based on actual field sampling results and laboratory-based QA/QC studies. Therefore, it is reasonable to expect that the measurement errors associated with this project will be within the objectives shown in Table 5-1. QA/QC determinations which fall outside of the target range will be flagged and an assessment of the impact, if any, on the usefulness of the data on the overall results and conclusions of the test program will be provided in the final test report.

The analytical laboratory's National Environmental Laboratory Accreditation Program (NELAP) accredited standard operating procedures (SOPs) for each analysis will be followed. If during the course of test sample analyses, an analytical result exceeds the calibrated range for a target analyte, or any other analytical anomalies are noted with any test samples, the Test Coordinator is to be contacted immediately to discuss the results/issues and possible options before proceeding with the subject analyses. If ongoing QA/QC procedures reveal that a measurement's error has exceeded the estimated data quality limits, the source of the excessive error will be identified and corrective action will be taken, as described in Section 14.0. If data fall outside the acceptable range of precision and accuracy, even after corrective action has been taken, those data points will be flagged in the final analytical report. The precision and accuracy for those measurements will be reported as determined using the actual data. Also, alternative procedures (either sampling or analytical) may be considered and recommended if possible.

5.2.1 Method 23 PCB/PCDD/PCDF/SVOC RCI Sampling Precision and Accuracy

EPA Method 23 will be used to concurrently sample the stack gas for emissions of PCB, PCDD/PCDF, and SVOC total chlorinated organic content (RCI). Prior to use in the field, all of the XAD-2 resin traps for use in the Method 23 sampling train are spiked with isotopically-labeled PCB, PCDD/PCDF, and SVOC sampling surrogate compounds as noted in Table 5-1. Two of the XAD-2 resin traps prepared for this project will also have PCB, PCDD/PCDF, and SVOC matrix spikes applied and are retained by the laboratory. These two XAD resin traps are then included with the field samples when they are returned to the laboratory for analysis. The recoveries of the PCB, PCDD/PCDF, and SVOC isotopically-labeled sampling surrogates and matrix spike compounds from these two retained XAD resin trap samples provide an accuracy assessment of the Method 23 analytical methodology. The recovery of the isotopically-labeled sampling surrogates spiked onto every field-use XAD resin sample provides a field through analysis accuracy assessment of the Method 23 methodology.

The recoveries of the internal standard, alternate standard, and recovery standard compounds applied during the preparation and analysis of the Method 23 sampling train components provide accuracy and precision measurements for the sample preparation and analysis steps. Table 5-1 notes the RPD and RSD values for the Method 23 PCB, PCDD/PCDF, and SVOC analyses.

5.2.2 Method 5/202 Particulate Sampling Precision and Accuracy

The gravimetric analysis of the Method 5/202 samples for particulate analyses includes replicate weighings to assess analysis precision. The analytical balance accuracy is verified using Class S weights.

5.2.3 Method 26A Chloride Sampling Precision and Accuracy

The analysis of the Method 26A samples for chloride includes a system MS/MSD analyses to evaluate the precision and accuracy of the ion chromatography analytical methodology. Matrix spikes to Method 26A field samples and reagent blanks will be performed at the greater of 2 times (2X) the sample's apparent

native concentration or 10 times (10X) the MDL used for the ion chromatography method to demonstrate the recovery and reproducibility of the method. The relative recoveries of the matrix spikes provide a measure of the accuracy of the chloride ion analysis methodology. Additionally, precision is assessed via duplicate analyses of field, reagent blank, calibration standard, and QC samples.

5.2.4 VOST Precision and Accuracy

The Volatile Organic Sampling Train (SW-846, Method 0030) will be used to sample stack gases for volatile organic compound (VOC) total chlorinated organic content (RCI).

5.2.4.1 Spiked Resin Blanks

During the preparation of the Tenax® and Tenax®/Charcoal tubes sets for the test program, two VOST Tenax® and Tenax®/charcoal tube pairs will be spiked with the SW-846 Method 5041A/8260D specified surrogate spike compounds. These samples will be retained by the laboratory, and included with the field samples when they are returned from the field for analysis. The relative recoveries of the surrogate spikes from these samples provide an accuracy assessment of the VOST analytical methodology. The relative recoveries of the isotopically labeled surrogate and internal standard spikes applied to every VOST sample analysis provide an ongoing accuracy assessment of the VOST analytical methodology.

The two pairs of the spiked VOST tubes provide a precision (reproducibility) assessment for VOST methodology. The consistency of the isotopically labeled surrogate spike recoveries applied to every VOST sample analysis provides an ongoing precision assessment of the VOST analytical methodology.

5.2.4.2 VOST Breakthrough Analysis

A breakthrough assessment for the VOST is prescribed in Section 7.3.7 of the Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January 1990. This reference requires that the Tenax® and Tenax®/charcoal VOST tubes from each set of test run tube pairs be analyzed separately to determine possible target VOC breakthrough to the Tenax®/charcoal tube. The analysis of a Tenax®/charcoal tube should indicate less than 30% of the target VOC concentration that is collected on the Tenax® tube. Breakthrough of the target VOC to the Tenax®/charcoal tube above this level may cause loss of the desorption efficiency and result in a low bias in the analytical result. This criterion does not apply when less than 75 ηg of the target VOC is detected on the Tenax®/charcoal tube.

5.2.5 PCB Liquid Sample Properties

Duplicate analyses will be used to demonstrate the precision (reproducibility) and accuracy of the PCB liquid sample analyses for total chlorine content. Where possible, laboratory standards will be used to demonstrate the accuracy of the analytical method applied to the project samples.

5.2.6 PCB Liquid Sample Organics

PCB liquid samples will be analyzed by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS) to determine total PCB content (EPA Method 1668C). To demonstrate the precision (reproducibility) of PCB analyses, duplicate analyses are performed as part of sample analyses. Prepared samples are spiked with analysis surrogates to demonstrate the recovery and reproducibility of the methods. The relative recoveries of the surrogate spikes and analysis of laboratory standards will be used to demonstrate the accuracy of the analytical methods applied to the project samples.

5.2.7 Installed CO, CO_2, and O_2 CEMS Precision and Accuracy

The precision of the installed carbon monoxide, carbon dioxide, and oxygen continuous emissions monitoring system (CEMS) analyzers will be assessed using the recommended calibration gases in accordance with 40 CFR 60, Appendix F. Precision will be assessed using the following equation:

$$\text{Precision}(\%drift) = \left(\frac{R_f - R_i}{Span}\right)x100$$

where:

R_f = Final monitor response at end of the test run

R_i = Initial monitor response at start of the test run

Span = Maximum range of the analyzer.

The accuracy of all CEMS analyzers will be evaluated by the measurement of percent accuracy as defined by the equation below:

$$\text{Accuracy}(\%) = \left(\frac{R_a - R_c}{Span}\right)x100$$

where:

R_a = Analyzer indicated concentration of the calibration gas

R_c = Certified concentration of the calibration gas

Span = Maximum range of the analyzer.

During the test, the carbon monoxide, carbon dioxide, and oxygen CEMS analyzers will be calibrated daily before the start of testing.

5.2.8 Temporary NO_X and SO_2 CEMS Precision and Accuracy

Temporary analyzers for nitrogen oxides and sulfur dioxide will be used to demonstrate compliance with SO_2 and NO_X emissions standards. The temporary CEMS will be calibrated and operated in accordance with 40 CFR 60, Appendix A, Methods 7E and 6C. The precision and accuracy of the analyzers will be assessed during the test using the recommended calibration gases. During the test, the analyzers will be calibrated before and after each test run.

5.3 DETECTION LIMITS AND REPORTING

How the detection limits will be used in data reduction and reporting is described in Section 11.0.

For inorganic analyses and non-isotope dilution method organic analyses, the laboratory report will provide both the Method Detection Limit (MDL) and the laboratory specified reporting limit (RL). The laboratory will maintain on records documenting the MDL and RL determinations. Generally, all non-detects for target analytes will be reported and assessed at the laboratory-determined RL. If an analyte is detectable at some value between the MDL and RL, the detected value will be reported and flagged as estimated. If matrix interference(s) occurs or sample dilutions are necessary, a sample specific MDL or sample quantitation limit (SQL) may be reported. If a sample specific MDL or SQL is applicable, the documentation of the serial dilutions or other measures taken to arrive at the SQL will be documented in the analytical report. The RL and MDL will be reported for all analytes, detect or non-detect.

For PCB and DF isotope dilution organic analysis, the non-detects will be determined using the SW-846 Method 8290A definition of an estimated detection limit (EDL) and Method 23 for MDL. The RL, EDL, and MDL will be reported for all analytes, detect or non-detect.

5.3.1 Stack Gas PCB

Sampling for PCB emissions will be via use of the same Method 23 sampling train being used for DF and SVOC RCI. The Method 23 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds for PCB as prescribed by Method 23. The recoveries of the surrogate spikes will demonstrate the required accuracy performance.

The target list of the PCB compounds includes all 209 PCB congeners. PCB will be analyzed via HRGC/HRMS. The RL, EDL and MDL will be reported for each specific PCB compound that is non-detect in stack gas samples.

5.3.2 Stack Gas Dioxin/Furan

Sampling for DF emissions will be via use of the same Method 23 sampling train being used for PCB and SVOC RCI. The Method 23 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds for DF as prescribed by Method 23. The recoveries of the surrogate spikes will demonstrate the required accuracy performance. DF will be analyzed via HRGC/HRMS. The RL, EDL

and MDL will be reported for each 2,3,7,8-chlorinated dioxin and furan congener, and tetra- through octa-congener groupreportedThe RL,.

5.3.3 Stack Gas SVOC

Sampling for SVOC RCI emissions will be via use of the same Method 23 sampling train being used for PCB and DF. The Method 23 sampling train XAD-2 resin traps will be pre-spiked with isotopically labeled sampling surrogate compounds of SVOC. The recoveries of the surrogate spikes will demonstrate the required accuracy performance.

The target list of the SVOC for analysis via Method 8270E is noted in Section 9.0 of the QAPP. SVOC will be analyzed via gas chromatograph/mass spectrometry (GC/MS). The MDL and RL will be reported for each specific target SVOC compound.

In addition to the target list of compounds, all non-target chlorinated compound peaks greater than 10% of the nearest internal standard will be tentatively identified via a GC/MS library search using the mass spectral data. Only tentatively identified compounds (TICs) that can be matched with 85% or greater confidence will be reported. SVOC RCI TICs will be quantified based on nearest internal standard. SVOC RCI TICs less than 10% of the nearest internal standard will not be reported or quantified.

5.3.4 Stack Gas VOST

VOC RCI emissions will be assessed using the VOST. A target list of VOC or analysis via Method 8260D is noted in Section 9.0 of the QAPP. Compounds on the target compound list will be reported per the standard SW-846 method using laboratory-determined RLs and MDLs.

In addition to the target list of compounds, all non-target chlorinated compound peaks greater than 10% of the nearest internal standard will be tentatively identified via a GC/MS library search using the mass spectral data. Only tentatively identified compounds (TICs) that can be matched with 85% or greater confidence will be reported. VOC RCI TICs will be quantified based on the nearest internal standard. VOC RCI TICs less than 10% of the nearest internal standard will not be reported or quantified.

5.4 COMPLETENESS

Data completeness represents the valid data collected from the total number of valid tests conducted. Samples resulting from test runs that are judged invalid based on field performance indicators or aborted runs will not be submitted to the laboratory for analysis. Because the possibility exists that a sample may be lost or broken, the data from each individual analytical parameter may not be complete for all test runs. The impact of any occurrence of sample loss will be assessed with regard to the objective of obtaining valid runs and will be discussed in the final test report. The completeness objective of this test program is to generate sufficient data for the regulatory agencies to judge the performance of the system.

5.5 REPRESENTATIVENESS AND COMPARABILITY

The sampling procedures chosen for the test program are, wherever possible, approved EPA or American Society for Testing Materials (ASTM) sampling methods that are typically employed on thermal treatment system tests. The use of standard sampling methods affirms sample consistency and representativeness.

Use of standard, approved sampling and analysis methods, standardized data reduction procedures, and QC samples will provide data that is technically defensible and is comparable from test run to test run, test condition to test condition.

Table 5-1 Test Analytical Data Quality Objectives

Parameter	QC type	Precision	Accuracy
PCB Liquid			
Total Chlorine	Duplicate Analysis	≤ 10% RPD	---
Total Chlorine	Reference Sample	---	± 10%
Polychlorinated Biphenyls (PCB)	Duplicate Analysis	≤ 35% RPD	---
	Surrogate spikes	≤ 35% RPD	Notes 1, 3, 5
Method 23 Sampling Train (PCB)			
Method 23 PCB	Spiked Resin Blanks	≤ 25% RPD	75-125%
	PCB C^{13} Labeled Sampling Surrogate Spikes	≤ 35% RSD	Note 2
	PCB C^{13} Labeled Isotope Dilution Internal Standard Spikes	---	Note 3
	PCB C^{13} Labeled Optional Cleanup Standard Spikes	---	Note 4
	PCB C^{13} Labeled Pre-Analysis Internal Standard Spikes	---	Note 5
Method 23 Sampling Train (PCDD/PCDF)			
Method 23 PCDD/PCDF	Spiked Resin Blanks	≤ 25% RPD	75-125%
	PCDD/PCDF C^{13} Labeled Sampling Surrogate Spike	≤ 35% RSD	Note 6
	PCDD/PCDF C^{13} Isotope Dilution Internal Standard Spikes	---	Note 7
	PCDD/PCDF C^{13} Labeled Pre-Analysis Internal Standard Spikes	---	Note 8
Method 23 Sampling Train (SVOC RCI)			
Method 23 SVOC	Spiked Resin Blanks	≤ 25% RPD	75-125%
	C^{13} Labeled Sampling Surrogate Spike	≤ 35% RSD	Note 9
	Semi-volatile Surrogate Spikes	≤ 35% RSD	Note 10
	Semi-volatile Matrix Spikes	≤ 35% RSD	70-130%
Method 5/202 Sampling Train			
Particulate Matter	Replicate Weighings	± 0.5 mg	± 0.5 mg
Method 26A Sampling Train			
Hydrogen Chloride/Chlorine	Duplicate Analysis	≤ 35% RPD	---
	Matrix Spikes	≤ 35% RPD	± 30%
	Reference Sample	---	± 10%
Method 0030 Sampling Train (VOST)			
VOST Tubes	Spiked Resin Blanks	≤ 25% RPD	75-125%
VOST Tubes	Surrogate Spikes	≤ 35% RSD	Note 11
VOST Condensate	Surrogate Spikes	≤ 35% RSD	Note 11
VOST Breakthrough Analysis	Breakthrough Analysis	---	Note 12
Continuous Emissions Monitors			

Table 5-1 Test Analytical Data Quality Objectives

Parameter	QC type	Precision	Accuracy
Carbon Monoxide	40 CFR 60, Appendix F	± 3% of Span	± 5% of Span
Carbon Dioxide	40 CFR 60, Appendix F	± 0.5% Carbon Dioxide	± 0.5% Carbon Dioxide
Oxygen	40 CFR 60, Appendix F	± 0.5% Oxygen	± 0.5% Oxygen
Nitrogen Oxides and Sulfur Dioxide	EPA Methods 7E and 6C	± 3% of Span	± 5% of Certified Calibration Gas
EPA Method 3A			
Carbon Dioxide	Certified Calibration Gas	---	± 0.5% CO_2
Oxygen	Certified Calibration Gas	---	± 0.5% O_2

Note 1: PCB Surrogate Compound Recovery	
Compound	**Target Recovery**
Tetrachloro-meta-xylene	45-139% for Solid Matrix
	39-150% for Liquid Matrix

Note 2: Method 23 PCB Pre-Sampling (Field) Surrogates		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,4'-dichlorobiphenyl	8L	70 – 130%
$^{13}C_{12}$-3,3',4,5'-tetrachlorobiphenyl	79L	70 – 130%
$^{13}C_{12}$-2,2',3,5',6-pentachlorobiphenyl	95L	70 – 130%
$^{13}C_{12}$-2,2',4,4',5,5'-hexachlorobiphenyl	153L	70 – 130%

Note 3: Method 23 PCB Pre-Extraction Internal Dilution Standards (IDS)		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,3,3',4,5,5'-HxCB (Filter Recovery Standard)	159L	70 – 130%
$^{13}C_{12}$-2-monochlorobiphenyl	1L	20 – 145%
$^{13}C_{12}$-4-monochlorobiphenyl	3L	20 – 145%
$^{13}C_{12}$-2,2'-dichlorobiphenyl	4L	20 – 145%
$^{13}C_{12}$-4,4'-dichlorobiphenyl	15L	20 – 145%
$^{13}C_{12}$-2,2',6-trichlorobiphenyl	19L	20 – 145%
$^{13}C_{12}$-3,4,4'-trichlorobiphenyl	37L	20 – 145%
$^{13}C_{12}$-2,2',6,6'-tetrachlorobiphenyl	54L	20 – 145%
$^{13}C_{12}$-3,3',4,4'-tetrachlorobiphenyl	77L	20 – 145%
$^{13}C_{12}$-3,4,4',5-tetrachlorobiphenyl	81L	20 – 145%
$^{13}C_{12}$-2,2',4,6,6'-pentachlorobiphenyl	104L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4'-pentachlorobiphenyl	105L	20 – 145%
$^{13}C_{12}$-2,3,4,4',5-pentachlorobiphenyl	114L	20 – 145%

Note 3: Method 23 PCB Pre-Extraction Internal Dilution Standards (IDS)		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,3',4,4',5-pentachlorobiphenyl	118L	20 – 145%
$^{13}C_{12}$-2',3,4,4',5-pentachlorobiphenyl	123L	20 – 145%
$^{13}C_{12}$-3,3',4,4',5-pentachlorobiphenyl	126L	20 – 145%
$^{13}C_{12}$-2,2',4,4',6,6'-hexachlorobiphenyl	155L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5-hexachlorobiphenyl	156L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5'-hexachlorobiphenyl	157L	20 – 145%
$^{13}C_{12}$-2,3',4,4',5,5'-hexachlorobiphenyl	167L	20 – 145%
$^{13}C_{12}$-3,3',4,4',5,5'-hexachlorobiphenyl	169L	20 – 145%
$^{13}C_{12}$-2,2',3,3',4,4',5-heptachlorobiphenyl	170L	20 – 145%
$^{13}C_{12}$-2,2',3,4',5,6,6'-heptachlorobiphenyl	188L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5,5'-heptachlorobiphenyl	189L	20 – 145%
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-octachlorobiphenyl	202L	20 – 145%
$^{13}C_{12}$-2,3,3',4,4',5,5',6-octachlorobiphenyl	205L	20 – 145%
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	206L	20 – 145%
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	208L	20 – 145%
$^{13}C_{12}$-decachlorobiphenyl	209L	20 – 145%

Note 4: Method 23 PCB Optional Cleanup Standards		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,4,4'-trichlorobiphenyl	28L	20 – 145%
$^{13}C_{12}$-2,3,3',5,5'-pentachlorobiphenyl	111L	20 – 145%
$^{13}C_{12}$-2,2',3,3',5,5',6-heptachlorobiphenyl	178L	20 – 145%

Note 5: Method 23 PCB Pre-Analysis Internal Standard (IS) Compound Recoveries		
Compound	**BZ No.**	**Target Recovery**
$^{13}C_{12}$-2,5-dichlorobiphenyl	9L	S/N$\geq$10
$^{13}C_{12}$-2,4',5-trichlorobiphenyl	31L	S/N$\geq$10
$^{13}C_{12}$-2,4',6-trichlorobiphenyl	32L	S/N$\geq$10
$^{13}C_{12}$-2,2',5,5'-tetrachlorobiphenyl	52L	S/N$\geq$10
$^{13}C_{12}$-2,2',4,5,5'-pentachlorobiphenyl	101	S/N$\geq$10
$^{13}C_{12}$-3,3',4,5,5'-pentachlorobiphenyl	127L	S/N$\geq$10
$^{13}C_{12}$-2,2',3,4,4',5'-hexachlorobiphenyl	138L	S/N$\geq$10
$^{13}C_{12}$-2,2',3,4,4',5,5'-heptachlorobiphenyl	180L	S/N$\geq$10
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-octachlorobiphenyl	194L	S/N$\geq$10

S/N – Signal to Noise Ratio

Note 6: Method 23 PCDD/PCDF Sampling Surrogate Compound Recoveries	
Compound	**Target Recovery**
$^{13}C_{12}$-1,2,3,6-TCDD	70 – 130%
$^{13}C_{12}$-1,2,3,4,7-PeCDD	70 – 130%
$^{13}C_{12}$-1,2,3,4,6-PeCDF	70 – 130%
$^{13}C_{12}$-1,2,3,4,6,8,9-HpCDF	70 – 130%

Note 7: Method 23 PCDD/PCDF Isotope Dilution Internal Standard Compound Recoveries	
Compound	**Target Recovery**
$^{13}C_{12}$-1,2,7,8-TCDD (Filter Recovery Standard)	20 – 130%
$^{13}C_{12}$-1,2,3,4,6,8-HxCDD (Filter Recovery Standard)	20 – 130%
$^{13}C_{12}$-1,3,7,8-TCDD (Alternate Recovery Standard)	20 – 130%
$^{13}C_{12}$-1,2,4,7,8-PeCDD (Alternate Recovery Standard)	20 – 130%
$^{13}C_{12}$-2,3,7,8-TCDD	20 – 130%
$^{13}C_{12}$-2,3,7,8-TCDF	20 – 130%
$^{13}C_{12}$-1,2,3,7,8-PeCDD	20 – 130%
$^{13}C_{12}$-1,2,3,7,8-PeCDF	20 – 130%
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	20 – 130%
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	20 – 130%
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	20 – 130%
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	20 – 130%
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	20 – 130%
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	20 – 130%
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	20 – 130%
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	20 – 130%
$^{13}C_{12}$-OCDD	20 – 130%
$^{13}C_{12}$-OCDF	20 – 130%

Note 8: Method 23 PCDD/PCDF Pre-Analysis Internal Standard (IS) Compound Recoveries

Compound	Target Recovery
$^{13}C_{12}$-1,2,3,4-TCDD	S/N$\geq$10
$^{13}C_{12}$-1,2,3,4-TCDF	S/N$\geq$10
$^{13}C_{12}$-1,2,3,4,6,9-HxCDD	S/N$\geq$10
$^{13}C_{12}$-1,2,3,4,6,7,9-HpCDF	S/N$\geq$10

Note 9: Method 23 Semi-volatile Surrogate Compound Spike Recoveries		
Compound	**Aqueous Target Recovery**	**Solid, XAD-2 Resin, and Filter Target Recovery**
Nitrobenzene-d_5	35-114%	23-120%
2-Fluorobiphenyl	43-116%	30-115%
Terphenyl-d_{14}	33-141%	18-137%
Phenol-d_6	10-110%	24-113%
2-Fluorophenol	21-110%	25-121%
2,4,6-Tribromophenol	10-123%	19-122%

Note 10: Method 23 Semi-volatile Sampling Surrogate Compound Recovery	
Compound	**Target Recovery**
$^{13}C_3$-labeled Naphthalene	50 – 150%

Note 11: Volatile Surrogate Compound Spike Recoveries		
Compound	**Aqueous Target Recovery**	**Solid and VOST Target Recovery**
Dibromofluoromethane	80 – 120%	50 – 150%
1,2-Dichloroethane-d_4	77 – 128%	50 – 150%
Toluene-d_8	80 – 120%	50 – 150%
Bromofluorobenzene	72 – 129%	50 – 150%

Note 12: VOST Breakthrough Analysis Criterion.
The front half (Tenax® tube) and back half (Tenax®/charcoal tube) volatile organic sampling train traps are analyzed separately to determine the possible target VOC breakthrough to the Tenax®/charcoal portion of the adsorbents. The analysis of the Tenax®/charcoal trap should show less than 30 percent of each target VOC collected on the two front Tenax® traps. Breakthrough of each target VOC to the Tenax®/charcoal above this level may cause loss of desorption efficiency and would indicate a possible negative bias in the emissions calculations. This criterion does not apply when less than 75 ηg of target VOC is detected on the Tenax®/charcoal trap.

6.0 SAMPLING AND MONITORING PROCEDURES

6.1 GENERAL

The objective of this test program is the collection of representative PCB liquid and stack gas samples to demonstrate compliance of the MRF with the TSCA performance and emissions standards. To meet this objective requires minimizing the potential sources of sample contamination or bias imparted to the samples by the sampling equipment, ambient conditions, handling, and preservation. The test program samples will be collected using the methods summarized in Table 6-1. The total numbers of field samples expected to be generated during the MRF testing are also summarized Table 6-1.

Guidelines followed to determine sampling equipment to be used, sampling points, and the frequency at which samples are to be taken are presented in the Test Plan and are incorporated here by reference. The reference sources for the standard sampling method references include:

- Appendix A to 40 CFR 60, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60 (EPA)
- Test Methods for Evaluating Solid Waste, SW-846, Third Edition, 1986 and updates (SW-846)
- American Society for Testing and Materials (ASTM) Annual Book of ASTM Standards.

Reference sampling and analytical methods are identified in the Test Plan and this QAPP. The specifics of the sampling and analytical methodologies followed during the course of test execution by the selected sampling and analytical contractors include the referenced nationally recognized methods (ASTM, SW-846, 40 CFR 60 Appendix A, etc.) and/or the contractor-specific standard operating procedures (SOPs) as recognized by NELAP.

During the course of sampling and analysis, situations may still arise that require modifying the specific sampling or analytical procedures included or referenced in the Test Plan or this QAPP. For the stack gas samples, there are few alternatives to the analysis methods prescribed in SW-846 or 40 CFR 60. For the samples from the single sampling train (e.g., Method 23 for PCB, PCDD/PCDF, and SVOC RCI), the proposed procedures for the sample extractions and splitting of extracts for the respective analyses are discussed in this QAPP. The NELAP-approved laboratory SOPs, which include a number of procedures for special circumstances, will be followed. In cases where the laboratory finds it necessary to make adjustments to the analytical methods, the changes will be documented following the corrective action procedures noted in Section 14.0 of this QAPP. Any such changes must be approved by the Test Coordinator. Regulatory observer approval (if present on-site during testing) will be requested if significant deviations from planned sampling procedures are encountered during the testing.

All stack sampling equipment and glassware will be prepared prior to the test according to the method specifications. Following each test run, the samples will be recovered from the sampling trains. The sample recovery procedures include prescribed rinses of the trains, which serve a dual purpose of sample recovery and decontamination of the train in preparation for the next run. Rinses that are not included in the sample recovery will be placed into a waste solvent container.

Process samples will be collected using dedicated sampling equipment (sample bottles, funnels, jars, etc.) at each sampling location, thus eliminating the potential for cross contamination from one sample matrix to another. New sampling containers are used for each test run. If the same equipment will be used for more than one run, the equipment will be decontaminated by additional solvent rinses. Any decontamination solution generated will be collected by the facility operators for proper disposal.

During the test program, the MRF will be operated and tested at the conditions specified in the Test Plan. The following samples will be collected during the test:

- PCB Liquid Samples
- Stack Gas Samples
  - SW-846 Method 23 for PCB, PCDD/PCDF, and SVOC RCl
  - EPA Method 5/202 for particulate
  - EPA Method 26A for HCl and Cl_2
  - SW-846 Method 0030 VOST for VOC RCl
  - Temporary CEMS for SO_2 (EPA Method 6C)
  - Temporary CEMS for NO_X (EPA Method 7E)
  - Installed CEMS for CO, CO_2, and O_2.

Refer to Section 7.0 of this QAPP. Sample tracking is documented using unique alphanumeric sample numbering applied to every sample, completed sample collection forms, completed request for analysis (RFAs) forms, completed chain of custody (COC) forms and sample collection checklists.

6.2 STACK GAS SAMPLING METHODS

6.2.1 General

During the test program, the Stack Sampling Team Leader and the Test Coordinator are responsible for monitoring the sampling team's adherence to the standard stack sampling procedures, especially sampling train preparation; leak checks and recoveries (including blank trains); and reagent, field, and trip blanks. The Stack Sampling Team Leader is responsible for the operation and recovery of the stack sampling equipment and stack gas samples. The Test Coordinator and Sample Custodian are responsible for preparing the stack gas and process samples for shipment to the laboratory. Sampling train calibration procedures are discussed in Section 8.0.

EPA Methods 1 and 2 will be used to determine the number and location of sampling traverse of isokinetic sampling locations and check for cyclonic flow. Documentation of Method 1 (including cyclonic flow check) and Method 2 (pitot tube measurements) will be included in the stack sampling report. Pitot tube traverses will also be performed at 16.7%, 50%, and 83.3% of the stack diameter at the temporary CEMS sampling port to check for stratification.

During each test run, the stack gas carbon dioxide and oxygen concentrations will be measured using EPA Method 3A. The stack gas carbon dioxide and oxygen concentrations are used to determine the stack gas molecular weight. Certified calibration gases containing at least 5 percent volume carbon dioxide and/or at least 5 percent volume oxygen may be used as reference standards analyzer.

Stack gas moisture content will be determined for each isokinetic sampling train via EPA Method 4 (sampling train moisture gain). Isokinetic sampling train silica gel impingers will be filled with fresh, dry indicating silica gel at the beginning of the test program. During the sampling train recovery process, and subsequent test runs, each indicating silica gel impinger will be inspected prior to reuse to verify that sufficient capacity remains for moisture absorption during the next test run. Silica gel more than 50% utilized will be discarded and the impinger recharged with fresh dry indicating silica gel.

6.2.1.1 Method 23 for PCB/PCDD/PCDF/SVOC RCI

A Method 23 sampling train will be used to concurrently sample stack gas for PCB, PDCDD/PCDF, and SVOC RCI. The extracts from the Method 23 sampling train will be split three ways. One set of extract fractions will be analyzed for PCB via EPA Method 1668C (HRGC/HRMS). The second set of extract fractions from the Method 23 sampling train will be analyzed for PCDD/PCDF via Method 8290A (HRGC/HRMS). The third set of extract fractions from the Method 23 sampling train will be analyzed for SVOC RCI via Method 8270E (GC/MS). The Method 23 sampling train will be operated for 240 minute (4 hours) to sample a target volume of 4.0 dry standard cubic meters of stack gas during each sampling run.

The XAD-2 resin will be prepared with sampling surrogates for all three (3) target analyte groups. To accommodate concurrent sampling of SVOC RCI with PCB and PCDD/PCDF, the sampling train recovery requires: 1) incorporating methylene chloride rinses of the sampling train components, and 2) capturing and maintaining the toluene rinses separate from the acetone and methylene chloride rinses. Methylene chloride is required to assure recovery of the SVOC analytes. Including the toluene rinses with the acetone and methylene chloride rinses increases the difficulty of removing moisture from sample if present. Additionally, maintaining the toluene rinses separately is necessary to preclude masking of early eluting SVOC RCI compounds by a toluene solvent peak during the GC/MS analysis.

Prior to each test run, the Method 23 sampling train will be assembled and leak checked. At the end of each run, the sampling train will be disassembled and all train samples collected. Using a single sampling train for PCB, PCDD/PCDF, and SVOC RCI requires special considerations in the recovery of the sampling train components and their subsequent preparation for analysis.

6.2.1.1.1 Method 23 Recovery

For the concurrent/combined sampling of PCB, PCDD/PCDF, and SVOC RCI using the Method 23 sampling train, the following general procedures will be used for sample recovery:

- Particulate Filter -- The particulate filter is removed from its holder and placed into its original petri dish (Container No. 1) which is sealed with Teflon tape and placed in a plastic bag.
- XAD-2 Adsorbent Resin Trap -- The XAD-2 adsorbent resin trap is removed from the train, and both ends are capped. The trap is then labeled, covered with aluminum foil, sealed in a plastic bag and stored on ice in an insulated cold chest.
- Acetone/Methylene Chloride Rinses -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware are brushed and rinsed three (3) times each with acetone, and then rinsed three (3) times with methylene chloride. The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed three (3) times with acetone followed by three (3) rinses with methylene chloride. All the acetone and methylene chloride rinses are placed into a single amber glass sample bottle (Container No. 2A). The final liquid level is marked on the sample container.
- Toluene Rinses -- The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or glassware are rinsed three (3) times with toluene. The back half of the filter holder, the filter support, transfer line (if used), and condenser (if separate from trap) are rinsed three (3) times with toluene. All the toluene rinses are collected in a single amber glass sample bottle (Container No. 2B). The final liquid level is marked on the sample container.
- Impinger Liquids -- The contents of the impingers 1, 2, 3, and 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and observed for the presence or absence of color or film, which is recorded on the sample recovery sheet. The impinger water is collected in a single amber glass sample bottle (Container No. 3A). The impingers are rinsed three (3) times with deionized water with the rinses added to Container 3A. The final liquid level is marked on the sample container.
- The impingers and connecting glassware are rinsed three (3) times with acetone followed by three (3) rinses with methylene chloride, with all the rinses collected in single amber glass sample bottle (Container No. 3B).
- The impingers and connecting glassware are rinsed three (3) times with toluene with the rinses collected in single amber glass bottle (Container No. 3C).
- Silica Gel -- The silica gel contents of the last impinger are weighed to the nearest 0.5 g. The color and condition of the silica gel is noted on the sample recovery sheet. The silica gel may be discarded or recovered for reuse.

Figure 6-1 presents a flow chart for the Method 23 precedingly described sampling train recovery. In the laboratory, successive extractions are performed for the respective analyses and discussed in the next section.

6.2.1.1.2 Method 23 Preparation for Analysis

When the Method 23 samples for PCB, PCDD/PCDF, and SVOC RCI arrive at the laboratory, special procedures are required again in the preparation of the samples for analysis. Surrogate compounds as discussed below are applied to each fraction.

Figures 6-2A through 6-2E present flow charts for the Method 23 sample preparation for analysis. The particulate filter, acetone/methylene chloride solvent rinses, and XAD resin samples will be combined for extraction; the separate toluene rinses will not be included in the initial extraction. Isotope dilution internal standard compounds for the PCB, PCDD/PCDF, and SVOC RCI are spiked directly onto the filter before the Soxhlet extraction. The sample is then Soxhlet extracted using methylene chloride. The methylene chloride extract is removed from the Soxhlet extractor and is then blown down to 30 mL and split three (3) ways: one 10 mL fraction for PCB analysis, one 10 mL fraction for PCDD/PCDF analysis, and one 10 mL fraction for SVOC RCI analysis.

The separate toluene solvent rinses are then added to the particulate filter residue in the Soxhlet extractor, the sample is Soxhlet extracted a second time using toluene. The toluene extract is removed from the Soxhlet extractor and is then blown down to 30 mL and split three (3) ways: one 10 mL fraction for PCB analysis, one 10 mL fraction for PCDD/PCDF analysis, and one 10 mL archive fraction. The methylene chloride fractions extracted for PCB and PCDF/PDCF analysis are combined with the respective toluene extracts.

The Method 23 condensate impinger catch and solvent rinses are required for the PCB and SVOC RCI analyses; this fraction is not analyzed for PCDD/PCDF. The condensate impinger sample is placed in a continuous liquid-liquid extractor. The liquid undergoes three separate methylene chloride extractions to assure recovery of acid and base-neutral SVOCs. The initial extraction is performed with no pH adjustment; the condensate is continuous liquid-liquid extracted using methylene chloride and organic free water. The methylene chloride extract layer is then removed and fresh methylene chloride added to the sample. The sample is then pH adjusted to acid (pH<2) and continuous liquid-liquid extracted a second time using methylene chloride and organic free water. The second methylene chloride extract layer is then removed and fresh methylene chloride added to the sample. The methylene chloride/water extraction is then performed a third time with the pH adjusted to basic (pH>12). The third methylene chloride extract layer is then removed and combined with the other two methylene chloride extracts. The combined condensate extracts are then blown down to 30 mL and split three (3) ways: one 10 mL fraction for PCB analysis, one 10 mL fraction for SVOC RCI analysis, and one 10 mL archive fraction. (Note: Impinger water extraction is not required for PCDD/PCDF analysis.)

The acetone and methylene chloride impinger rinses are concentrated and split three (3) ways: one fraction for PCB analysis, one fraction for SVOC RCI analysis, and one archive fraction. (Note: The acetone and methylene chloride impinger rinses fraction is not required for PCDD/PCDF analysis.) The methylene chloride fractions concentrates for PCB and SVOC RCI analysis are combined with the respective front-half and back-half extracts.

The toluene impinger rinses are concentrated and split three (3) ways: one fraction for PCB analysis and two archive fractions. (Note: The toluene impinger rinses fraction is not required for PCDD/PCDF or SVOC

RCI analysis.) The toluene concentrate for PCB analysis is combined with the respective front-half and back-half extracts.

The isotopically-labeled materials noted in Table 5-1 are applied to the Method 23 sampling train samples:

- Pre-Sampling Standards – Isotopically labeled compounds spiked directly on the XAD-2 resin in the laboratory during XAD-2 tube preparation prior to stack sampling use. The recovery of these compounds provides a comprehensive accuracy indication (stack to final analysis) of the PCB, PCDD/PCDF, and SVOC RCI found using the Method 23 sampling method.
- Pre-Extraction Standards - Isotopically labeled PCB, PCDD/PCDF, and SVOC RCI compounds applied to the sample prior to extraction. The recoveries of these compounds reflect the overall relative accuracy of the sample handling preparation and analysis by the laboratory.
- Cleanup Standards - For PCB, isotopically labeled compounds are applied to the sample after extraction and before extract cleanup. The recovery of this compound reflects the impacts on the sample of the extract cleanup step of sample preparation.
- PCB and PCDD/PCDF Pre-Analysis Standards- Isotopically labeled compounds applied to the extracts just before HRGC/HRMS analysis. These compounds are providing the relative response factors, which are used to calculate analyte concentrations. (Note: SVOC RCI GC/MS analysis does not include use of pre-analysis standards.)

6.2.1.2 EPA Method 5/202 for PM

The stack gas filterable and condensable particulate emissions are determined by separate analysis of the Method 5/202 sampling train tare weighed filter, the front-half acetone probe rinses, condenser rinses and ambient impinger contents, ambient filter, and cold (iced) impinger contents.

The tare weighed particulate filter PM catch is determined by the differential weight of the particulate collected by the Method 5/202 sampling train. Filter samples are dried to a constant weight to the nearest 0.1 mg. Constant weight shall mean a difference between two consecutive weighings of no more than 0.5 mg.

The acetone probe rinse fraction is transferred to a tare weighed flask, evaporated and dried to a constant weight to the nearest 0.1 mg. Constant weight shall mean a difference between two consecutive weighings of no more than 0.5 mg.

The corresponding test run filter and probe rinse residue differential weights are added together. The sum is reported as the test run filterable particulate catch.

The ambient impinger contents, condenser and impinger solvent (acetone and hexane) rinses, ambient filter, and cold (iced) impinger contents are analyzed separately. Each fraction is evaporated or dried to a constant weight to the nearest 0.1 mg. Constant weight shall mean a difference between two consecutive weighings of no more than 0.5 mg. The sum of the respective fraction analyses is reported as the test run condensable particulate catch.

The analysis of the Method 5/202 sampling train includes a field blank train, and particulate, acetone, hexane, and deionized water reagent blanks to assess blank contamination. Precision for the particulate analyses is determined via replicate weighings. Accuracy is determined by using Class-S weight to verify the scale accuracy.

6.2.1.3 EPA Method 26A for HCl/Cl_2

An EPA Method 26A sampling train will be used to sample the stack gas for HCl, and Cl_2. The stack gas HCl/Cl_2 is sampled by sparging the sampled gas through impingers containing 0.1N H_2SO_4 (acid) and 0.1N NaOH (alkaline) solutions in series. In the acid impingers, HCl gas is captured. Any Cl_2 in the sampled stack gas passes through to the acid impingers and is captured in the alkaline impingers. The chloride concentrations of the acid and alkaline impinger samples are analyzed separately for chloride ion and are reported as HCl and Cl_2 catches, respectively. During the sampling train recovery, the pH of the NaOH impingers are checked separately and noted on the sampling train recovery sheet. Precision for these samples is determined through the use of duplicate analyses of the calibration standard, QC, reagent blank and field samples. Accuracy is determined by matrix spike analyses.

In the alkaline impinger, Cl_2 is captured in solution by its dissociation into chloride ion (Cl^-) and hypochlorite ion (OCl^-). Sodium thiosulfate ($Na_2S_2O_3$) is added to the recovered NaOH solution to convert the hypochlorite (OCl^-) in the sample to chloride (Cl^-). The analysis of the alkaline impinger may include additional thiosulfate addition by the laboratory analyst to complete the conversion of the hypochlorite (OCl^-) in the sample to chloride (Cl^-). The sample is then analyzed for chloride ion concentration. In the data reduction, the chloride analysis result for the alkaline impingers is reported as Cl_2.

The analysis of Method 26A includes H_2SO_4, NaOH and deionized water reagent blanks to assess blank contamination. Precision for the chloride analyses is determined through the use of duplicate analyses of all calibration standards, all QC samples and all field samples. Accuracy is determined by matrix spike analyses of field samples and reagent blanks.

6.2.1.4 VOST

The VOST will be used to sample stack gas for VOC RCI. The test program includes a target list of VOC compounds for the VOST analyses. The VOST sampling equipment will be inspected and leak checked prior to each test run. Four pairs of VOST tubes will be used during each sampling run to sample a nominal 20 liters of stack gas per tube set pair. VOST sampling will be conducted at a nominal rate of 1.0 liters per minute for 20 minutes per tube set pair. Three of the four pairs will be analyzed by Method 5041A/8260D. The fourth set pair will serve as an archive set in the event of sample breakage during shipping and handling. During the analysis, the Tenax® and Tenax®/charcoal tube sets used to sample the stack gas will be analyzed separately to assess breakthrough. Field blank and trip blank tube sets may be analyzed as a single sample or separately as breakthrough criterion need not be applied to these samples.

6.3 FIELD QUALITY CONTROL SAMPLES

Field QC samples will be collected during the test to provide an indication of quality assurance for the test samples. The field QC samples include:

- Spiked XAD-2 resin blanks for Method 23 (PCB, PCDD/PCDF, & SVOC RCI) retained by the laboratory and included with the field samples when they are delivered to the laboratory
- Blank train for Method 23 (PCB, PCDD/PCDF, & SVOC RCI)
- Blank train for Method 5/202 (PM)
- Spiked Tenax® and Tenax®/charcoal blanks for VOST retained by the laboratory and included with the field samples when they are delivered to the laboratory
- Tenax® and Tenax®/charcoal field and trip blanks for VOST
- Reagent blanks for all sampling trains.

Table 6-1 includes the field QC samples that will be collected.

6.3.1 Spiked Resin Blanks

During the preparation of the Tenax® and Tenax®/Charcoal tubes sets for the test program, two VOST Tenax® and Tenax®/charcoal resin tube pairs will be spiked with standard surrogate spike compounds. The VOST tube preparation laboratory, to demonstrate the resin is free of background contamination, and to confirm that efficient surrogate recoveries are, achievable will analyze these samples.

Two XAD-2 resin traps prepared for the Method 23 PCB, PCDD/PCDF, and SVOC RCI sampling train will be spiked with a sampling surrogate and matrix spike compounds. These samples will be extracted and analyzed for PCB, PCDD/PCDF, and SVOC RCI by the XAD-2 trap preparation laboratory to demonstrate the resin is free of background contamination, and to confirm that efficient surrogate recoveries are achievable.

6.3.2 VOST Field Blanks

Field blanks are sampling media that are handled at the sampling location in the same manner as the actual test samples. However, these media are not used to collect stack gas samples. The field blank samples will be collected and analyzed to demonstrate that the sample handling procedures do not expose the samples to contaminants. This test program includes collecting one pair of VOST tubes as field blanks once during each test run (three samples total per test condition). Each field blank VOST tube pair is opened in the field by the VOST operator during the sampling run and are allowed to remain open for a period equivalent to the time required for a tube pair change-out during testing. The field blank pair is then sealed up, labeled and handled in the same manner as other VOST samples. The compounds found in field blanks reflect exposure to field fugitives, laboratory contaminants and resin degradation products, and are used to assess any contamination that can impact test results.

6.3.3 VOST Trip Blanks

Trip blanks are similar to field blanks in that they are used to assess contamination resulting from sample shipment. With each shipment of VOST samples from the test site to the laboratory, a pair of VOST tubes that have remained sealed as shipped from the laboratory to the field to be used as trip blanks. Additionally, a pair of volatile organic analysis (VOA) vials filled with organic free water is included with the VOST samples shipped from the test site back to the laboratory. The trip blank and organic free water analyses demonstrate that the samples are not exposed to contamination during transport from the field to the laboratory.

6.3.4 Blank Trains and Reagent Blanks

Blank train samples are the samples recovered from sampling trains that have been assembled and charged with all the required chemical reagents and collection media in the same manner as the sampling trains used to sample the stack gases. The sampling trains are leak checked and heated to temperature in a location near the stack. The sampling train remains sealed at the stack location for a period equivalent to the length of time the corresponding sampling train is operated during the test run. The blank train is then recovered in the same way that actual stack gas sampling trains are recovered. The recovered blank train components are labeled as blank train samples and submitted for analysis with the actual stack gas train samples. The results of the blank train samples provide an indication of possible contamination introduced to the samples by reagents, glassware, sampling environment, and sampling recovery. The blank train samples for the stack sampling trains used during this test program will be collected as summarized in Table 6-1. For this test program one blank train for Method 23 PCDD/PCDF, PCB, and SVOC RCI, and one Method 5/202 blank train for particulate matter will be collected for analysis.

Reagent blanks are samples of the reagent source solvents, solutions, and other media used in stack sampling. Reagent blank samples for all sampling trains as summarized in Table 6-1.

Table 6-1. A-Line TSCA Compliance Test Total Field Samples

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Cycle 1		Cycle 2		Total Field Samples
					Test	Field QC	Test	Field QC	
PCB Liquid	ASTM D-4057, E-300-03	250 mL glass sample bottle	PCB	Collect a 250 mL grab sample during the PCB DRE sampling cycle	3	--	--	--	3
		250 mL glass sample bottle	Total Chlorine	Collect a 250 mL grab sample during the PCB DRE sampling cycle	3	--	3	--	6
Method 23 Particulate Filter	Method 23	Petri Dish	PCB, DF, & SVOC RCl	Collect integrated sample for PCB, DF, & SVOC RCl during each test run. Sample for 240 minutes with a target volume of 4.0 dry standard cubic meters of stack gas.	3	1	--	--	4
Method 23 XAD-2 Resin		Resin Trap	PCB, DF, & SVOC RCl		3	1	--	--	4
Method 23 Acetone & Methylene Chloride Rinses		500 mL glass sample bottle	PCB, DF, & SVOC RCl		3	1	--	--	4
Method 23 Toluene Rinses		500 mL glass sample bottle	PCB & DF Only		3	1	--	--	4
Method 23 Condensate		2.5-liter glass sample bottle	PCB & SVOC RCl Only		3	1	--	--	4
Method 23 Acetone Reagent Blank		250 mL glass sample bottle	PCB, DF, & SVOC RCl	Reagent Blank	--	1	--	--	1
Method 23 Methylene Chloride Reagent Blank		250 mL glass sample bottle	PCB, DF, & SVOC RCl	Reagent Blank	--	1	--	--	1
Method 23 Toluene Reagent Blank		250 mL glass sample bottle	PCB & DF Only	Reagent Blank	--	1	--	--	1

Table 6-1. A-Line TSCA Compliance Test Total Field Samples (cont'd)

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Cycle 1		Cycle 2		Total Field Samples
					Test	Field QC	Test	Field QC	
Method 5/202 Particulate Filter	EPA Method 5/202	Petri Dish	Filterable Particulate	Collect integrated sample for particulate for 120 minutes during each test run. .	3	1	--	--	4
Method 5/202 Front Half Acetone Rinses		250 mL glass sample bottle	Filterable Particulate		3	1	--	--	4
Method 5/202 Back-Half-Filter Holder, Condenser, and Ambient Impinger Contents and DI Water Rinses		1-liter glass sample bottle	Condensable Particulate		3	1	--	--	4
Method 5/202 Back-Half-Filter Holder, Condenser, and Ambient Impinger Acetone and Hexane Rinses		500 mL glass sample bottle	Condensable Particulate		3	1	--	--	4
Method 5/202 Ambient Filter		Petri Dish	Condensable Particulate		3	1	--	--	4
Method 5/202 Cold (Iced) Impinger Contents and Deionized Water Rinses		500 mL polyethylene sample bottle	Condensable Particulate		3	1	--	--	4
Method 5/202 Particulate Filter Reagent Blank		Petri Dish	Particulate	Reagent Blank	--	1	--	--	1
Method 5/202 Acetone Reagent Blank		250 mL glass sample bottle	Particulate	Reagent Blank	--	1	--	--	1
Method 5/202 Hexane Reagent Blank		250 mL glass sample bottle	Particulate	Reagent Blank	--	1	--	--	1

Table 6-1. A-Line TSCA Compliance Test Total Field Samples (cont'd)

Sample Name	Sampling Reference Method	Sample Container	Analysis	General Procedure/Frequency	Cycle 1		Cycle 2		Total Field Samples
					Test	Field QC	Test	Field QC	
Method 5/202 Deionized Water Reagent Blank	EPA Method 5/202 (cont'd)	250 mL glass sample bottle	Particulate	Reagent Blank	--	1	--	--	1
Method 26A Sulfuric Acid Impingers and Rinses	Method 26A	1-liter polyethylene sample bottle	Chloride Ion	Collect integrated sample for HCl and Cl_2 during each test run. Sample for a minimum 60 minutes.	--	--	3	--	3
Method 26A Sodium Hydroxide Impingers and Rinses		1-liter polyethylene sample bottle	Chloride Ion		--	--	3	--	3
Method 26A Deionized Water Reagent Blank		250 mL polyethylene sample bottle	Chloride Ion	Reagent Blank	--	--	--	1	1
Method 26A Sulfuric Acid Reagent Blank		250 mL polyethylene sample bottle	Chloride Ion	Reagent Blank	--	--	--	1	1
Method 26A Sodium Hydroxide Reagent Blank		250 mL polyethylene sample bottle	Chloride Ion	Reagent Blank	--	--	--	1	1
VOST Resin Tubes	SW846 Method 0030	VOST Resin Tube Pairs	VOC RCI	Collect four (4) tube set pairs per test run ~20 liters of stack gas sampled per tube set pair.	--	--	--	12	12
VOST Condensate		40 mL glass VOA	VOC RCI	Collect one (1) composite stack gas condensate for each test run.	--	--	--	3	3
VOST Field Blank Resin Tubes		VOST Resin Tube Pairs	VOC RCI	Collect one (1) tube set pair per test run.	--	--	--	1	1
VOST Trip Blank Resin Tubes		VOST Resin Tube Pairs	VOC RCI	Collect one (1) tube set pair per test condition.	--	--	--	1	1
VOST Condensate Trip/Field Blank		40 mL glass VOA	VOC RCI	Collect one (1) glass VOA per test condition.	--	--	--	1	1
TOTAL SAMPLES									95

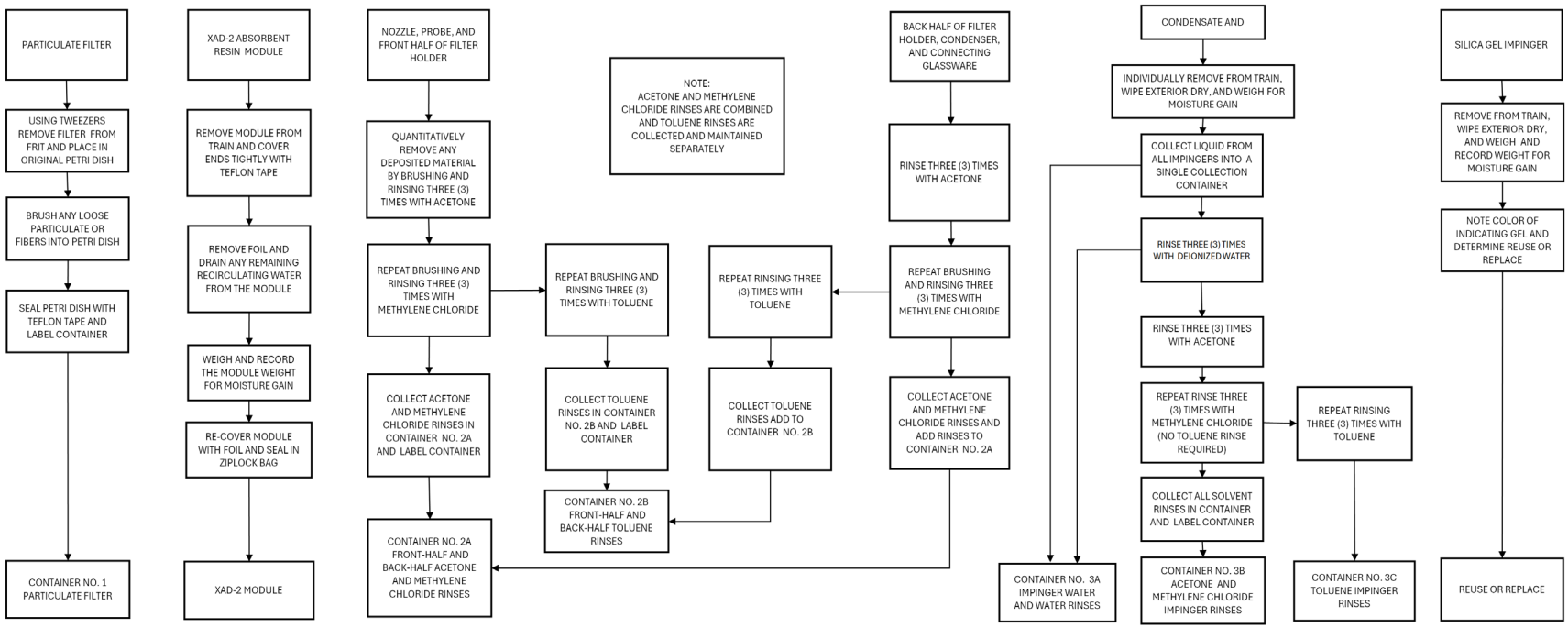

Figure 6-1. Method 23 Sampling Train Recovery

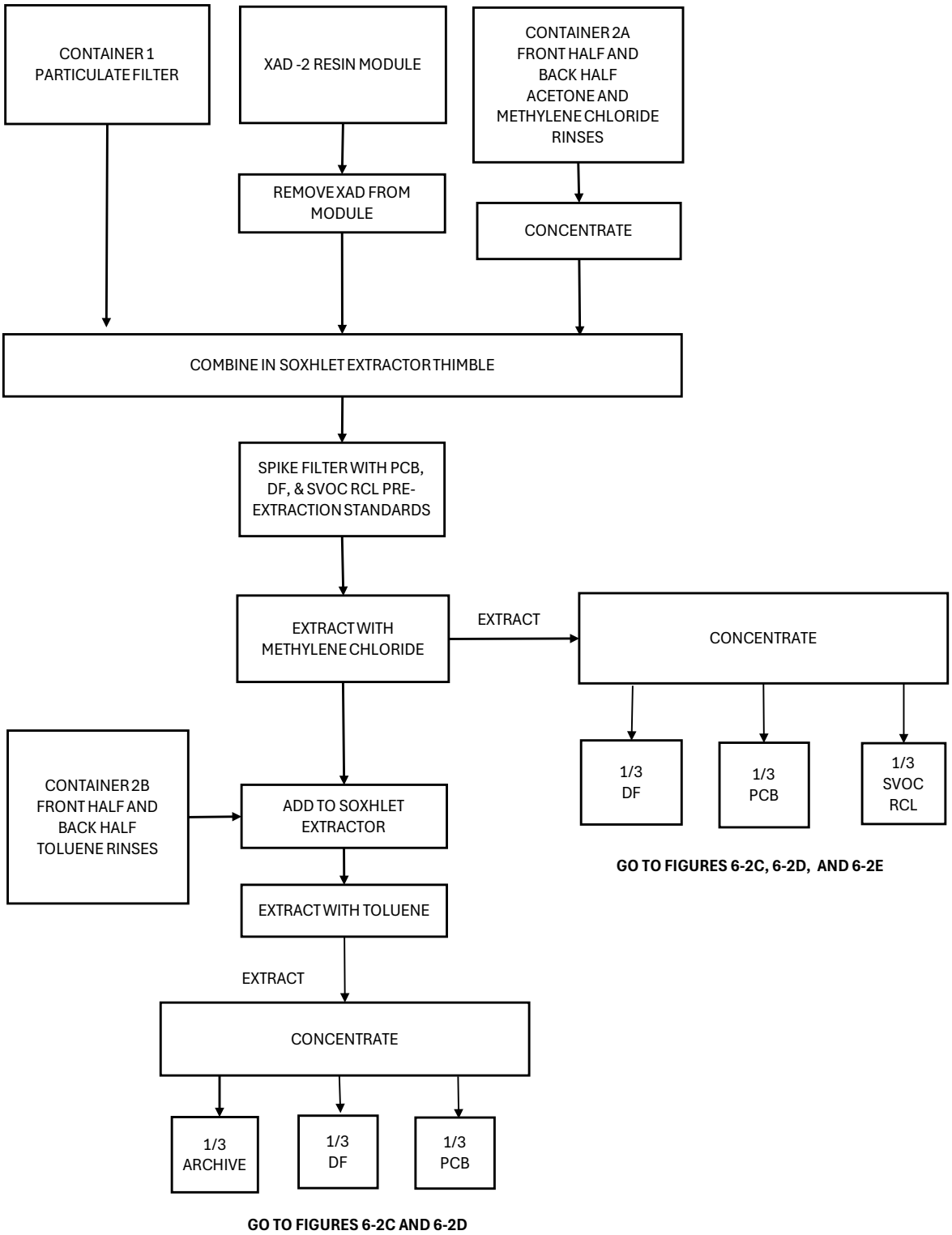

Figure 6-2A. Method 23 Soxhlet Extraction of XAD-2 Resin, and Front Half and Back Half Solvent Rinses

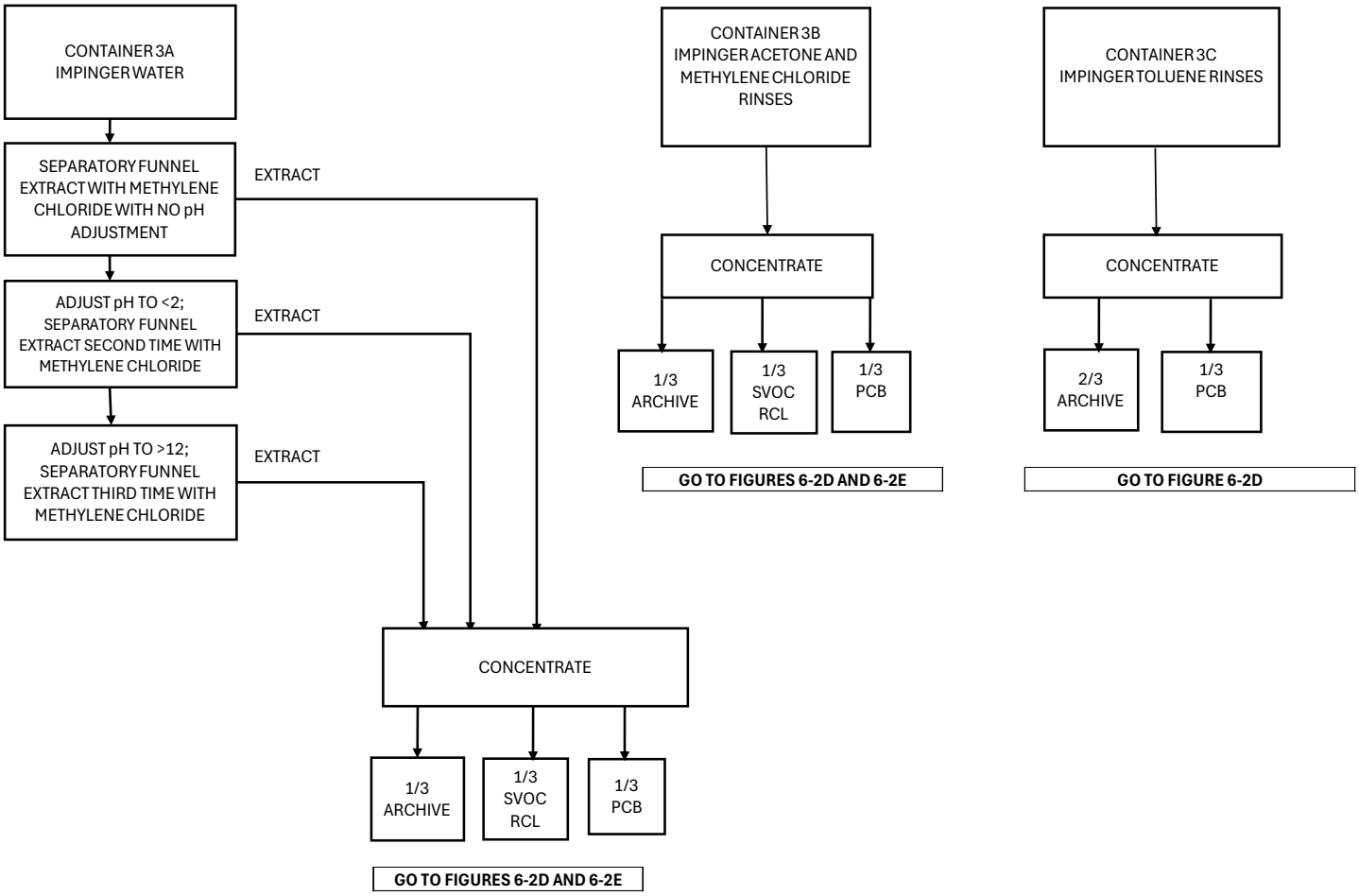

Figure 6-2B. Method 23 Extraction of Impinger Condensate and Concentrating of Impinger Solvent Rinses

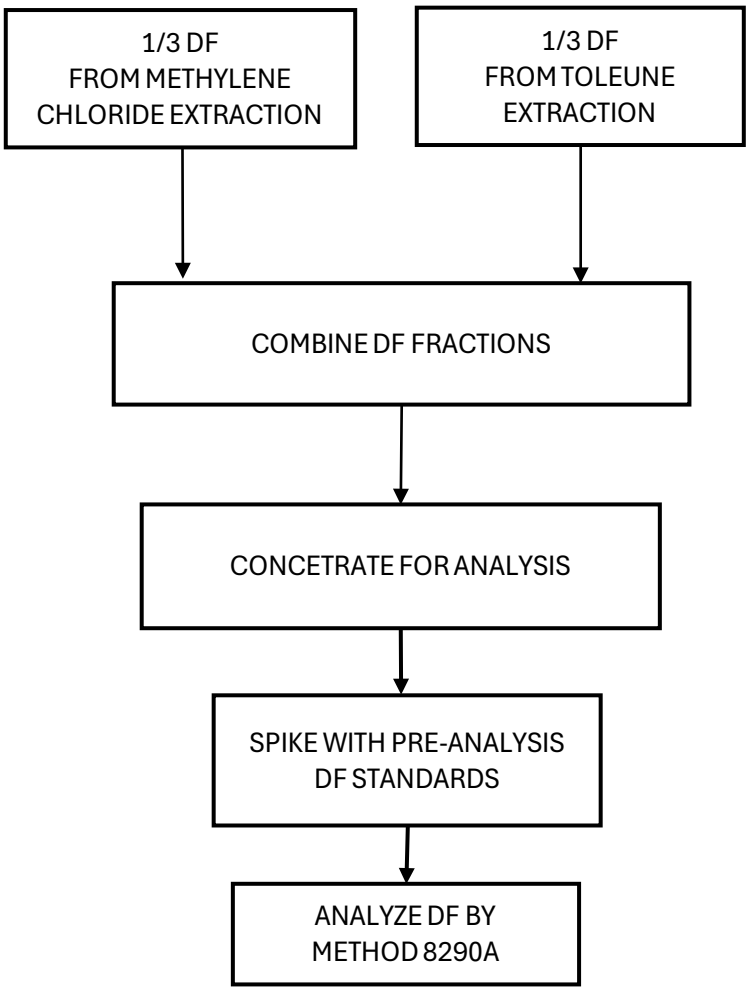

Figure 6-2C. Method 23 Combining of Extracts for Dioxin/Furan Analysis

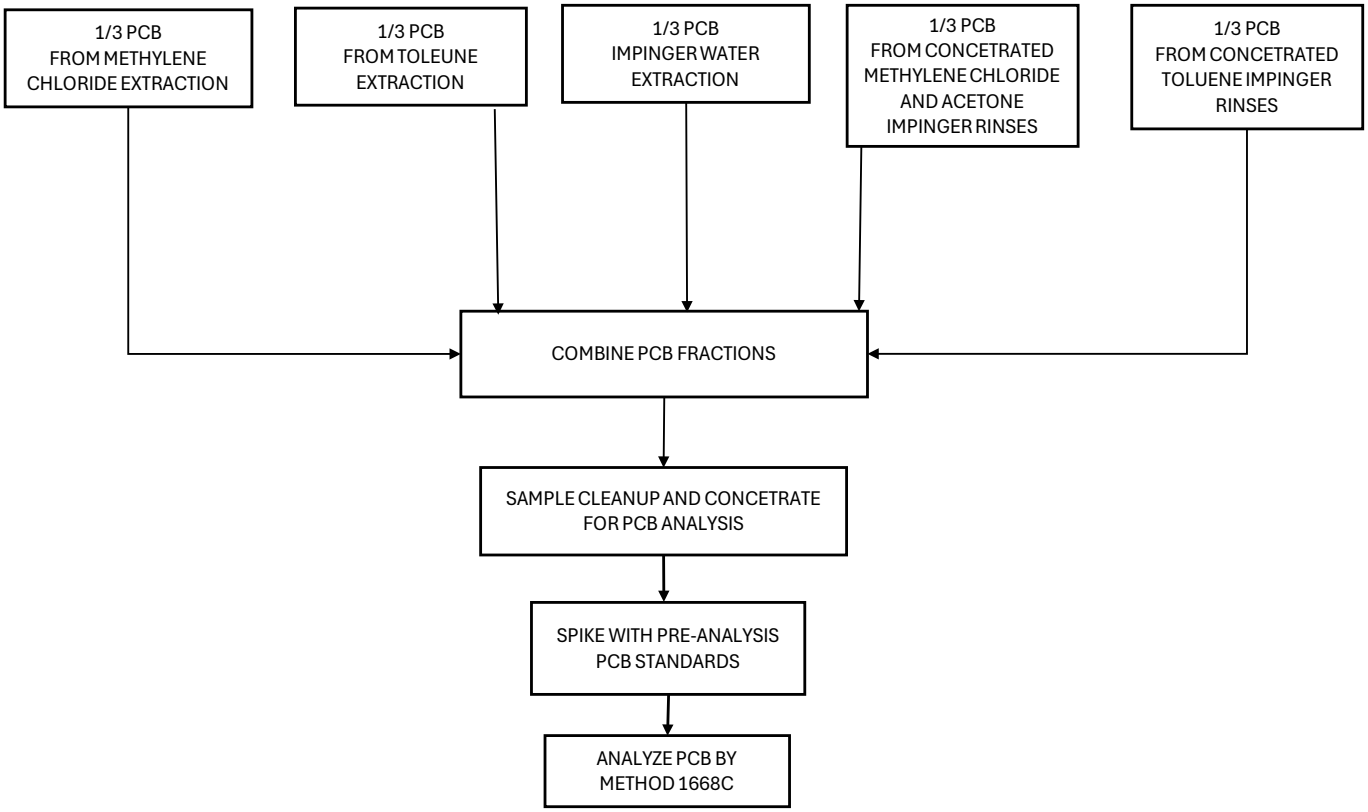

Figure 6-2D. Method 23 Combining of Extracts for PCB Analysis

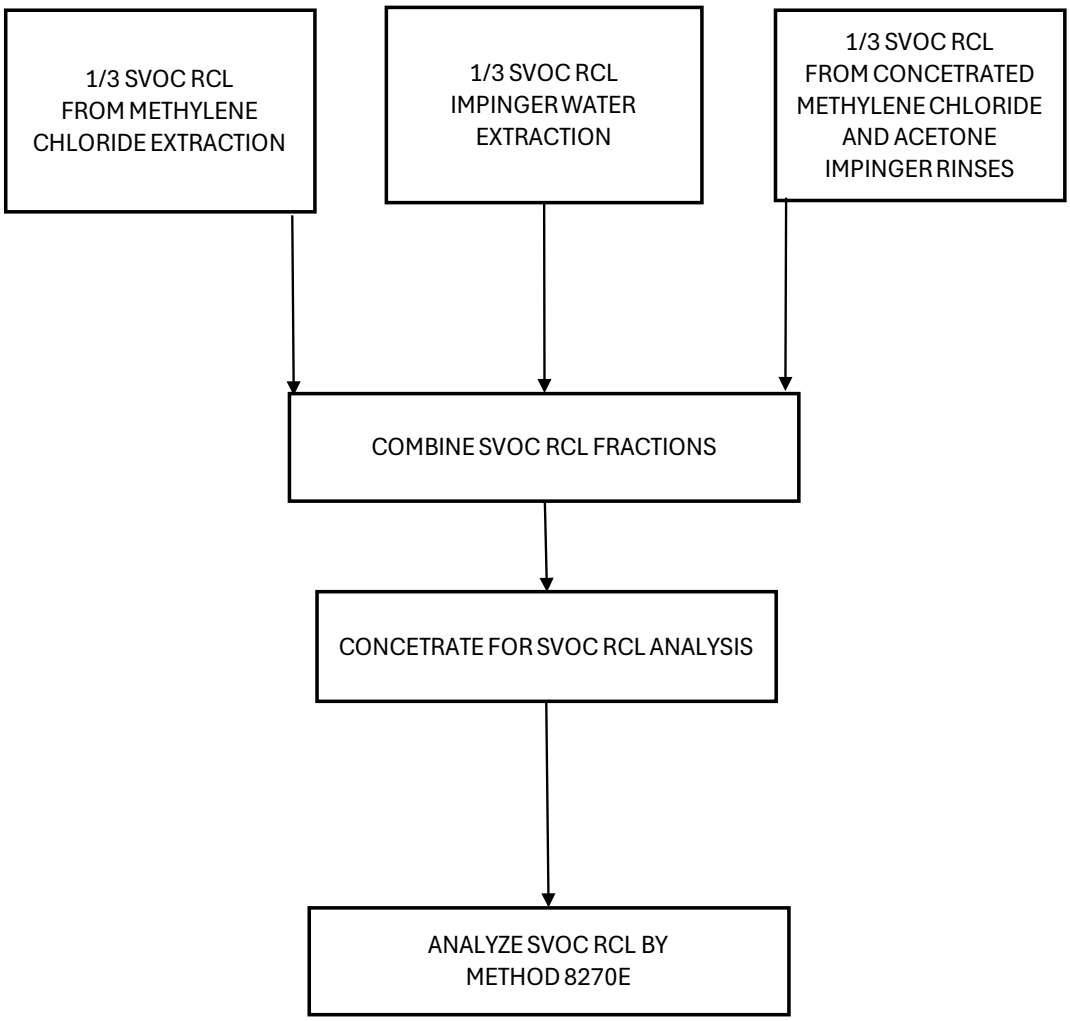

Figure 6-2E. Method 23 Combining of Extracts for SVCO RCL Analysis

7.0 SAMPLE HANDLING, TRACEABILITY, AND HOLDING TIMES

7.1 SAMPLE CUSTODY AND SECURITY

A sample will be considered to be in the custody of a person if it is in his or her possession, in his or her sight, or secured by that person in an approved location accessible only to authorized personnel. Evidence tamper seals will be placed on each sample container.

Sample collection will include preparation of a chain of custody (COC). The COC will accompany the samples from the field to the analytical laboratory. If overnight couriers are utilized, the air bill will serve to document the transfer of custody to the courier. The courier's air bill becomes part of the chain of custody (COC) record. Upon transfer of the samples from the courier to the analytical laboratory, sample custody will be maintained by the analytical laboratory performing the analyses.

Samples for organic analysis (VOST, Method 23, etc.) will be maintained on ice ($4 \pm 2^{o}C$) and shipped to the analytical laboratory in insulated shipping containers. All ice used for shipping samples shall be double bagged in Ziplock® bags to prevent leakage of water during shipping. "Blue ice" may also be used to chill samples. Samples not requiring chilling (particulate, chloride, properties, etc.) may be shipped without ice.

7.2 SAMPLE IDENTIFICATION

Refer to Figure 7-1. In consultation with the Test Coordinator, the Laboratory Project Manager will prepare the master sample list for the test program. Once the master sample list is set, the alpha-numeric sample numbers will be assigned to every sample. The sample numbers are used to track individual samples from collection through analysis. These items will be shipped to the test site in sealed transport containers. The stack sampling contractor will provide the sampling reagents for field use.

7.3 STACK SAMPLE COLLECTION FORMS

While stack sampling is being performed, the sampling technician will complete a stack sampling record. An example stack field sampling record for iso-kinetic sampling is presented as Figure 7-2. The stack sampling record will be completed in its entirety for every sampling train. This will provide information necessary to perform the emissions calculations. The sampling technician shall provide the completed stack sampling record to the Stack Sampling Coordinator at the completion of each sampling run.

7.4 SAMPLE LABELING

An example sample label format is presented in Figure 7-3. Each sample container will be labeled to show the source of the sample as A-Line; the project identification; sampler's initials; laboratory to which the sample will be shipped; the unique alphanumeric sample number; date and time; sample description; test number; and run number. If a single sample requires multiple containers, the number of the container and the total number of containers will be noted on the label. Project samples will be tracked via the assigned

unique alphanumeric sample numbers. The sample number will appear on the sample label, the request for analysis (RFA), and the chain of custody (COC).

7.5 SAMPLE COLLECTION CHECKLIST

The master sample list identifies every sample by the assigned unique alphanumeric sample numbers (Refer to Figure 7-1), and the corresponding analytical test(s) required. As field samples are acquired and routed through the Sample Custodian, the samples will be checked off against the master list to ensure that all of the appropriate samples have been collected.

7.6 REQUEST FOR ANALYSIS/CHAIN OF CUSTODY

Collected samples will be shipped from the site to the laboratory in sealed containers with COC and RFA forms. Example RFA and COC forms are presented as Figures 7-4 and 7-5, respectively. The Sampling Technician and Sample Custodian will complete the COC and RFA forms for every sample. Some samples may consist of several sub-samples. Each individual component of the sample will be listed separately on the RFA/COC with its own unique alphanumeric sample identification number. The samples will be preserved as needed, and will remain in the possession of the Sample Custodian. The Sample Custodian will secure the samples in a location accessible only to authorized personnel until custody is transferred to a courier for delivery to the laboratory.

7.7 SAMPLE SHIPMENT

Field samples may be transported directly to the analytical laboratory by the test management or sampling contractor. If the samples are shipped via overnight courier, e.g., Federal Express, an individual trained in Federal Department of Transportation (DOT) and International Air Transport Association (IATA) regulations will package the samples to assure compliance with the applicable portions of these regulations.

Prior to shipping any samples, the condition of the samples will be verified: sample temperatures for organic analyses samples, condition of all containers, level of sample within all containers (to be marked on the outside of the container), and type of packing material used. RFA/COCs will be checked to verify there is a RFA and COC for every sample being shipped.

7.8 SAMPLE DELIVERY

Upon receipt of samples at the laboratory, the receiver will accept custody for the shipment by an exchange of signatures with the delivering agent. The shipping containers will be opened by the Laboratory Project Manager or his/her designee and inspected. The container contents will verified against the accompanying RFA/COC. Any damage to the contents of the shipping container or deviations from the original shipment documents will be noted on the COC. A labeled temperature blank (labeled bottle or VOA vial with water) will be shipped in every container with samples for organic analysis expressly for the purpose of determining sample temperatures. The Laboratory Project Manager or designee will, immediately upon opening the

sample packaging, open the temperature blank and measure the temperature of the water inside the temperature blank using a thermometer. This temperature will be recorded on the COCs and any applicable laboratory documentation (sample receipt log).

Individual samples will be sorted and directed to the respective laboratory section responsible for the analyses noted on the RFA. Samples will be secured in a location accessible only to authorized personnel. Samples for organic analysis shall be secured in refrigerated sample storage. The COC forms are used specifically to track the samples. To provide specific instructions to the analysts, the RFAs will accompany the respective COCs.

Transfer of custody to and within the analytical laboratory is addressed in the Laboratory's QA Manual. Upon completion of analysis, samples will be maintained at the laboratory under COC until they are released for proper disposal.

7.9 SAMPLE PRESERVATION

Table 7-1 shows the appropriate containers, preservation, and holding times for all samples to be collected during the test.

Table 7-1. Sample Containers, Preservation, and Holding Times

Parameter	Sample Name/Matrix	Sample Containers	Preservation	Maximum Holding Time[a]
Liquid PCB for PCB Analysis	PCB Liquid	Amber glass bottles with Teflon-lined caps	Chill to 4°C	14 days
Liquid PCB for Total Chlorine Analysis	PCB Liquid	Amber glass bottles with Teflon-lined caps	NA	180 days
Stack gas PCB, PCDD/PCDF, & SVOC RCl	Stack Gas Method 23 Filter	Glass petri dish	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack Gas Method 23 Sorbent Tube	Standard cartridge wrapped in aluminum foil and sealed in plastic bag	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack Gas Method 23 Solvents	Amber glass bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
	Stack Gas Method 23 Condensate	Amber glass bottles with Teflon-lined caps	Chill to 4°C	14 days until extraction, 40 days after extraction
Stack Gas Particulate	Method 5/202 Filters	Glass or plastic petri dish	NA	180 days
	Method 5/202 Acetone Probe Rinses	Amber glass bottles with Teflon-lined caps	NA	180 days
	Method 5/202 Impingers Contents and Solven Rinses	Amber glass bottles with Teflon-lined caps	NA	180 days
Stack Gas Chloride	Method 26A Impinger Liquids	Amber glass bottles with Teflon-lined caps or polyethylene bottles	NA	28 days
Stack VOC RCl	Stack Gas VOST Tubes	Glass culture tube in foam cushioned plastic tube	Chill to 4°C	14 days
	Stack gas VOST condensate	Glass VOA vials with Teflon-lined lined caps or septum caps	Chill to 4°C	14 days

Table Notes:

[a] Reference: Quality Assurance/Quality Control (QA/QC) Procedures for Hazardous Waste Incineration, EPA/625/6-89/023, January, 1990 and promulgated method.

A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

MRF TSCA TEST MASTER SAMPLE LIST

Eurofins, Knoxville, TN
25-Oct -24

Field Sample No.		Test No.	Run No.	RFA/COC No.	Sample Source	Sample Description	Sample Container	Analytical Parameters	Analytical Laboratory	QC Analysis
A-	4000	NA	1	001	PCB Liquid	PCB Liquid Spike	250 mL amber bottle	PCB	Eurofins-Knox	DUP
A-	4001	NA	1	002	PCB Liquid	PCB Liquid Spike	250 mL amber bottle	Total Cl	Eurofins-Knox	MS/MSD
A-	4002	NA	1	003	Method 23 Train	Particulate Filter	Petri dish	PCB/DF/SVOC RCl	Eurofins-Knox	
A-	4003	NA	1	003	Method 23 Train	Acetone & MeCl2 FH&BH Rinses	250 mL amber bottle	PCB/DF/SVOC RCl	Eurofins-Knox	
A-	4004	NA	1	003	Method 23 Train	Toluene FH&BH Rinses	250 mL amber bottle	PCB/DF	Eurofins-Knox	
A-	4005	NA	1	003	Method 23 Train	Impinger Liquid & DI Water Rinses	2.5-L amber bottle	PCB/SVOC RCl	Eurofins-Knox	
A-	4006	NA	1	003	Method 23 Train	Acetone & MeCl2 Impinger Rinses	250 mL amber bottle	PCB/SVOC RCl	Eurofins-Knox	
A-	4007	NA	1	003	Method 23 Train	Toluene Impinger Rinses	250 mL amber bottle	PCB	Eurofins-Knox	
A-	4008	NA	1	003	Method 23 Train	Acetone Reagent Blank	250 mL amber bottle	PCB/DF/SVOC RCl	Eurofins-Knox	RB
A-	4009	NA	1	003	Method 23 Train	Methylene Chloride Reagent Blank	250 mL amber bottle	PCB/DF/SVOC RCl	Eurofins-Knox	RB
A-	4010	NA	1	003	Method 23 Train	Toluene Reagent Blank	250 mL amber bottle	PCB/DF	Eurofins-Knox	RB
A-	4011	NA	1	004	Method 5/202 Train	Particulate Filter	Petri dish	Filterable Particulate	Eurofins-Knox	
A-	4012	NA	1	004	Method 5/202 Train	Acetone Probe Rinses	250 mL amber bottle	Filterable Particulate	Eurofins-Knox	
A-	4013	NA	1	004	Method 5/202 Train	Ambient Impinger Liquid	1-L amber bottle	Condensable Particulate	Eurofins-Knox	
A-	4014	NA	1	004	Method 5/202 Train	Acetone & Hexane Rinses	500 mL amber bottle	Condensable Particulate	Eurofins-Knox	
A-	4015	NA	1	004	Method 5/202 Train	Ambient Particulate Filter	Petri dish	Condensable Particulate	Eurofins-Knox	
A-	4016	NA	1	004	Method 5/202 Train	Cold (Iced) Impinger Liquid	500 mL HPDE bottle	Condensable Particulate	Eurofins-Knox	
A-	4017	NA	1	004	Method 5/202 Train	Filter Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4018	NA	1	004	Method 5/202 Train	Acetone Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4019	NA	1	004	Method 5/202 Train	Hexane Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4020	NA	1	004	Method 5/202 Train	DI Water Reagent Blank	250 mL amber bottle	Particulate	Eurofins-Knox	RB
A-	4021	NA	1	004	Method 26A Train	H2SO4 Impingers	1-L amber bottle	Chloride	Eurofins-Knox	
A-	4022	NA	1	004	Method 26A Train	NaOH Impingers	500 mL HPDE bottle	Chloride	Eurofins-Knox	
A-	4023	NA	1	004	Method 26A Train	H2SO4 Reagent Blank	250 mL amber bottle	Chloride	Eurofins-Knox	RB
A-	4024	NA	1	004	Method 26A Train	NaOH Reagent Blank	250 mL HDPE bottle	Chloride	Eurofins-Knox	RB
A-	4025	NA	1	004	Method 26A Train	DI Water Reagent Blank	250 mL amber bottle	Chloride	Eurofins-Knox	RB
A-	4026	NA	1	005	VOST Tenax Tube A	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4027	NA	1	005	VOST Tenax/Char Tube A	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4028	NA	1	005	VOST Tenax Tube B	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4029	NA	1	005	VOST Tenax/Char Tube B	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4030	NA	1	005	VOST Tenax Tube C	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4031	NA	1	005	VOST Tenax/Char Tube C	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4032	NA	1	005	VOST Tenax Tube D	Tenax Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4033	NA	1	005	VOST Tenax/Char Tube D	Tenax/Charcoal Tube	VOST Tube	VOC RCl	Eurofins-Knox	
A-	4034	NA	1	005	VOST Condensate	Aqueous	40 mL VOA	VOC RCl	Eurofins-Knox	

Figure 7-1. Example Master Sample List

Isokinetic Stack Sample Data Collection Sheet

Contract No.	80201	Method:	Method 5/202			Page 1 of 1	
Facility	A-Line T.D.S., Inc.	Initial Leak Rate (ft^3 @ in.Hg)	<0.010 @ 10"			Operator	MJK
Source	MRF Stack	Final Leak Rate (ft^3 @ in.Hg)	<0.010 @ 10"			Pitot No.	K-004
Date	29-Oct-24	Start Time	0800	Meter No.	1442	PTCF	0.84
Condition No.	NA	End Time	0926	DGMCF	1.004	Init. Pitot Leak Check	0.0
Run No.	1	Duration (min)	120	Δ H @	1.645	Final Pitot Leak Check	0.0
Stat. Press. (in. H_2O)	-0.94	Bar. Press. (in.Hg)	29.73	Nozzle Dia.(")	0.251	Kf	2.3

Point	Time	Volume	Δ P	Δ H	Temperatures (°F)							Vacuum
No.	(24 Hr)	(ft^3)	(in. H_2O)	(in. H_2O)	Flue Gas	Probe	Filter	Impingers	Meter in	Meter Out	Cond. Exit	(in. Hg)
A-1	0800	352.13	0.78	1.79	294	225	258	68	103	105	NA	6.0
A-1	0805	353.94	0.78	1.79	294	260	257	67	105	104		6.0
A-2	0810	355.75	0.74	1.70	294	257	261	66	106	104		6.0
A-2	0815	357.48	0.74	1.70	294	261	258	66	107	104		6.0
A-3	0820	359.05	0.68	1.56	292	258	257	64	108	104		6.0
A-3	0825	360.75	0.68	1.56	292	257	258	63	109	104		6.0
A-4	0830	362.68	0.77	1.77	292	258	258	67	104	104		6.0
A-4	0835	364.68	0.77	1.77	292	258	256	67	109	103		6.0
A-5	0840	366.60	0.77	1.70	293	258	259	61	110	104		6.0
A-5	0845	368.55	0.77	1.70	289	256	258	61	108	104		6.0
A-6	0850	370.34	0.74	1.43	285	259	255	62	106	105		6.0
A-6	0855	372.06	0.74	1.43	290	258	255	62	105	103		6.0
STOP	0900	373.61										
B-1	0920	373.71	0.62	1.77	292	255	259	66	96	95		7.0
B-1	0925	375.47	0.62	1.77	292	259	257	65	96	95		7.0
B-2	0930	377.38	0.77	1.43	293	257	257	62	99	95		7.0
B-2	0935	379.11	0.77	1.29	289	257	258	62	102	95		6.0
B-3	0940	380.76	0.62	1.04	285	258	257	62	104	97		6.0
B-3	0945	382.26	0.56	1.10	290	257	253	61	106	99		7.0
B-4	0950	383.90	0.45	1.50	296	257	257	63	109	100		6.0
B-4	0955	383.96	0.56	1.50	296	253	258	64	111	101		6.0
B-5	1000	387.26	0.45	0.99	296	257	259	61	112	103		6.0
B-5	1005	388.76	0.44	0.94	297	258	258	60	112	104		5.5
B-6	1010	390.24	0.65	0.85	297	259	258	61	113	105		5.5
B-6	1015	391.59	0.65	0.85	294	258	257	61	112	105		5.5
END	1020	392.97										

Comments:

Figure 7-2. Example Stack Sampling Record

A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

Sample Type:	Method 5/202 PM Filter	**Sample No.:**	**A-4011**
Test No. 1	**Run No.** 1	**Container(s):**	1 of 1
Analysis Required:	Particulate Method 5 (Gravimetric)		
Analysis Laboratory:	Eurofins, Knoxville, TN		
Date:	18-Mar-25	**Initials:**	MJK
Time:	1215	**Preservation:**	NA

Figure 7-3 Example Sample Label Format

Request for Analysis/Chain of Custody No. 004
A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

Eurofins-Knoxville Lot No. _H-XXXXXXXX_____
Eurofins-Knoxville Project No. ___XXXXXXX_____

Project Description:	MRF TSCA Test
Client Project No.:	Focus Project No. P-001578
Test America Project No:	XXXXXXX
Client Project Mgr:	Chris McBride 865-692-8662
Test America Contact:	Courtney Adkins 865-291-3019

Laboratory Deliverable Requirements

Analytical Due Date: 21 days from lab receipt

Data Package Due Date: 30 days from lab receipt
Holding Time: 180 to analysis
Data Package Due Date: 30 days from lab receipt

Analytical Testing QC Requirements:
MS - Matrix Spike
MSD - Matrix spike duplicate
PDS - Post-digestion spike
DUP - Duplicate
BT- Blank train

Laboratory Destination:

Eurofins-Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
(865)-291-3000

Courier: Hand deliver

Project Deliverables:
Report analytical results on R-02 Reports and in data packages. Include "Field Number", "Sample Type", "test Number", and "Run Number" on all R-02 Reports.

Holding Time Requirements:	
Particulate	180 days to analysis

Field Sample No.	Test No.	Run No.	Sample Collection Date	Sample Container	Sample Description	Analysis Specifications	Project QC Requirements
A- 4011	NA	1	18-Mar-25	Petri dish	Method 5/202 Train Particulate Filter	Desiccate to constant mass; determine differential from logbook recorded original tare weight (EPA Method 5)	Replicate weighings
A- 4012	NA	1	18-Mar-25	250 mL amber bottle	Method 5/202 Train Acetone Probe Rinse	Transfer sample to tare weighed beaker; evaporate/desiccate to constant mass; determine differential mass (EPA Method 5)	Replicate weighings
A- 4013	NA	1	18-Mar-25	250 mL amber bottle	Method 5/202 Train Ambient Impinger Liquid	Transfer sample to tare weighed beaker; evaporate/desiccate to constant mass; determine differential mass (EPA Method 202)	Replicate weighings

Figure 7-4. Example Request for Analysis

Request for Analysis/Chain of Custody No. 004
A-Line T.D.S., Inc.
Tonkawa, OK
Focus Project No. P-001578

Sample Receipt Log and Condition of the Samples Upon Receipt

Please fill in the following information:		Comments
		(Please write "NONE" if no comment is applicable.)
(1)	Record the identities of any samples that were listed on the Request for Analysis form but were not found in the sample shipment	_____
(2)	Record the sample shipping cooler temperature of all coolers transporting samples listed on the Request for Analysis form.	_____
(3)	Record any apparent sample loss or breakage.	
(4)	Record any unidentified samples transported with this shipment of samples.	_____
(5)	Indicate if all samples were received according to the project's required specifications (i.e, no non-conformances).	_____

Custody Transfer

Relinquished by: _____
Name Company Date/Time

Accepted by: _____
Name Company Date/Time

Relinquished by: _____
Name Company Date/Time

Accepted by: _____
Name Company Date/Time

Relinquished by: _____
Name Company Date/Time

Accepted by: _____
Name Company Date/Time

Figure 7-5. Example Chain of Custody

8.0 SPECIFIC CALIBRATION PROCEDURES AND FREQUENCY

The objective of this section is to assure that process instrumentation, gas sampling equipment, and analytical instruments are performing properly before conducting the test and analyzing samples. Equipment and instruments used to generate data for determining compliance with performance requirements or to establish quantitative allowable operating limits will be calibrated according to the manufacturer's instructions, prior to and/or during the test as necessary.

The calibration procedures are separated into groups according to the personnel who will perform them. A-Line operations personnel will calibrate the process instruments. Stack sampling equipment will be calibrated by the stack sampling contractor and analytical instruments will be calibrated by the contracted laboratory personnel. The calibration procedures for process instrumentation, stack gas sampling, and laboratory analytical instruments are described in the following subsections.

8.1 PROCESS INSTRUMENTATION

Within 30 days of the start of testing, the thermocouples and pressure transducers will be calibrated. The report of the most recent Relative Accuracy Test Audit (RATA) of the installed CO, and CO_2, and O_2 CEMS will be included with the final test report. The CEMS RATA will be performed within 30 days of the expected test date. The MRF operating data will be reported on 1-minute intervals and will be archived in the CMS data acquisition system. Table 8-1 summarizes the general procedures for the MRF key instrumentation,

8.2 STACK SAMPLING EQUIPMENT

Sampling equipment is calibrated according to the criteria specified in the reference method being employed. In addition, the guidelines set forth in the Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods (EPA-600/4-77-027b) will be followed. Dry gas meters, orifices, nozzles, pitot tubes, etc. are calibrated in accordance with this document. The range of the calibration is specified for all environmental measurements to encompass the range of probable experimental values. This approach ensures that all results are based upon interpolative analyses rather than extrapolative analyses.

Calibrations are designed to include, where practical, at least three measurement points evenly spaced over the range. This practice minimizes the probability that false assumptions of calibration linearity will be made. In addition, it is common practice to select, when practical, at least one calibration value approximating the levels anticipated in the actual measurement. Typically, calibration frequency is dictated by the need to demonstrate the stability of the calibration value over the course of measurements. Calibrations are made both pre- and post-test to accomplish the demonstration of stability.

Following the test program, calibrations are checked on all relevant items of sampling equipment to ensure the validity of data collected in the field. New items for which calibration is required are calibrated before

initial field use. Equipment whose calibration status may change with use or time is inspected in the field before testing begins and again upon return from each field use. When an item of equipment is found to be out of calibration, it is repaired and recalibrated or retired from service. All equipment is periodically recalibrated in full, regardless of the outcome of these regular inspections.

Data obtained during calibrations are recorded on standardized forms, which are checked for completeness and accuracy by management personnel. Data reduction and subsequent calculations are performed using standard procedures, and are computerized where appropriate. Calculations are checked at least twice for accuracy. Copies of calibration forms are included in the test or project reports.

Emissions sampling equipment requiring calibration include pitot tubes, pressure gauges, thermometers, dry gas meters, and barometers. The following sections elaborate on the calibration procedures for these specific equipment items.

8.2.1 Pitot Tubes

All Type S pitot tubes, whether separate or attached to a sampling probe, are inspected in accordance with the geometry standards contained in EPA Method 2.

For Type S pitot tubes with a D_t between 3/16 and 3/8 inches, the pitot tube may be calibrated according to the procedure outlined in Sections 10.1.2 through 10.1.5 of Method 2 before and after the test, or a baseline (isolated tube) coefficient value of 0.84 may be assigned.

All Type S pitot tubes >3/8 inches are calibrated over an eight-point range with a wind tunnel and a calibration coefficient is calculated for each pitot tube. The acceptance limits are listed in Table 8-2.

8.2.2 Differential Pressure Gauges

Some meter consoles are equipped with 10-inch water column (W.C.) inclined-vertical manometers. Fluid manometers do not require calibration other than leak-checks. Manometers are leak-checked in the field prior to each test series.

8.2.3 Digital Temperature Indicator

One digital temperature indicator is used to determine the flue gas temperature, probe temperature, oven temperature, "train temperature" and dry gas meter temperature. The digital temperature indicator is calibrated over a seven-point range (32°F-450°F) using an ASTM mercury-in-glass thermometer as a reference. The calibration is acceptable if the agreement is within ±2% or 2°F from 50°F-180°F.

8.2.4 Dry Gas Meter and Orifice

A calibrated wet test meter is used to calibrate the dry gas meter and orifice. The full calibration procedure is used to obtain the calibration factor of the dry gas meter. Full calibrations are performed using a calibrated wet test meter as a reference standard.

8.2.4.1 Dry Gas Meter

Each metering system receives a full calibration at the time of purchase and quarterly. Upon request, a post-test calibration can be performed after each field use. If the calibration factor deviates by less than five percent from the initial value, the test data are acceptable. If it deviates by more than 5%, the meter is recalibrated and the meter coefficient (initial or recalibrated) that yields the lowest sample volume for the test runs is used.

EPA Method 5 requires another full calibration anytime the post-test calibration check indicates that the calibration factor has changed by more than 5%. Standard practice is to recalibrate the dry gas meter quarterly and check the orifice calibration during and after each field use.

8.2.4.2 Orifice

An orifice calibration factor is calculated for each of the eighteen flow settings during a full calibration. The arithmetic average of the values obtained during the calibration is used.

8.2.5 Barometer

Each field barometer is adjusted before each test series to agree within ±0.1 inches of a reference aneroid barometer. The reference barometer is checked against the weather station pressure value (corrected for elevation difference) reported by the National Weather Service or mercury barometer. This information is obtained via a call to the weather line or the nearest airport

8.3 LABORATORY ANALYTICAL EQUIPMENT

The laboratory instruments will be calibrated as specified by the appropriate method before analyzing the test samples. The laboratory instrument calibration procedures are based on instructions in the referenced analytical methods and are summarized, along with other routine quality control checks, in Table 8-3. The calibrations performed and the results will be reported as appropriate to assure the quality of data in the laboratory sample analysis report.

Table 8-1. MRF Compliance Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure	Calibration Frequency	Actions taken if Criteria is not Met
Primary and Secondary Chamber Temperatures	Thermocouples and Temperature Transmitters	Factory calibrated thermocouples are purchased, and used to replace thermocouples as they fail. The manufacturer's calibration certificate of the current thermocouples are maintained in file. The thermocouple transmitter is calibrated using a standard thermocouple simulator. The simulator is used to generate a millivolt signal from the ANSI standard thermocouple tables corresponding to a given temperature and adjust output signal to generate the proper temperature readout.	Quarterly	Replace with new thermocouple and/or transmitter and re-check calibration
Primary Chamber Pressure	Pressure Transmitter	Use a standard pressure calibrator or manometer to generate a signal corresponding to pressure signal data provided by instrument manufacturer.	Quarterly	Replace with new transmitter and re-check calibration
Combustion Air Flow Rate	Orifice Plate w/Transmitter	Calibrate transmitter output with an electromagnetic calibrator standard. Generate a signal according to process value and check electronically 0, 50% and 100% of the span.	Quarterly	Replace with new transmitter and re-check calibration

Table 8-1. MRF Compliance Instrumentation Calibration Procedures

Parameter	Instrument Type	Calibration Procedure	Calibration Frequency	Actions taken if Criteria is not Met
CO, CO_2 and O_2 Continuous Emissions Monitoring System (CEMS)	CO & CO_2: Non-Dispersive Infrared (NDIR) Monitor O_2: Paramagnetic Monitor	Perform zero and span checks per 40 CFR 60, Appendix A Perform Relative Accuracy Test Audit (RATA) and Cylinder Gas Audit (CGA) per 40 CFR 60, Appendix A	Zero and Span Checks: Each MRF operating day before system operation. RATA: Annually CGA: Quarterly except in calendar quarter when RATA is performed.	Failure of Zero and Span Checks: Adjust zero and span, then recheck calibration. Contact vendor for repair or replacement if monitor continues to fail calibration. Failure of RATA or CGA: Contact vendor for repair or replace. Recheck calibration of repaired or replaced monitor via CGA followed by RATA within 90 days.

Table 8-2. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
Volumetric Flow Measurements			
Type S pitot tube inspection	All dimension specifications met	Calibrate prior to test and visually inspect after each field test	Use pitot tubes that meet face opening specifications; repair or replace as required
Type S pitot tube calibration	± 3% for volumetric flows >1,000 fpm ± 5-6% for volumetric flows >600 and <1,000 fpm	Refer to Section 10.0 of Method 2: If D_t is between 0.48 and 0.95 cm (3/16 and 3/8 in.), and if P_A and P_B are equal and between 1.05 and 1.50 D_t, there are two possible options: (1) the pitot tube may be calibrated according to the procedure outlined in Sections 10.1.2 through 10.1.5 of Method 2 before and after the test, or (2) a baseline (isolated tube) coefficient value of 0.84 may be assigned to the pitot tube with pitot tube inspection before and after the test.	Check for blockage. If blockage is significant, recalculate calibration coefficient.
Barometers	±0.1 inches Hg (± 2.5mm Hg) of mercury-in-glass barometer	Calibrate initially versus mercury-in-glass barometer; check before and after field test	Adjust to agree with a certified barometer
Stack gas temperature measurement system	Capable of measuring within ± 2°F (± 1°C) of mercury-in-glass thermometer	Calibrate prior to test and after each field use	Adjust to agree with Hg bulb thermometer; construct calibration curve, correct readings
Pressure sensors (excludes inclined manometer)	Agree within ± 5 percent of inclined manometers	Prior to and after field use	Adjust to agree with Hg bulb thermometer; construct calibration curve, correct readings
Wet test meter	$Y_{mi} = Y_m \pm 0.030$ Y (before test) Y_{mf}/Y_{mi} is 0.95 to 1.05 (after test)	Calibration prior to test Check calibration after test	Before test: Adjust until specifications are met. After test: Recalculate calibration coefficient.
Dry gas meters	$Y_i = Y \pm 0.02$ Y (before test) Y_{mf}/Y_{mi} is 0.95 to 1.05 (after test)	Calibration versus wet test meter initially, and when post-check exceeds $\Delta Y \pm 0.05$	Before test: Repair or replace and then calibrate After test: Recalculate calibration coefficient.

Table 8-2. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
Assembled isokinetic sampling train leakage	0.02 cfm (0.00057 m^3/min) at vacuum of ≥ 10 inches Hg (250 mm Hg) before the start of stack sampling, and ≥ maximum vacuum value recorded during sampling run for post sampling leak checks	Just prior to start of first sampling traverse (required); after first sampling traverse (recommended); after moving sampling train from first traverse port to second traverse port (recommended); end of second sampling traverse (required).	Before stack sampling or at post port change: Isolate and repair leak point(s); repeat leak check. End of first traverse or end of second traverse: Determine leak rate; If <4% of sampling rate, correct sample volume per procedures in Section 6.3 of Method 5. If >4% of sampling rate, invalid test sample; discard sample and repeat sampling run for invalid train.
Oxygen and carbon dioxide analyzers used for Method 3A analyses	3-point Calibration Error Test: ± 0.5 vol% 2-point Calibration Drift Check: ± 0.5 vol% 2-point System Bias Check: ≤ 0.5 vol%)	Calibration Error: Beginning of each test day Calibration Drift: Before and after each test run System Bias: Before and after each test run	Calibration Error: Repair or replace Monitor Calibration Drift: Void test run; re-calibrate or repair/replace monitor System Bias: Void test run; re-calibrate or repair/replace monitor
Analytical balance (for moisture)	± 1 mg of Class-S weights	Check with Class-S weights upon receipt and daily	Adjust or repair
Sampling Train Heating Systems and Thermocouples			
Probe heating system (isokinetic sampling trains)	Capable of maintaining 248° ± 25°F (120°C ± 14°C) at a flow of 0.75 cfm (21.2 L/min)	Calibrate initially by APTD-0576(11) or use published calibration curves	Repair, or replace, and then verify the calibration
Probe nozzle (isokinetic sampling trains)	Average of three ID measurements of nozzle within 0.001 inches (0.0025 mm); difference between high and low 0.002 inches (0.0050 mm)	Use a micrometer to measure to nearest 0.025mm (0.001 in.); check before and after field test	Recalibrate, reshape, and sharpen when nozzle becomes nicked, dented, or corroded

Table 8-2. Sampling Equipment Calibration Requirements

Stack Sampling Equipment	Acceptance Criteria	Measurement Frequency	Action If Criteria Are Not Met
Probe heating system (VOST)	Maintained at a temperature >130°C (>266°F)	Periodic check during sampling	Immediately increase the VOST system to the proper temperature
Thermocouples (stack gas meters and final impinger)	Impinger thermocouple ± 1°C (2°F) [Method 5]; dry gas thermocouple ± 3°C (5.4°F) [Method 0010]; stack thermocouple within ± 1°C(± 2°F) of absolute temperature.	Calibrate prior to test against a mercury thermometer	Adjust; determine a correction factor or reject

Sources:
Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods, EPA-600/R-94/038c, September 1994.
Maintenance, Calibration, and Operation of Isokinetic Source Sampling Equipment, APTD-0576, U.S. EPA, Office of Air Programs, March 1972.
Construction of Isokinetic Source Sampling Equipment, APTD-0581, U.S. EPA, Office of Air Programs, April 1971.
Method 0030, Volatile Organics Sampling Train and Method 0010, Modified Method 5 Sampling Train, Test Method for Evaluating Solid Waste Physical/Chemical Methods (SW-846), U.S. EP A Office of Solid Waste, Update III, December 1997.
Determination of Particulate Emissions from Stationary Sources, U.S. EPA, Test Methods and Procedures, New Source Performance Standards, 40 CFR 60, Appendix A.

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Volatile organics by GC/MS (SW-846 8260D)	Initial calibration	3 - 5 standards bracketing expected concentrations	Prior to sample analysis	Variability of average RRF less than or equal to 20% RSD for POHCs and CCCs SPCCs (chlorobenzene and 1,1,2,2-tetrachloroethane) will be μ 0.3, and SPCCs (chloromethane, 1,1-dichloroethane, and bromoform) will be μ 0.1	Recalibrate
	Continuing calibration	Midlevel standard	Prior to sample analysis, then every 12 hours or after sample set	RRF for POHCs and CCCs within 25% difference of the initial calibration average RRF. SPCCs (chlorobenzene and 1,1,2,2-tetrachloroethane) will be μ 0.3, and SPCCs (chloromethane, 1,1-dichloroethane, and bromoform) will be μ 0.1	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.
	Consistency in chromatography	For MS methods, monitor internal standard retention time and area. For non-MS methods, monitor retention time windows for compounds of interest.	Every sample, standard, and blank	Retention time within 30 seconds of last calibration check. Area within -50 to +100% of last calibration check	Perform calibration standard check. Reanalyze sample if possible, or flag data.
	Calibration check or LCS	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck.
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Result less than method detection limit	Flag data and discuss in case narrative.
Semi-volatile organics GC/MS (SW-846 8270E)	Initial calibration	5 standards bracketing expected concentrations. Critical level should be at least 10 times higher than lowest standard	Prior to sample analysis	Variability of average RRF less than or equal to 30% RSD for CCCs. SPCCs greater than or equal to 0.05.	Recalibrate

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
Semi-volatile organics GC/MS (SW-846 8270E) (continued)	Continuing calibration	Midlevel standard	Prior to sample analysis, then every 12 hours or after sample set	RRF for CCCs within 20% of initial calibration average RRF. SPCCs greater than or equal to 0.05.	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.
	Consistency in chromatography	For MS methods, monitor internal standard retention time and area. For non-MS methods, monitor retention time window for compounds of interest.	Every sample, standard, and blank	Retention time within 30 seconds of last calibration check. Area within -50 to +100% of last calibration check	Perform calibration standard check. Reanalyze sample if possible, or flag data.
	Calibration check	Analysis of independent calibration check standard	In association with each initial calibration	Within 3 std. deviations of historical mean (laboratory specific)	Recalibrate and recheck.
	Method Blank	Analysis of blank	Analyze one with each analytical batch	Results less than method detection limit	Flag data and discuss in the case narrative.
PCB and PCDD/PCDF by High Resolution GC/High Resolution MS (EPA Method 1668C and SW-846 8290A)	Initial Calibration	All five high resolution concentration calibration solutions must be used for the initial calibration	Prior to sample analysis	PCDD/PCDF: The %RSD for the mean RRF from the each of the unlabeled standards must not exceed ± 20%, and those for the labeled reference compounds must not exceed ± 30%. PCB: Mean RRF %RSD must be no greater than 30% for both unlabeled analytes and internal standards	Recalibrate
	Continuing Calibration	Midlevel standard	At the beginning and end of each 12 hour shift	PCDD/PCDF: RFs must be within ± 20% of the initial calibration mean RRF for unlabeled standards and ± 30% for labeled standards PCB: RRFs must be within ±30% of the initial calibration mean RRF for all analytes (both labeled and unlabeled)	Reanalyze standard. If second analysis does not meet criteria, recalibrate and reanalyze samples or justify acceptance of sample results since the last successful check.

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
PCB and PCDD/PCDF by HRGC/HRMS (continued)	Retention time window verification and GC column performance	Monitor retention times	Start of each 12 hour shift	PCDD/PCDF: Compliance with Section 8.2.1 of Method 8290A PCB: The internal standard RT must be within ± 10 seconds of the continuing calibration.	Correct according to method
	Method Blank	Analysis of blanks	Analyze one with each analytical batch	Results less than method detection limit	Flag data as discussed in case narrative
Particulate and Gravimetric (EPA Method 5/202)	Calibration check	Calibration of balance with standardized weights	Prior to analysis, between each group of sample weighings, and at the end of each day.	99 – 101% of theoretical value	Recalibrate and recheck sample weights.
Chloride by Ion Chromatography SW-846 Method 9056A)	Initial Calibration	4 standards bracketing expected concentrations Note: Separate calibrations are required for the acid and alkaline samples	Prior to sample analysis	Linear correlation coefficient >0.995	Recalibrate
	Retention time check for ion identification	Determine average retention time for ions of interest or relative retention time of several ions for every calibration curve	Prior to sample analysis	Average Retention Time - Sample identification is positive if results are within retention time window of standards Relative Retention Time – Sample identification is positive if results are within 3 SD of average RRT	Ions of interest are not present if criteria are not met.
Chloride by Ion Chromatography (continued)	Control check sample	Midlevel independent standard analyzed in duplicate	Beginning and end of each analysis period and after every 10 samples	90 – 110% of theoretical value	Repeat calibration check. If second check fails criteria, regenerate analytical system and reanalyze all samples since last acceptable calibration check.

Table 8-3. Laboratory Quality Control Checks, Frequencies, Acceptance Criteria, and Corrective Actions

Parameter/Method	Quality Control Check	Method of Determination	Frequency	Acceptance Criteria	Corrective Action
	Reagent blank (ICB and CCBs)	Analysis of blanks	Immediately following the ICV and following each CCV.	Less than 1 mg/L	Contamination source must be found and corrected. All samples analyzed since the last acceptable CCB must be reanalyzed.
	Reagent blank (ICB and CCBs)	Analysis of blanks	Immediately following the ICV and following each CCV.	Less than 1 mg/L	Contamination source must be found and corrected. All samples analyzed since the last acceptable CCB must be reanalyzed.

9.0 ANALYTICAL PROCEDURES

Analytical procedures and methods are summarized in Tables 3-1.

The target PCB, PCDD/PCDF, and SVOC RCI compounds and expected detection limits are noted in Tables 9-1, 9-2, and 9-3.

Table 9-4 presents expected detection limits for stack gas particulate for Method 5/202. Table 9-5 presents expected detection limits for stack gas HCl and Cl_2 for the Method 26A. These data show the expected resolution for particulate, HCl, and Cl_2 for emissions determinations.

Table 9-6 presents the stack gas target volatile organic analytes for the VOST samples and expected detection limits.

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
1	1	2-monochlorobiphenyl	2051-60-7	0.0230	0.00575	0.144	0.0360	0.300	0.0750
2	2	3-monochlorobiphenyl	2051-61-8	0.0244	0.00610	0.120	0.0300	0.300	0.0750
3	3	4-monochlorobiphenyl	2051-62-9	0.0241	0.00603	0.129	0.0323	0.300	0.0750
4	4	2,2'-dichlorobiphenyl	13029-08-8	0.0227	0.00568	0.180	0.0450	0.600	0.150
5	5	2,3-dichlorobiphenyl	16605-91-7	0.0184	0.00460	0.138	0.0345	0.300	0.0750
6	6	2,3'-dichlorobiphenyl	25569-80-6	0.0160	0.00400	0.108	0.0270	0.300	0.0750
7	7	2,4-dichlorobiphenyl	33284-50-3	0.0175	0.00438	0.150	0.0375	0.300	0.0750
8	8	2,4'-dichlorobiphenyl	34883-43-7	0.0155	0.00388	0.132	0.0330	0.600	0.150
9	9	2,5-dichlorobiphenyl	34883-39-1	0.0173	0.00433	0.096	0.0240	0.300	0.0750
10	10	2,6-dichlorobiphenyl	33146-45-1	0.0188	0.00470	0.126	0.0315	0.300	0.0750
11	11	3,3'-dichlorobiphenyl	2050-67-1	0.0190	0.00475	0.189	0.0473	0.600	0.150
12	12	3,4-dichlorobiphenyl	2974-92-7	0.0185	0.00463	0.168	0.0420	0.600	0.150
13	13	3,4'-dichlorobiphenyl	2974-90-5	0.0185	0.00463	0.168	0.0420	0.600	0.150
14	14	3,5-dichlorobiphenyl	34883-41-5	0.0176	0.00440	0.108	0.0270	0.300	0.0750
15	15	4,4'-dichlorobiphenyl	2050-68-2	0.0166	0.00415	0.150	0.0375	0.300	0.0750
16	16	2,2',3-trichlorobiphenyl	38444-78-9	0.0451	0.0113	0.177	0.0443	0.300	0.0750
17	17	2,2',4-trichlorobiphenyl	37680-66-3	0.0409	0.0102	0.195	0.0488	0.300	0.0750
18	18	2,2',5-trichlorobiphenyl	37680-65-2	0.0288	0.00720	0.285	0.0713	0.600	0.150
19	19	2,2',6-trichlorobiphenyl	38444-73-4	0.0397	0.0099	0.150	0.0375	0.300	0.0750
20	20	2,3,3'-trichlorobiphenyl	38444-84-7	0.0132	0.00330	0.252	0.0630	0.600	0.150
21	21	2,3,4-trichlorobiphenyl	55702-46-0	0.0144	0.00360	0.273	0.0683	0.600	0.150
22	22	2,3,4'-trichlorobiphenyl	38444-85-8	0.0130	0.00325	0.126	0.0315	0.300	0.0750
23	23	2,3,5-trichlorobiphenyl	55720-44-0	0.0143	0.00358	0.162	0.0405	0.300	0.0750
24	24	2,3,6-trichlorobiphenyl	55702-45-9	0.0303	0.0076	0.222	0.0555	0.300	0.0750
25	25	2,3',4-trichlorobiphenyl	55712-37-3	0.0122	0.00305	0.123	0.0308	0.300	0.0750
26	26	2,3',5-trichlorobiphenyl	38444-81-4	0.0138	0.00345	0.231	0.0578	0.600	0.150
27	27	2,3',6-trichlorobiphenyl	38444-76-7	0.0278	0.00695	0.135	0.0338	0.300	0.0750
28	28	2,4,4'-trichlorobiphenyl	7012-37-5	0.0132	0.00330	0.252	0.0630	0.600	0.150
29	29	2,4,5-trichlorobiphenyl	15862-07-4	0.0138	0.00345	0.231	0.0578	0.600	0.150
30	30	2,4,6-trichlorobiphenyl	35693-92-6	0.0288	0.00720	0.285	0.0713	0.600	0.150
31	31	2,4',5-trichlorobiphenyl	16606-02-3	0.0135	0.00338	0.141	0.0353	0.600	0.150
32	32	2,4',6-trichlorobiphenyl	38444-77-8	0.0278	0.00695	0.129	0.0323	0.300	0.0750

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
33	33	2',3,4-trichlorobiphenyl (2,3',4'-trichlorobiphenyl)	38444-86-9	0.0144	0.00360	0.273	0.0683	0.600	0.150
34	34	2',3,5-trichlorobiphenyl (2,3',5'-trichlorobiphenyl)	37680-68-5	0.0138	0.00345	0.165	0.0413	0.300	0.0750
35	35	3,3',4-trichlorobiphenyl	37680-69-6	0.0137	0.00343	0.171	0.0428	0.300	0.0750
36	36	3,3',5-trichlorobiphenyl	38444-87-0	0.0140	0.00350	0.123	0.0308	0.300	0.0750
37	37	3,4,4'-trichlorobiphenyl	38444-90-5	0.0136	0.00340	0.117	0.0293	0.300	0.0750
38	38	3,4,5-trichlorobiphenyl	53555-66-1	0.0143	0.00358	0.129	0.0323	0.300	0.0750
39	39	3,4',5-trichlorobiphenyl	38444-88-1	0.0134	0.00335	0.0900	0.0225	0.300	0.0750
40	40	2,2',3,3'-tetrachlorobiphenyl	38444-93-8	0.0186	0.00465	0.420	0.105	0.900	0.225
41	41	2,2',3,4-tetrachlorobiphenyl	52663-59-9	0.0186	0.00465	0.420	0.105	0.900	0.225
42	42	2,2',3,4'-tetrachlorobiphenyl	36559-22-5	0.0203	0.00508	0.168	0.0420	0.300	0.075
43	43	2,2',3,5-tetrachlorobiphenyl	70362-46-8	0.0159	0.00398	0.243	0.0608	0.600	0.150
44	44	2,2',3,5'-tetrachlorobiphenyl	41464-39-5	0.0169	0.00423	0.390	0.0975	0.900	0.225
45	45	2,2',3,6-tetrachlorobiphenyl	70362-45-7	0.0199	0.00498	0.267	0.0668	0.600	0.150
46	46	2,2',3,6'-tetrachlorobiphenyl	41464-47-5	0.0232	0.00580	0.138	0.0345	0.300	0.0750
47	47	2,2',4,4'-tetrachlorobiphenyl	2437-79-8	0.0169	0.00423	0.390	0.0975	0.900	0.225
48	48	2,2',4,5-tetrachlorobiphenyl	70362-47-9	0.0196	0.00490	0.165	0.0413	0.300	0.0750
49	49	2,2',4,5'-tetrachlorobiphenyl	41464-40-8	0.0154	0.00385	0.270	0.0675	0.600	0.150
50	50	2,2',4,6-tetrachlorobiphenyl	62796-65-0	0.0192	0.00480	0.306	0.0765	0.600	0.150
51	51	2,2',4,6'-tetrachlorobiphenyl	68194-04-7	0.0199	0.00498	0.267	0.0668	0.600	0.150
52	52	2,2',5,5'-tetrachlorobiphenyl	35693-99-3	0.0179	0.00448	0.132	0.0330	0.300	0.0750
53	53	2,2',5,6'-tetrachlorobiphenyl	41464-41-9	0.0192	0.00480	0.306	0.0765	0.600	0.150
54	54	2,2',6,6'-tetrachlorobiphenyl	15968-05-5	0.00301	0.00075	0.135	0.0338	0.300	0.0750
55	55	2,3,3',4-tetrachlorobiphenyl	74338-24-2	0.0124	0.00310	0.090	0.0225	0.300	0.0750
56	56	2,3,3',4'-tetrachlorobiphenyl	41464-43-1	0.0134	0.00335	0.102	0.0255	0.300	0.0750
57	57	2,3,3',5-tetrachlorobiphenyl	70424-67-8	0.0152	0.00380	0.111	0.0278	0.300	0.0750
58	58	2,3,3',5'-tetrachlorobiphenyl	41464-49-7	0.0124	0.00310	0.123	0.0308	0.300	0.0750
59	59	2,3,3',6-tetrachlorobiphenyl	74472-33-6	0.0139	0.00348	0.420	0.105	0.900	0.225
60	60	2,3,4,4'-tetrachlorobiphenyl	33025-41-1	0.0147	0.00368	0.102	0.0255	0.300	0.0750
61	61	2,3,4,5-tetrachlorobiphenyl	33284-53-6	0.0131	0.00328	0.480	0.120	1.200	0.300
62	62	2,3,4,6-tetrachlorobiphenyl	54230-22-7	0.0139	0.00348	0.420	0.105	0.900	0.225

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
63	63	2,3,4',5-tetrachlorobiphenyl	74472-34-7	0.0146	0.00365	0.156	0.0390	0.300	0.0750
64	64	2,3,4',6-tetrachlorobiphenyl	52663-58-8	0.0140	0.00350	0.195	0.0488	0.300	0.0750
65	65	2,3,5,6-tetrachlorobiphenyl	33284-54-7	0.0169	0.00423	0.390	0.0975	0.900	0.225
66	66	2,3',4,4'-tetrachlorobiphenyl	32598-10-0	0.0131	0.00328	0.120	0.0300	0.300	0.0750
67	67	2,3',4,5-tetrachlorobiphenyl	73575-53-8	0.0116	0.00290	0.120	0.0300	0.300	0.0750
68	68	2,3',4,5'-tetrachlorobiphenyl	73575-52-7	0.0131	0.00328	0.156	0.0390	0.300	0.0750
69	69	2,3',4,6-tetrachlorobiphenyl	60233-24-1	0.0154	0.00385	0.270	0.0675	0.600	0.150
70	70	2,3',4',5-tetrachlorobiphenyl	32598-11-1	0.0131	0.00328	0.480	0.120	1.200	0.300
71	71	2,3',4',6-tetrachlorobiphenyl	41464-46-4	0.0186	0.00465	0.420	0.105	0.900	0.225
72	72	2,3',5,5'-tetrachlorobiphenyl	41464-42-0	0.0150	0.00375	0.129	0.0323	0.300	0.0750
73	73	2,3',5',6-tetrachlorobiphenyl	74338-23-1	0.0159	0.00398	0.243	0.0608	0.600	0.150
74	74	2,4,4',5-tetrachlorobiphenyl	32690-93-0	0.0131	0.00328	0.480	0.120	1.200	0.300
75	75	2,4,4',6-tetrachlorobiphenyl	32598-12-2	0.0139	0.00348	0.420	0.105	0.900	0.225
76	76	2',3,4,5-tetrachlorobiphenyl (2,3',4',5'-tetrachlorobiphenyl)	70362-48-0	0.0131	0.00328	0.480	0.120	1.200	0.300
77	77	3,3',4,4'-tetrachlorobiphenyl	32598-13-3	0.0147	0.00368	0.126	0.0315	0.300	0.0750
78	78	3,3',4,5-tetrachlorobiphenyl	70362-49-1	0.0142	0.00355	0.105	0.0263	0.300	0.0750
79	79	3,3',4,5'-tetrachlorobiphenyl	41464-48-6	0.0115	0.00288	0.0990	0.0248	0.300	0.0750
80	80	3,3',5,5'-tetrachlorobiphenyl	33284-52-5	0.0124	0.00310	0.120	0.0300	0.300	0.0750
81	81	3,4,4',5-tetrachlorobiphenyl	70362-50-4	0.0158	0.00395	0.0960	0.0240	0.300	0.0750
82	82	2,2',3,3',4-pentachlorobiphenyl	52663-62-4	0.0126	0.00315	0.168	0.0420	0.300	0.0750
83	83	2,2',3,3',5-pentachlorobiphenyl	60145-20-2	0.0124	0.00310	0.246	0.0615	0.600	0.150
84	84	2,2',3,3',6-pentachlorobiphenyl	52663-60-2	0.0143	0.00358	0.171	0.0428	0.300	0.0750
85	85	2,2',3,4,4'-pentachlorobiphenyl	65510-45-4	0.0100	0.00250	0.273	0.0683	0.900	0.225
86	86	2,2',3,4,5-pentachlorobiphenyl	55312-69-1	0.00996	0.00249	0.600	0.150	1.800	0.450
87	87	2,2',3,4,5'-pentachlorobiphenyl	38380-02-8	0.00996	0.00249	0.600	0.150	1.800	0.450
88	88	2,2',3,4,6-pentachlorobiphenyl	55215-17-3	0.0130	0.00325	0.210	0.0525	0.600	0.150
89	89	2,2',3,4,6'-pentachlorobiphenyl	73575-57-2	0.0134	0.00335	0.195	0.0488	0.300	0.0750
90	90	2,2',3,4',5-pentachlorobiphenyl	68194-07-0	0.0109	0.00273	0.390	0.0975	0.900	0.225
91	91	2,2',3,4',6-pentachlorobiphenyl	68194-05-8	0.0130	0.00325	0.210	0.0525	0.600	0.150
92	92	2,2',3,5,5'-pentachlorobiphenyl	52663-61-3	0.0122	0.00305	0.126	0.0315	0.300	0.0750
93	93	2,2',3,5,6-pentachlorobiphenyl	73575-56-1	0.0124	0.00310	0.315	0.0788	0.600	0.150

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
94	94	2,2',3,5,6'-pentachlorobiphenyl	73575-55-0	0.0137	0.00343	0.165	0.0413	0.300	0.0750
95	95	2,2',3,5',6-pentachlorobiphenyl	38379-99-6	0.0130	0.00325	0.147	0.0368	0.300	0.0750
96	96	2,2',3,6,6'-pentachlorobiphenyl	73575-54-9	0.00954	0.00239	0.105	0.0263	0.300	0.0750
97	97	2,2',3',4,5-pentachlorobiphenyl (2,2',3,4',5'-pentachlorobiphenyl)	41464-51-1	0.00996	0.00249	0.600	0.150	1.800	0.450
98	98	2,2',3',4,6-pentachlorobiphenyl (2,2',3,4',6'-pentachlorobiphenyl)	60233-25-2	0.0126	0.00315	0.246	0.0615	0.600	0.150
99	99	2,2',4,4',5-pentachlorobiphenyl	38380-01-7	0.0124	0.00310	0.246	0.0615	0.600	0.150
100	100	2,2',4,4',6-pentachlorobiphenyl	39485-83-1	0.0124	0.00310	0.315	0.0788	0.600	0.150
101	101	2,2',4,5,5'-pentachlorobiphenyl	37680-73-2	0.0109	0.00273	0.390	0.0975	0.900	0.225
102	102	2,2',4,5,6''-pentachlorobiphenyl	68194-06-9	0.0126	0.00315	0.246	0.0615	0.600	0.150
103	103	2,2',4,5',6-pentachlorobiphenyl	60145-21-3	0.0119	0.00298	0.153	0.0383	0.300	0.075
104	104	2,2',4,6,6'-pentachlorobiphenyl	56558-16-8	0.0103	0.00258	0.195	0.0488	0.300	0.0750
105	105	2,3,3',4,4'-pentachlorobiphenyl	32598-14-4	0.0124	0.00310	0.102	0.0255	0.300	0.0750
106	106	2,3,3',4,5-pentachlorobiphenyl	70424-69-0	0.0141	0.00353	0.153	0.0383	0.300	0.0750
107	107/109	2,3,3',4',5-pentachlorobiphenyl	70424-68-9	0.0126	0.00315	0.150	0.0375	0.300	0.0750
108	108/107	2,3,3',4,5'-pentachlorobiphenyl	70362-41-3	0.0134	0.00335	0.192	0.0480	0.600	0.150
109	109/108	2,3,3',4,6-pentachlorobiphenyl	74472-35-8	0.00996	0.00249	0.600	0.150	1.800	0.450
110	110	2,3,3',4',6-pentachlorobiphenyl	38380-03-9	0.00875	0.00219	0.300	0.075	0.600	0.150
111	111	2,3,3',5,5'-pentachlorobiphenyl	39635-32-0	0.00860	0.00215	0.123	0.0308	0.300	0.0750
112	112	2,3,3',5,6-pentachlorobiphenyl	74472-36-9	0.00739	0.00185	0.123	0.0308	0.300	0.0750
113	113	2,3,3',5',6-pentachlorobiphenyl	68194-10-5	0.0109	0.00273	0.390	0.098	0.900	0.225
114	114	2,3,4,4',5-pentachlorobiphenyl	74472-37-0	0.0142	0.00355	0.165	0.0413	0.300	0.0750
115	115	2,3,4,4',6-pentachlorobiphenyl	74472-38-1	0.00875	0.00219	0.300	0.0750	0.600	0.150
116	116	2,3,4,5,6-pentachlorobiphenyl	18259-05-7	0.0100	0.00250	0.273	0.0683	0.900	0.225
117	117	2,3,4',5,6-pentachlorobiphenyl	68194-11-6	0.0100	0.00250	0.273	0.0683	0.900	0.225
118	118	2,3',4,4',5-pentachlorobiphenyl	31508-00-6	0.0127	0.00318	0.183	0.0458	0.300	0.0750
119	119	2,3',4,4',6-pentachlorobiphenyl	56558-17-9	0.00996	0.00249	0.600	0.150	1.800	0.450
120	120	2,3',4,5,5'-pentachlorobiphenyl	68194-12-7	0.00707	0.00177	0.111	0.0278	0.300	0.0750
121	121	2,3',4,5',6-pentachlorobiphenyl	56558-18-0	0.00805	0.00201	0.0750	0.0188	0.300	0.0750
122	122	2',3,3',4,5-pentachlorobiphenyl (2,3,3',4',5'-pentachlorobiphenyl)	76842-07-4	0.0160	0.00400	0.138	0.0345	0.300	0.0750

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
123	123	2',3,4,4',5-pentachlorobiphenyl (2,3',4,4',5'-pentachlorobiphenyl)	65510-44-3	0.0143	0.00358	0.171	0.0428	0.300	0.0750
124	124	2',3,4,5,5'-pentachlorobiphenyl (2,3',4',5',5-pentachlorobiphenyl)	70424-70-3	0.0134	0.00335	0.192	0.0480	0.600	0.150
125	125	2',3,4,5,6'-pentachlorobiphenyl (2,3',4',5',6-pentachlorobiphenyl)	74472-39-2	0.0100	0.00250	0.600	0.150	1.80	0.450
126	126	3,3',4,4',5-pentachlorobiphenyl	57465-28-8	0.0144	0.00360	0.123	0.0308	0.300	0.0750
127	127	3,3',4,5,5'-pentachlorobiphenyl	39635-33-1	0.0134	0.00335	0.126	0.0315	0.300	0.0750
128	128	2,2',3,3',4,4'-hexachlorobiphenyl	38380-07-3	0.00103	0.000258	0.204	0.0510	0.600	0.150
129	129	2,2',3,3',4,5-hexachlorobiphenyl	55215-18-4	0.00107	0.000268	0.510	0.128	1.20	0.300
130	130	2,2',3,3',4,5'-hexachlorobiphenyl	52663-66-8	0.00144	0.000360	0.153	0.0383	0.300	0.0750
131	131	2,2',3,3',4,6-hexachlorobiphenyl	61798-70-7	0.00135	0.000338	0.174	0.0435	0.300	0.0750
132	132	2,2',3,3',4,6'-hexachlorobiphenyl	38380-05-1	0.00135	0.000338	0.177	0.0443	0.300	0.0750
133	133	2,2',3,3',5,5'-hexachlorobiphenyl	35694-04-3	0.00125	0.000313	0.180	0.0450	0.300	0.0750
134	134	2,2',3,3',5,6-hexachlorobiphenyl	52704-70-8	0.00127	0.000318	0.390	0.098	0.600	0.150
135	135	2,2',3,3',5,6'-hexachlorobiphenyl	52744-13-5	0.00195	0.000488	0.270	0.0675	0.600	0.150
136	136	2,2',3,3',6,6'-hexachlorobiphenyl	38411-22-2	0.00140	0.000350	0.144	0.0360	0.300	0.0750
137	137	2,2',3,4,4',5-hexachlorobiphenyl	35694-06-5	0.00131	0.000328	0.096	0.0240	0.300	0.0750
138	138	2,2',3,4,4',5'-hexachlorobiphenyl	35065-28-2	0.00107	0.000268	0.510	0.128	1.20	0.300
139	139	2,2',3,4,4',6-hexachlorobiphenyl	56030-56-9	0.00116	0.000290	0.273	0.0683	0.600	0.150
140	140	2,2',3,4,4',6'-hexachlorobiphenyl	59291-64-4	0.00116	0.000290	0.273	0.0683	0.600	0.150
141	141	2,2',3,4,5,5'-hexachlorobiphenyl	52712-04-6	0.00116	0.000290	0.177	0.0443	0.300	0.0750
142	142	2,2',3,4,5,6-hexachlorobiphenyl	41411-61-4	0.00135	0.000338	0.150	0.0375	0.300	0.0750
143	143	2,2',3,4,5,6'-hexachlorobiphenyl	68194-15-0	0.00127	0.000318	0.390	0.098	0.600	0.150
144	144	2,2',3,4,5',6-hexachlorobiphenyl	68194-14-9	0.00180	0.000450	0.132	0.0330	0.300	0.0750
145	145	2,2',3,4,6,6'-hexachlorobiphenyl	74472-40-5	0.00146	0.000365	0.123	0.0308	0.300	0.0750
146	146	2,2',3,4',5,5'-hexachlorobiphenyl	51908-16-8	0.00105	0.000263	0.135	0.0338	0.300	0.0750
147	147	2,2',3,4',5,6-hexachlorobiphenyl	68194-13-8	0.00113	0.000283	0.360	0.090	0.600	0.150
148	148	2,2',3,4',5,6'-hexachlorobiphenyl	74472-41-6	0.00186	0.000465	0.165	0.0413	0.300	0.0750
149	149	2,2',3,4',5',6-hexachlorobiphenyl	38380-04-0	0.00113	0.000283	0.360	0.090	0.600	0.150
150	150	2,2',3,4',6,6'-hexachlorobiphenyl	68194-08-1	0.00139	0.000348	0.144	0.0360	0.300	0.075
151	151	2,2',3,5,5',6-hexachlorobiphenyl	52663-63-5	0.00195	0.000488	0.270	0.0675	0.600	0.150

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
152	152	2,2',3,5,6,6'-hexachlorobiphenyl	68194-09-2	0.00143	0.000358	0.159	0.0398	0.300	0.0750
153	153	2,2',4,4',5,5'-hexachlorobiphenyl	35065-27-1	0.000928	0.000232	0.249	0.0623	0.600	0.150
154	154	2,2',4,4',5,6'-hexachlorobiphenyl	60145-22-4	0.00174	0.000435	0.180	0.0450	0.300	0.075
155	155	2,2',4,4',6,6'-hexachlorobiphenyl	33979-03-2	0.00150	0.000375	0.156	0.0390	0.300	0.075
156	156	2,3,3',4,4',5-hexachlorobiphenyl	38380-08-4	0.00115	0.000288	0.255	0.0638	0.600	0.150
157	157	2,3,3',4,4',5'-hexachlorobiphenyl	69782-90-7	0.00115	0.000288	0.255	0.0638	0.600	0.150
158	158	2,3,3',4,4',6-hexachlorobiphenyl	74472-42-7	0.000774	0.000194	0.156	0.0390	0.300	0.0750
159	159	2,3,3',4,5,5'-hexachlorobiphenyl	39635-35-3	0.000732	0.000183	0.117	0.0293	0.300	0.0750
160	160	2,3,3',4,5,6-hexachlorobiphenyl	41411-62-5	0.00107	0.000268	0.510	0.128	1.200	0.300
161	161	2,3,3',4,5',6-hexachlorobiphenyl	74472-43-8	0.000899	0.000225	0.111	0.0278	0.300	0.0750
162	162	2,3,3',4',5,5'-hexachlorobiphenyl	39635-34-2	0.000807	0.000202	0.150	0.0375	0.300	0.0750
163	163	2,3,3',4',5,6-hexachlorobiphenyl	74472-44-9	0.00107	0.000268	0.510	0.128	1.20	0.300
164	164	2,3,3',4',5',6-hexachlorobiphenyl	74472-45-0	0.000977	0.000244	0.075	0.0188	0.300	0.075
165	165	2,3,3',5,5',6-hexachlorobiphenyl	74472-46-1	0.000990	0.000248	0.150	0.0375	0.300	0.075
166	166	2,3,4,4',5,6-hexachlorobiphenyl	41411-63-6	0.00103	0.000258	0.204	0.0510	0.600	0.150
167	167	2,3',4,4',5,5'-hexachlorobiphenyl	52663-72-6	0.000736	0.000184	0.180	0.0450	0.300	0.075
168	168	2,3',4,4',5',6-hexachlorobiphenyl	59291-65-5	0.000928	0.000232	0.249	0.0623	0.600	0.150
169	169	3,3',4,4',5,5'-hexachlorobiphenyl	32774-16-6	0.000746	0.000187	0.123	0.0308	0.300	0.075
170	170	2,2',3,3',4,4',5-heptachlorobiphenyl	35065-30-6	0.00107	0.000268	0.132	0.0330	0.300	0.075
171	171	2,2',3,3',4,4',6-heptachlorobiphenyl	52663-71-5	0.00101	0.000253	0.279	0.0698	0.600	0.150
172	172	2,2',3,3',4,5,5'-heptachlorobiphenyl	52663-74-8	0.00111	0.000278	0.150	0.0375	0.300	0.075
173	173	2,2',3,3',4,5,6-heptachlorobiphenyl	68194-16-1	0.00101	0.000253	0.279	0.0698	0.600	0.150
174	174	2,2',3,3',4,5,6'-heptachlorobiphenyl	38411-25-5	0.000980	0.000245	0.075	0.0188	0.300	0.075
175	175	2,2',3,3',4,5',6-heptachlorobiphenyl	40186-70-7	0.000992	0.000248	0.138	0.0345	0.300	0.075
176	176	2,2',3,3',4,6,6'-heptachlorobiphenyl	52663-65-7	0.000766	0.000192	0.186	0.0465	0.300	0.075
177	177	2,2',3,3',4',5,6-heptachlorobiphenyl (2,2',3,3',4,5',6'-heptachlorobiphenyl)	52663-70-4	0.000967	0.000242	0.0960	0.0240	0.300	0.075
178	178	2,2',3,3',5,5',6-heptachlorobiphenyl	52663-67-9	0.00106	0.000265	0.0600	0.0150	0.300	0.075
179	179	2,2',3,3',5,6,6'-heptachlorobiphenyl	52663-64-6	0.000662	0.000166	0.126	0.0315	0.300	0.075
180	180	2,2',3,4,4',5,5'-heptachlorobiphenyl	35065-29-3	0.000809	0.000202	0.204	0.0510	0.600	0.150
181	181	2,2',3,4,4',5,6-heptachlorobiphenyl	74472-47-2	0.000994	0.000249	0.150	0.0375	0.300	0.075
182	182	2,2',3,4,4',5,6'-heptachlorobiphenyl	60145-23-5	0.00102	0.000255	0.156	0.0390	0.300	0.075

Table 9-1. Stack Gas PCB Target Analytes

PCB No. [1]	BZ/ IUPAC No. [2]	PCB Chemical Structure Name [3]	PCB CAS No. [4]	Estimated Detection Limit (ng) [5]	Train Detection Limit @ EDL (ng/m^3) [5,6]	Method Detection Limit (ng) [5]	Train Detection Limit @ MDL (ng/m^3) [5,6]	Reporting Limit (ng) [5]	Train Detection Limit @ RL (ng/m^3) [5,6]
183	183	2,2',3,4,4',5',6-heptachlorobiphenyl	52663-69-1	0.000962	0.000241	0.231	0.0578	0.600	0.150
184	184	2,2',3,4,4',6,6'-heptachlorobiphenyl	74472-48-3	0.000691	0.000173	0.135	0.0338	0.300	0.075
185	185	2,2',3,4,5,5',6-heptachlorobiphenyl	52712-05-7	0.000962	0.000241	0.231	0.0578	0.600	0.150
186	186	2,2',3,4,5,6,6'-heptachlorobiphenyl	74472-49-4	0.000641	0.000160	0.144	0.0360	0.300	0.075
187	187	2,2',3,4',5,5',6-heptachlorobiphenyl	52663-68-0	0.000857	0.000214	0.126	0.0315	0.300	0.075
188	188	2,2',3,4',5,6,6'-heptachlorobiphenyl	74487-85-7	0.000662	0.000166	0.126	0.0315	0.300	0.075
189	189	2,3,3',4,4',5,5'-heptachlorobiphenyl	39635-31-9	0.00674	0.001685	0.147	0.0368	0.300	0.075
190	190	2,3,3',4,4',5,6-heptachlorobiphenyl	41411-64-7	0.000709	0.000177	0.150	0.0375	0.300	0.075
191	191	2,3,3',4,4',5',6-heptachlorobiphenyl	74472-50-7	0.000733	0.000183	0.153	0.0383	0.300	0.075
192	192	2,3,3',4,5,5',6-heptachlorobiphenyl	74472-51-8	0.000702	0.000176	0.120	0.0300	0.300	0.075
193	193	2,3,3',4',5,5',6-heptachlorobiphenyl	69782-91-8	0.000809	0.000202	0.204	0.0510	0.600	0.150
194	194	2,2',3,3',4,4',5,5'-octachlorobiphenyl	35694-08-7	0.002780	0.000695	0.144	0.0360	0.300	0.075
195	195	2,2',3,3',4,4',5,6-octachlorobiphenyl	52663-78-2	0.00327	0.00082	0.159	0.0398	0.300	0.075
196	196	2,2',3,3',4,4',5,6'-octachlorobiphenyl	42740-50-1	0.00132	0.000330	0.180	0.0450	0.300	0.075
197	197	2,2',3,3',4,4',6,6'-octachlorobiphenyl	33091-17-7	0.000896	0.000224	0.141	0.0353	0.300	0.075
198	198	2,2',3,3',4,5,5',6-octachlorobiphenyl	68194-17-2	0.00118	0.000295	0.246	0.0615	0.600	0.150
199	201/199	2,2',3,3',4,5,5',6'-octachlorobiphenyl	52663-75-9	0.00118	0.000295	0.246	0.0615	0.600	0.150
200	199/200	2,2',3,3',4,5,6,6'-octachlorobiphenyl	52663-73-7	0.00102	0.000255	0.102	0.0255	0.300	0.0750
201	200/201	2,2',3,3',4,5',6,6'-octachlorobiphenyl	40186-71-8	0.00105	0.000263	0.159	0.0398	0.300	0.0750
202	202	2,2',3,3',5,5',6,6'-octachlorobiphenyl	2136-99-4	0.000991	0.000248	0.153	0.0383	0.300	0.0750
203	203	2,2',3,4,4',5,5',6-octachlorobiphenyl	52663-76-0	0.00111	0.000278	0.204	0.0510	0.300	0.0750
204	204	2,2',3,4,4',5,6,6'-octachlorobiphenyl	74472-52-9	0.000979	0.000245	0.144	0.0360	0.300	0.0750
205	205	2,3,3',4,4',5,5',6-octachlorobiphenyl	74472-53-0	0.00248	0.000620	0.165	0.0413	0.300	0.0750
206	206	2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	40186-72-9	0.0519	0.0130	0.171	0.0428	0.300	0.0750
207	207	2,2',3,3',4,4',5,6,6'-nonachlorobiphenyl	52663-79-3	0.0411	0.0103	0.114	0.0285	0.300	0.0750
208	208	2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	52663-77-1	0.0419	0.0105	0.153	0.0383	0.300	0.0750
209	209	2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	2051-24-3	0.000617	0.000154	0.138	0.0345	0.300	0.0750
Total		All Congeners	NA	2.18	0.546	44.8	11.2	105	26.2

Table 9-1. Stack Gas PCB Target Analytes

Table 9-1 Notes:

1. The PCB congener number is from Method 1668C and Chemical Abstract Services.

2. The BZ number is from Ballschmiter and Zell (1980). The IUPAC number, when different from the BZ, follows the recommended changes to the BZ number per Schulte and Malisch (1983) and Guitart et al. (1993).

3. The chemical structure names are from Ballschmiter and Zell (1980). IUPAC nomenclature structure names are listed in parenthesis when different from the BZ name (source CAS Registry).

4. Chemical Abstract Service Registry number (source CAS Registry and 1668A Table 1).

5. Detection limits based on analysis of extracts split three ways: one-third for PCB, one-third for DF, and one-third for SVOC. The PCB detection limits values represent approximate, relative limits using isotope dilution and HRGC/SIMS analysis which can result in detection limit variations.

6. Based on four (4.0) dry standard cubic meters of stack gas sampled.

Table 9-2. Stack Gas Dioxin/Furan Target Analytes

Compound	CAS No.	Per Analysis EDL (pg) [1]	Per Analysis MDL (pg) [1]	Per Analysis RL (pg) [1]	Train Detection Limit @ EDL (ng/m^3) [1,2,3]	Train Detection Limit @ MDL (ng/m^3) [1,2,4]	Train Detection Limit @ RL (ng/m^3) [1,2,3]	2,3,7,8-TCDD TEQ Factor	2,3,7,8-TCDD TEQ @ EDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ MDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ RL (ng/m^3) [1,2]
2,3,7,8 - TCDD	1746-01-6	2.06	6.30	30.0	0.000514	0.00158	0.00750	1	0.000514	0.00158	0.00750
Total TCDD	NA	2.06		30.0	0.000514		0.00750	NA	NA		NA
2,3,7,8 - TCDF (DB225)	51207-31-9	4.23	9.60	30.0	0.00106	0.00240	0.00750	0.1	0.000106	0.000240	0.000750
Total TCDF	NA	2.39		30.0	0.000597		0.00750	NA	NA		NA
1,2,3,7,8 - PeCDD	40321-76-4	1.99	25.2	150	0.000497	0.00630	0.0375	0.5	0.000249	0.00315	0.0188
Total PeCDD	NA	1.99		150	0.000497		0.0375	NA	NA		NA
1,2,3,7,8 - PeCDF	57117-41-6	0.966	18.9	150	0.000242	0.00473	0.0375	0.05	0.0000121	0.000236	0.00188
2,3,4,7,8 - PeCDF	57117-31-4	0.948	20.1	150	0.000237	0.00503	0.0375	0.5	0.000119	0.00251	0.0188
Total PeCDF	NA	0.957		150	0.000239		0.0375	NA	NA		NA
1,2,3,6,7,8 - HxCDD	57653-85-7	1.19	28.2	150	0.000299	0.00705	0.0375	0.1	0.0000299	0.000705	0.00375
1,2,3,4,7,8 - HxCDD	39227-28-6	1.13	21.3	150	0.000283	0.00533	0.0375	0.1	0.0000283	0.000533	0.00375
1,2,3,7,8,9 - HxCDD	19408-74-3	1.11	23.7	150	0.000277	0.00593	0.0375	0.1	0.0000277	0.000593	0.00375
Total HxCDD	NA	1.14		150	0.000286		0.0375	NA	NA		NA
1,2,3,6,7,8 - HxCDF	57117-44-9	1.41	23.1	150	0.000352	0.00578	0.0375	0.1	0.0000352	0.000578	0.00375
1,2,3,4,7,8 - HxCDF	70648-26-9	1.29	20.4	150	0.000323	0.00510	0.0375	0.1	0.0000323	0.000510	0.00375
1,2,3,7,8,9 - HxCDF	72918-21-9	1.39	27.9	150	0.000348	0.00698	0.0375	0.1	0.0000348	0.000698	0.00375
2,3,4,6,7,8 - HxCDF	60851-34-5	1.52	28.8	150	0.000379	0.00720	0.0375	0.1	0.0000379	0.000720	0.00375
Total HxCDF	NA	1.40		150	0.000350		0.0375	NA	NA		NA
1,2,3,4,6,7,8 - HpCDD	35822-39-4	6.54	21.0	150	0.00164	0.00525	0.0375	0.01	0.0000164	0.0000525	0.000375
Total HpCDD	NA	6.54		150	0.00164		0.0375	NA	NA		NA
1,2,3,4,6,7,8 - HpCDF	67562-394	1.04	24.0	150	0.000260	0.00600	0.0375	0.01	0.00000260	0.0000600	0.000375
1,2,3,4,7,8,9 - HpCDF	55673-89-7	1.25	27.9	150	0.000312	0.00698	0.0375	0.01	0.00000312	0.0000698	0.000375
Total HpCDF	NA	1.14		150	0.000286		0.0375	NA	NA		NA
Total OCDD	3268-87-9	1.30	123	300	0.000324	0.0308	0.0750	0.001	0.000000324	0.0000308	0.0000750

Table 9-2. Stack Gas Dioxin/Furan Target Analytes

Compound	CAS No.	Per Analysis EDL (pg) [1]	Per Analysis MDL (pg) [1]	Per Analysis RL (pg) [1]	Train Detection Limit @ EDL (ng/m^3) [1,2,3]	Train Detection Limit @ MDL (ng/m^3) [1,2,4]	Train Detection Limit @ RL (ng/m^3) [1,2,3]	2,3,7,8-TCDD TEQ Factor	2,3,7,8-TCDD TEQ @ EDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ MDL (ng/m^3) [1,2]	2,3,7,8-TCDD TEQ @ RL (ng/m^3) [1,2]
Total OCDF	39001-02-0	0.984	57.0	300	0.000246	0.0143	0.0750	0.001	0.000000246	0.0000143	0.0000750
TOTAL					0.00497	0.127	0.390		0.00125	0.0123	0.0752

Notes:

[1] Detection limits based on combined analysis of the front-half and back-half extracts split three (3) ways for PCB, PCDD/PCDF, and SVOC RCI . PCDD/PCDF detection limits using isotope dilution and HRGS/HRMS analysis method can vary. The detection values represent approximate, relative limits of detection.

[2] Based on 4.0 dry standard cubic meters (dscm) of stack gas sampled.

[3] "TOTAL" based on sum of the individual congener group "Total" detection limits.

[4] "TOTAL" based on sum of the individual 2,3,7,8-congener detection limits.

Table 9-3 Stack Gas Semivolatile Organic Target Analytes

Compound [1]	CAS No.	Combined Fractions @ Method Detection Limit (ug) [2]	Train Detection Limit @ MDL (ug/m^3) [2,3]	Combined Fractions @ Reporting Limit (ug) [2]	Train Detection Limit @ RL (ug/m^3) [2,3]
bis(2-Chloroethoxy)methane	111-91-1	3.00	0.750	30	7.50
bis(2-Chloroethyl) ether	111-44-4	3.30	0.825	30	7.50
4-Chloroaniline	106-47-8	36.0	9.00	60	15.0
4-Chloro-3-methylphenol	59-50-7	3.75	0.938	30	7.50
2-Chloronaphthalene	91-58-7	3.00	0.750	30	7.50
2-Chlorophenol	95-57-8	3.00	0.750	30	7.50
4-Chlorophenyl phenyl ether	7005-72-3	3.00	0.750	30	7.50
1,2-Dichlorobenzene	95-50-1	3.00	0.750	30	7.50
1,3-Dichlorobenzene	541-73-1	3.60	0.900	30	7.50
1,4-Dichlorobenzene	106-46-7	3.30	0.825	30	7.50
3,3'-Dichlorobenzidine	91-94-1	45.0	11.3	150	37.5
2,4-Dichlorophenol	120-83-2	4.50	1.13	30	7.50
Hexachlorobenzene	118-74-1	3.00	0.750	30	7.50
Hexachlorobutadiene	87-68-3	4.50	1.13	30	7.50
Hexachlorocyclopentadiene	77-47-4	60.0	15.0	150	37.5
Hexachloroethane	67-72-1	7.50	1.88	30	7.50
Pentachlorobenzene	608-93-5	3.00	0.750	30	7.50
Pentachloronitrobenzene	82-68-8	3.00	0.750	30	7.50
Pentachlorophenol	87-86-5	100	25.0	150	37.5
1,2,4-Trichlorobenzene	120-82-1	3.60	0.900	30	7.50
2,4,5-Trichlorophenol	95-95-4	7.80	1.95	30	7.50
2,4,6-Trichlorophenol	88-06-2	4.50	1.13	30	7.50

Notes:
[1] In addition to the target SVOC compounds listed above, all non-target chlorinated SVOC compound peaks greater than 10% of the nearest internal standard will be tentatively identified with 85% or better match via GC/MS library search of the mass spectral data, with quantity estimated based on the nearest internal standard.
[2] Detection limits are based on previous similar sampling and Method 8270E analysis. Detection limits based on combined analysis of the front-half and back-half extracts split three (3) ways for PCB, PCDD/PCDF, SVOC RCI and archive.
[3] Based on four (4) dry standard cubic meters (dscm) of stack gas sampled.

Table 9-4. Stack Gas Particulate

Parameter	Probe Rinse (mg)	Filter (mg)	Conden-sate (mg)	Filterable Train Detection Limit (mg/m^3) [1]	Filterable Train Detection Limit (gr/dscf) [1]	Filterable & Condesable Train Detection Limit (mg/m^3) [1]	Filterable & Condensable Train Detection Limit (gr/dscf) [1]
Particulate Matter	0.5	0.5	0.5	0.50	0.00022	0.75	0.00033

Notes:

[1] For particulate, the measurement is of differential weight. The detection limit accuracy for gravimetric is ±0.5 mg for each of the two fractions, the filter and the probe rinse. The stack gas concentration limit is based on 2.0 dry standard cubic meters (dscm) of stack gas sampled.

Table 9-5. Method 26A HCl/Cl_2 Detection Limts

Parameters	H_2SO_4 Impinger Method Detection Limit (ug)	NaOH Impinger Method Detection Limit (ug)	Train Method Detection Limit (ug/m^3)[1]	H_2SO_4 Impinger Reporting Limit (ug)	NaOH Impinger Reporting Limit (ug)	Train Reporting Limit (ug/m^3)[1]
HCl/Cl_2						
Hydrogen Chloride [1]	200	NA	200	400	NA	400
		ug/m^3 as HCl:	206		ug/m^3 as HCl:	411
		ppm as HCl:	0.14		ppm as HCl:	0.27
Chlorine [1]	NA	100	100	NA	200	200
		ug/m^3 as Cl_2:	100		ug/m^3 as Cl_2:	200
		ppm as Cl_2:	0.034		ppm as Cl_2:	0.068
Total as Cl^-	200	100	300	400	200	600
		ug/m^3 as Cl^-:	300		ug/m^3 as Cl^-:	600
		ppm as Cl^-:	0.20		ppm as Cl^-:	0.41

Notes:

[1] Detection limits are for chloride ion via Ion Chromatography (IC) analysis, SW-846 Method 9056A. The stack gas concentration limit is based on 1.0 cubic meters of stack gas sampled using a Method 26A sampling train. Method detection limit (MDL) and reporting limit (RL) values are based on previous similar testing.

Table 9-6. Stack Gas Volatile Organic Target Analytes

Compound [1]	CAS No.	Method Detection Limit per Tube (ug)	Tube Total @ MDL (ug)[1]	Condensate @ MDL (ug)[c]	Train Total @ MDL (ug/m^3) [4]	Reporting Limit per Tube (ug)	Tube Total @ RL (ug) [2]	Condensate @ RL (ug) [3]	Train Total @ RL (ug/m^3) [4]
Bromochloromethane	74-97-5	0.00560	0.0336	0.00960	0.720	0.0250	0.150	0.0400	3.17
Bromodichloromethane	75-27-4	0.00420	0.0252	0.00400	0.487	0.0250	0.150	0.0400	3.17
Carbon tetrachloride	56-23-5	0.00690	0.0414	0.00480	0.770	0.0250	0.150	0.0400	3.17
Chlorobenzene	108-90-7	0.00320	0.0192	0.00400	0.387	0.0250	0.150	0.0400	3.17
Chlorodibromomethane	124-48-1	0.00560	0.0336	0.00800	0.693	0.0250	0.150	0.0400	3.17
Chloroethane	75-00-3	0.00680	0.0408	0.00960	0.840	0.0500	0.300	0.0800	6.33
Chloroform	67-66-3	0.00700	0.0420	0.00400	0.767	0.0250	0.150	0.0400	3.17
Chloromethane	74-87-3	0.00480	0.0288	0.00480	0.560	0.0500	0.300	0.0800	6.33
2-Chlorotoluene	95-49-8	0.00180	0.0108	0.00960	0.340	0.0250	0.150	0.0400	3.17
4-Chlorotoluene	106-43-4	0.00180	0.0108	0.00840	0.320	0.0250	0.150	0.0400	3.17
1,2-Dibromo-3-chloro-propane	96-12-8	0.0110	0.0660	0.0180	1.40	0.0500	0.300	0.0800	6.33
1,2-Dichlorobenzene	95-50-1	0.00770	0.0462	0.00400	0.837	0.0250	0.150	0.0400	3.17
1,3-Dichlorobenzene	541-73-1	0.00380	0.0228	0.00400	0.447	0.0250	0.150	0.0400	3.17
1,4-Dichlorobenzene	106-46-7	0.00550	0.0330	0.00480	0.630	0.0250	0.150	0.0400	3.17
Dichlorodifluoromethane	75-71-8	0.00510	0.0306	0.00600	0.610	0.0250	0.150	0.0800	3.83
1,1-Dichloroethane	75-34-3	0.00640	0.0384	0.00400	0.707	0.0250	0.150	0.0400	3.17
1,2-Dichloroethane	107-06-2	0.00660	0.0396	0.00400	0.727	0.0250	0.150	0.0400	3.17
cis-1,2-Dichloroethene	156-59-2	0.00620	0.0372	0.00480	0.700	0.0250	0.150	0.0400	3.17
trans-1,2-Dichloroethene	156-60-5	0.00740	0.0444	0.00400	0.807	0.0250	0.150	0.0400	3.17
1,1-Dichloroethene	75-35-4	0.00670	0.0402	0.00400	0.737	0.0250	0.150	0.0400	3.17
1,2-Dichloropropane	78-87-5	0.00490	0.0294	0.00400	0.557	0.0250	0.150	0.0400	3.17
1,3-Dichloropropane	142-28-9	0.00730	0.0438	0.00680	0.843	0.0250	0.150	0.0400	3.17
2,2-Dichloropropane	594-20-7	0.00700	0.0420	0.00440	0.773	0.0250	0.150	0.0400	3.17
cis-1,3-Dichloropropene	10061-01-5	0.00460	0.0276	0.00400	0.527	0.0250	0.150	0.0400	3.17
trans-1,3-Dichloropropene	10061-02-6	0.00590	0.0354	0.00440	0.663	0.0250	0.150	0.0400	3.17
1,1-Dichloropropene	563-58-6	0.00770	0.0462	0.00400	0.837	0.0250	0.150	0.0400	3.17
Hexachlorobutadiene	87-68-3	0.0120	0.0720	0.00480	1.28	0.0250	0.150	0.0800	3.83
Methylene chloride	75-09-2	0.0160	0.0960	0.00920	1.75	0.0250	0.150	0.0800	3.83

Table 9-6. Stack Gas Volatile Organic Target Analytes

Compound [1]	CAS No.	Method Detection Limit per Tube (ug)	Tube Total @ MDL (ug)[1]	Condensate @ MDL (ug)[c]	Train Total @ MDL (ug/m^3) [4]	Reporting Limit per Tube (ug)	Tube Total @ RL (ug) [2]	Condensate @ RL (ug) [3]	Train Total @ RL (ug/m^3) [4]
1,1,1,2-Tetrachloroethane	630-20-6	0.00370	0.0222	0.00480	0.450	0.0250	0.150	0.0400	3.17
1,1,2,2-Tetrachloroethane	79-34-5	0.00970	0.0582	0.00600	1.07	0.0250	0.150	0.0400	3.17
Tetrachloroethene	127-18-4	0.00620	0.0372	0.00400	0.687	0.0250	0.150	0.0400	3.17
1,2,3-Trichlorobenzene	87-61-6	0.0140	0.0840	0.00920	1.55	0.0250	0.150	0.0400	3.17
1,2,4-Trichlorobenzene	120-82-1	0.0130	0.0780	0.00600	1.40	0.0250	0.150	0.0400	3.17
1,1,1-Trichloroethane	71-55-6	0.00820	0.0492	0.00400	0.887	0.0250	0.150	0.0400	3.17
1,1,2-Trichloroethane	79-00-5	0.00700	0.0420	0.0100	0.867	0.0250	0.150	0.0400	3.17
Trichloroethene	79-01-6	0.00650	0.0390	0.00400	0.717	0.0250	0.150	0.0400	3.17
Trichlorofluoromethane	75-69-4	0.00680	0.0408	0.00480	0.760	0.0500	0.300	0.0800	6.33
1,2,3-Trichloropropane	96-18-4	0.0100	0.0600	0.0144	1.24	0.0250	0.150	0.0400	3.17
Vinyl chloride	75-01-4	0.0250	0.150	0.00960	2.66	0.0250	0.150	0.0400	3.17

Notes:
[1] In addition to the target compounds listed above, all non-target chlorinated compound peaks greater than 10% of the nearest internal standard will be tentatively identified with 85% or better match via GC/MS library search of the mass spectral data, with quantity estimated based on the nearest internal standard.
[2] Based on summation of analysis of three tube sets at the method detection limit (MDL) presented. MDLs are based on previous similar VOST sampling and analysis.
[3] Based on 40 mL of VOST Cond. (one 40-mL VOA).
[4] Based on 60 liters (0.060 cubic meters)of stack gas sampled using three tube sets and 40 mL of VOST Condensate

10.0 SPECIFIC INTERNAL QUALITY CONTROL CHECKS

10.1 DEFINITIONS

The various types of QA/QC checks that may be performed as part of the test, both for sampling and analysis, are defined below. One or more of these QA/QC checks are associated with each measurement system in order to assess the compliance of the data to the DQOs established in Section 5.0. Table 10-1 is a summary of all the sample analyses and their associated internal quality control checks associated with this test program.

Audit Sample An audit sample is a field or alternate laboratory prepared blank spike submitted to the test laboratory to assess accuracy or potential sample degradation.

Blank, Field A field blank is a sampling train or sampling component that is set-up in the field but is not used for test sampling. The field blank is used to assess background contamination that may affect the representativeness of the field samples.

Blank, Media A sample of unused sampling media analyzed to ensure the media are uncontaminated. This type of sample may also be referred to as a “reagent blank” (see below).

Blank, Method A method blank is a sample of unused media that is prepared and analyzed in the test laboratory to assess background contamination that may exist in the laboratory, on glassware, or in the analytical system.

Blank, Reagent A sample of unused reagent(s) used to demonstrate the absence of contamination in the reagents.

Blank, Spike A blank spike is a laboratory prepared sample of blank media that is spiked with a known amount of target analyte(s) used to assess the accuracy of the analytical method.

Blank, System An aliquot of uncontaminated reagent used to clean out the analytical system after high level samples have been analyzed or before analysis begins.

Blank, Trip A trip blank is an unused sample component that is shipped to the field along with the sampling equipment/media and/or returned to the laboratory without having been exposed to field conditions. If contamination is encountered in the field blank(s), the trip blank is analyzed to assess whether or not the contamination originates in the field, is inherent in the equipment/media, or results from exposure during shipping and handling.

Breakthrough Check The result of the analysis of a secondary component (i.e., sorbent tube) in a sampling train is compared to the result of the primary component to assess whether or not the primary component has successfully captured the target analytes. If the result of the secondary component analysis is high compared to the primary component analysis, the possibility exists that the analytical results may be artificially low.

Calibration Check A standard solution from a source other than the calibration standards used to verify the integrity of an instrument's calibration.

Calibration Standards High purity compounds or mixtures of compounds used to adjust the response of an analytical instrument. The laboratory will use traceable standards and submit standard preparation logs as part of the deliverables package.

Contingency Sample An archived portion of a field sample from the same location as other field samples that is collected and held in case of breakage or QA/QC failure during the handling or analysis of the primary sample. This type of sample is sometimes referred to as an “archive sample.”

Continuing Calibration Verification A mid-point standard, from the same Calibration source as the initial calibration solution analyzed periodically to verify that calibration conditions have not drifted from the initial calibration.

Duplicate Analysis A duplicate is a sample that is split in the laboratory and prepared and analyzed twice. The results of the two analyses are compared as a measure of precision.

Duplicate Injection A second analysis of a single sample preparation. This QC test may be used to assess analytical QC failures, matrix interferences, or as a measure of analytical system precision.

Initial Calibration A series of analyses of solutions, that have known concentrations, used to establish the correspondence between the amount of an analyte present in the solution and the instrument's response across the expected analytical range of the samples. Initial calibrations also establish retention time windows for identification purposes in chromatographic methods.

Internal Standard Recovery Internal standards are non-target spikes added to samples for quantitation purposes. The percent recovery of the internal standards is checked to assess whether or not significant matrix interferences may affect the accuracy and precision of analytical results.

Performance Evaluation (PE) Sample See Audit Sample.

Proficiency Test A series of blank spikes analyzed in the test laboratory to demonstrate an analyst's ability to successfully perform the method with acceptable precision and accuracy.

Replicate One of a series of identical samples or splits of a single sample used to assess precision.

Serial Dilution The result of the analysis of a highly contaminated sample, run undiluted, is compared to the results for the same sample after serial dilution. The two results are expected to match to within method specified criteria. This test is a measure of the linearity of ICP calibration and the analysis technique.

Spike, Field See Audit Sample.

Spike, Matrix Spike of the known or controlled amount of an actual target analyte to an actual sample matrix that is then analyzed for that analyte. The percent recovery of the spiked analyte provides a measure of the matrix bias.

Surrogates Non-target or isotopically labeled analytes spiked into field samples as a measure of method efficiency and accuracy.

10.2 SPECIFIC QUALITY CONTROL CHECKS AND ACCEPTANCE CRITERIA

A variety of QC checks are required both in the field and in the laboratory to ensure the collection of samples that accurately represent the field conditions under study, to assess compliance with the Data Quality Objectives (DQOs), and to assess biases in the measurement system.

10.2.1 Field Activities

In order to ensure the representativeness of samples collected during the test, and to ensure integrity of field measurements, a variety of QC checks and controls will be implemented throughout the sampling program. These checks and controls will include:

- Standard forms and/or standard field notebooks will be used to document field activities and for data collection. The data collection forms and field notebooks will be reviewed routinely by senior staff for accuracy, completeness, and internal consistency.
- The strict adherence to detailed operating procedures as documented in the various project controlling documents and related SOPs will be enforced by experienced senior technical staff.
- Project personnel will be selected based on appropriate levels of training and experience and will receive site-specific training prior to working on-site. The site-specific training will include health and safety requirements; security requirements; briefings on overall project goals, objectives, and schedules; and, specific technical training related to their assigned tasks.
- Routine calibration will be performed on measurement systems and sampling equipment including metering systems, thermocouples, barometers, rotameters, and pitot tubes. Guidance related to equipment calibration is provided in Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III, Stationary Source Specific Methods and Quality Assurance/Quality Control Procedures for Hazardous Waste Incinerators, Appendix A. The detailed specifications, acceptance criteria, and corrective action requirements are presented in Section 8.0 of this QAPP. All calibrations will be documented and the documentation maintained in the project files.
- Leak checks will be performed according to method specifications before and after sampling.
- Field QC samples for sampling train are submitted including field blanks, media blanks, reagent blanks, trip blanks, and contingency samples. The frequency of submittal for these field QC samples and other field samples are provided in Tables 5-1 and 8-2.
- Field QC samples of process samples, e.g., spiking material, are not routinely collected unless split or duplicate samples are to be provided to a third party to perform their own independent comparative analysis.
- Field audits/surveillance will be performed periodically to assess conformance to specifications. If nonconforming conditions are noted, the corrective action provisions of the QA plan will be invoked.

10.2.2 Laboratory Activities

Standard laboratory QA procedures, required of each laboratory, provide discussions related to QA/QC checks and controls within the laboratory. Specific data quality objectives, calibration requirements, acceptance criteria, and corrective action requirements for this test program are presented in Table 5-1 and Table 8-3 of this plan.

In addition to the requirements referenced above the laboratory will provide for quality control of sampling media and sample collection equipment. Sorbents used in the organic sampling trains will be prepared according to method specifications. Samples of the prepared media will be tested according to the intended method of use. The results of these tests will be retained in the laboratory's files for future reference.

10.3 PCB SPIKNG MATERIAL ANLAYSES

Actual liquid drained items expected to have very high PCB concentrations will be accumulated and retained for purposes of conducting the MRF DRE testing. Samples of the reserved PCB liquid will be taken prior to the test date and analyzed using EPA Method 1668C. This analytical method will provide speciation of all 209 congeners. This pre-test analysis will identify the total concentration of PCB. This

information can then be used to estimate the PCB liquid feed rate necessary to demonstrate 99.9999% DRE. The DRE will be calculated based on the total PCB feed and total PCB emission rates

Table 9-1 of the QAPP summarizes the expected in-stack detection limit for each of the 209 PCB congeners. Table 3-2 of the MRF test plan includes a DRE analysis using the expected in-stack detection limit. The in-stack PCB detection limit for each congener is based on the expected stack gas sampled volume of four (4) dry standard cubic meters (dscm) and the analytical detection limit for single analysis of the combined Method 23 fractions. To allow for operational and analytical variability, the PCB liquid feed rate will be based on demonstrating between 99.99995% to 99.99999% DRE, a 5X to 10X DRE target window.

Table 3-2 of the MRF test plan provides an example calculation of the potential PCB liquid feed rates necessary to effectively demonstrate 99.9999% DRE. A grab sample of the PCB liquid spike will be collected once during each test run for PCB concentration analysis by Method 1668C as noted in Table 3-1 of the MRF test plan and Tables 6-1 and 10-1 of this QAPP. This analysis method will provide the total PCB content based on full speciation of all 209 congeners. The DRE will be calculated based on the total as-fed PCB liquid sample analysis, PCB liquid feed rate, and total PCB emission rate. One duplicate analysis of the PCB liquid feed is included Table 10-1 of the QAPP to provide a measure of analytical precision.

Table 10-1. A-Line TSCA Compliance Test Program Analyses

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
PCB Content and Speciation	PCB Liquid	3	--	--	--	Serial Dilution	HRGC/HRMS for PCB (EPA Method 1668C)	Duplicate	One per test	1	4
Total Chlorine		3	--	3	--	Bomb or flask combustion (SW-846 Method 5/202050)	Ion chromatography of residue (SW-846 Method 9056A)	Duplicate	One per test	1	7
PCB, DF, & SVOC RCI by EPA Method 23	Method 23 Filter, XAD-2, Acetone & Methylene Chloride Solvent Rinses (First Extraction)	3	1	--	--	Soxhlet Extraction	HRGC/HRMS for PCB and GC/MS Analysis for SVOC RCI	PCB isotope dilution internal standard spike	Every analysis	4	4
								PCB recovery standard spike	Every analysis	4	
								SVOC surrogate spike	Every analysis	4	4
	Method 23 Filter, XAD-2, Toluene Solvent Rinses (Second Extraction)						HRGC/HRMS for DF	DF isotope dilution internal standard spike	Every analysis	4	4
								DF recovery standard spike	Every analysis	4	4

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
PCB & SVOC RCI by EPA Method 23 (cont'd)	Method 23 Impinger Liquid and Rinses	3	1	--	--	Separatory Funnel Extraction	HRGC/HRMS for PCB and GC/MS Analysis for SVOC RCI	PCB isotope dilution internal standard spike	Every analysis	Combine w/ Corresponding FH & BH Extract for Single Analysis	NA
								PCB recovery standard spike	Every analysis		
								SVOC surrogate spikes	Every analysis	Combine w/ Corresponding FH & BH Extract for Single Analysis	NA
	Method 23 Acetone Reagent Blank	--	1	--	--	NA	HRGC/HRMS for PCB & DF, GC/MS Analysis for SVOC RCI	PCB isotope dilution internal standard spike	Every analysis	1	1
								PCB recovery standard spike	Every analysis	1	
								SVOC surrogate spike	Every analysis	1	1
								DF isotope dilution internal standard spike	Every analysis	1	1
								DF recovery standard spike	Every analysis	1	
	Method 23 Methylene Chloride Reagent Blank	--	1	--	--	NA	HRGC/HRMS for PCB & DF, GC/MS Analysis for SVOC RCI	PCB isotope dilution internal standard spike	Every analysis	1	1
								PCB recovery standard spike	Every analysis	1	
								SVOC surrogate spike	Every analysis	1	1

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
PCB, DF, & SVOC RCI by EPA Method 23 (cont'd)	Method 23 Methylene Chloride Reagent Blank	--	1	--	--	NA	HRGC/HRMS for PCB & DF, GC/MS Analysis for SVOC RCI	DF isotope dilution internal standard spike	Every analysis	1	1
								DF recovery standard spike	Every analysis	1	
	Method 23 Toluene Reagent Blank	--	1	--	--	NA	HRGC/HRMS for DF	DF isotope dilution internal standard spike	Every analysis	1	1
								DF recovery standard spike	Every analysis	1	
	Method 23 Spiked XAD-2 Resin Blank	--	--	--	--	Soxhlet Extraction	HRGC/HRMS for PCB, DF, & SVOC RCI	PCB isotope dilution internal standard spike	Every analysis	1	1
								PCB recovery standard spike	Every analysis	1	
								SVOC surrogate spike	Every analysis	1	1
								DF isotope dilution internal standard spike	Every analysis	1	1
								DF recovery standard spike	Every analysis	1	

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
Particulate by Method 5/202	Method 5/202 particulate filter	3	1	--	--	Desiccate to constant mass	Method 5	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 probe and filter holder acetone rinses	3	1	--	--	Evaporate/Desiccate to constant mass	Method 5	Gravimetric (Method 5)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 ambient impinger water and rinses	3	1	--	--	Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 ambient impinger acetone and hexane rinses	3	1	--	--	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 ambient filter	3	1	--	--	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4
	Method 5/202 cold water and rinses	3	1	--	--	Extract/Evaporate/Desiccate to constant mass	Method 202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	4

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
Particulate by Method 5/202 (cont'd)	Method 5/202 filter reagent blank	--	1	--	--	Desiccate to constant mass	Method 5/202	Gravimetric (Method 5/202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 acetone reagent blank	--	1	--	--	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 5/202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 hexane reagent blank	--	1	--	--	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 ambient filter reagent blank	--	1	--	--	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 202)	Replicate weighing to constant weight	Every sample	1
	Method 5/202 water reagent blank	--	1	--	--	Evaporate/Desiccate to constant mass	Method 5/202	Gravimetric (Method 5/202)	Replicate weighing to constant weight	Every sample	1

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
HCl & Cl_2 by Method 26A	Method 26A H_2SO_4 Impingers	--	--	3	--	NA	Ion chromatography (EPA Method 26A)	Duplicate	Every Sample	3	8
								MS/MSD analyzed	One per batch (all samples in one batch)	2	
	Method 26A H_2SO_4 reagent blank	--	--	--	1	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One per test	1	1
	Method 26A NaOH impingers	--	--	3	--	NA	Ion chromatography (EPA Method 26A)	Duplicate	Every Sample	3	8
								MS/MSD analyzed	One per batch (all samples in one batch)	2	
	Method 26A NaOH Reagent Blank	--	--	--	1	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One per test	1	1
	Method 26A Deionized Water Reagent Blank	--	--	--	1	NA	Ion chromatography (EPA Method 26A)	Reagent Blank	One per test	1	1
	Analytical System QC	NA	NA	NA	NA	NA	Ion chromatography (EPA Method 26A)	LCS/LCSD	One per batch following initial calibration (separate calibration for each matrix)	2	2

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
HCl & Cl2 by Method 26A (cont'd)	Analytical System QC	NA	NA	NA	NA	NA	Ion chromatography (EPA Method 26A)	Method Blank	One per batch/ matrix specific - analyzed in duplicate	2	2
Method 0030 VOST for Volatile RCI	VOST stack sample tube pairs	--	--	--	12	NA (Note: Only 3 of the 4 tube pairs from each test run will be analyzed; the fourth pair is a back-up in case of tube breakage.	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D); Each tube in each tube pair is analyzed separately.	Surrogate spikes[c]	Every sample	18	18
	VOST Condensate	--	--	--	3	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D)	Surrogate spikes[c]	Every analysis [c]	3	3
	VOST field blank tube pairs	--	--	--	1	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	1	1
	VOST trip blank tube pairs	--	--	--	1	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	1	1

Table 10-1. A-Line TSCA Compliance Test Program Analyses (cont'd)

Analysis	Sample Matrix	Field Samples				Reference Preparation Method	Reference Analytical Method	QC Analysis	QC Analysis Frequency	QC Analyses	Total Analyses
		Cycle 1		Cycle 2							
		Test	Field QC	Test	Field QC						
Method 0030 VOST for Volatile RCI	VOST Cond. Trip Blanks	--	--	--	1	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D)	Surrogate spikes[c]	Every analysis [c]	1	1
	Spiked resin blank tube pairs	--	--	--	--	NA	Purge and trap, GC/MS (SW-846 Methods 5041A, 8260D); Tube pair is analyzed as a single sample.	Surrogate spikes[c]	Every analysis [c]	2	2
	Analytical system QC	NA	NA	NA	NA	NA	Purge and trap, GC/MS (SW-846 Method 8260D)	LCS	1 per condensate batch	2 or more	2
								Method blank	1 per analytical run	2 or more	2
TOTAL											**123**

11.0 DATA REDUCTION, DATA VALIDATION, AND DATA REPORTING

11.1 DATA REDUCTION

This section of the QAPP describes the approach that will be used to report, review, and reduce the field and laboratory data. The raw data include field samples and sampling documentation, sample tracking documentation, laboratory preparation documentation, and raw analytical data. The analytical results from the laboratory are assembled into complete analytical data packages. The analytical data packages include the analytical results and their defensible backup data. The analytical data are evaluated for compliance with the project DQOs. Data determined to meet the analytical requirements will be used to calculate the unit performance and emissions.

11.2 ORGANIC ANALYSES

Organic analyses will be conducted using gas chromatography (GC) techniques. Although the principles of operation and specific methods of calibration differ according to the analyte specific methods, the general data reduction scheme is the same for all of these tests. The individual methods should be consulted for details. A summary of the data reduction scheme is presented below.

Depending on the specific method, analytical instrumentation is calibrated using 3 to 5 points covering the expected analytical range. The gas chromatograph/flame ionization detector (GC/FID) or gas chromatograph/electron capture detector (GC/ECD) methods generally employ an external standard calibration technique while the GC/MS methods employ an internal standard technique. For GC/FID and GC/ECD methods, a calibration factor (CF) is calculated using the following formula:

$$CF = \frac{R}{M}$$

Where: CF = Calibration Factor

R = Response or Area of the GC Peak

M = Mass Injected (in nanograms)

The calibration factors must agree to within method specified criteria for the percent relative standard deviation (%RSD). The formula for %RSD is given below.

$$\%\,\mathrm{RSD} = \frac{\sigma}{\mathrm{avg\ CF}} \times 100$$

Where: $\%RSD$ = Percent Relative Standard Deviation

σ = Standard Deviation of the Calibration Factors

$avg\ CF$ = Average Calibration Factor

For gas chromatograph/mass spectral (GC/MS) calibrations, a response factor (RF) is used rather than the CF. The formula for the RF is:

$$RF = \frac{(A_s \times C_{is})}{(A_{is} \times C_s)}$$

Where: RF = Response Factor

A_s = Response for the Analyte

A_{is} = Response for the Internal Standard

C_s = Concentration of the Analyte

C_{is} = Concentration of the Internal Standard

The RFs must also pass a test of the %RSD in order for the calibration to be considered valid.

When samples are analyzed, the area of the peak produced by a given analyte is compared to the CF or RF to arrive at an analytical result according to the following formula:

$$M_x = A_x \times CF$$

Where: M_x = The Mass of Analyte in the Sample

A_x = The Response of the Analyte in the Sample

CF = The Calibration (or Response) Factor

Samples containing a concentration of an analyte exceeding the concentration the instrument is calibrated for, will have a serial dilution performed, if such a dilution is practical given the sample preparation method, to bring the concentration within the calibrated range of the instrument. Such dilutions will be documented in the analytical data report and preparation logs. In that case M_x is multiplied by the dilution factor to arrive at the final result. If, under the circumstances of the method, a dilution is not possible (sample is completely consumed in original analysis), the original analytical result must be considered estimated.

To arrive at a concentration in the gas sample the mass of any sub-samples must be added together and then compared to the volume of gas sampled according to the following formula:

$$C_x = \frac{(M_1 + M_2 + ...M_n)}{V}$$

Where: C_x = The Concentration of the Analyte in the Gas Sample

M_n = The Result (Mass) for Each Component in the Sampling Train

V = The Volume of Gas Sampled

11.3 ION CHROMATOGRAPHY

Anions, such as chloride, are separated on the ion chromatograph using a system comprising separator columns, guard columns, and eluents. The system is calibrated using a minimum of 3 points and the calibration is verified with a mid-range standard. Samples are quantitated in the same manner as described above.

11.4 DIRECT READING INSTRUMENTS

Gravimetric, temperature, pressure, flow, and CEMS data are directly read from the measurement instrumentation. The instrumentation will be calibration checked prior to the test, and routinely prior to reading measurements, however, no data reduction beyond formatting into tables is expected

11.5 ANALYTICAL DATA PACKAGES

Analytical data packages will be organized in accordance with the laboratory standard operating procedures. The complete analytical data package is a stand-alone deliverable that includes the final analysis results, raw analytical instrument data, initial and continuing calibration data, parameter-specific quality control documentation, sample preparation documentation, and records of sample traceability. These data are sufficient for performing independent verification of the final analytical results. Every analytical data package includes the following:

- Cover Page—Identifies the laboratory-assigned lot number, project identification, laboratory project manager, and issue date.
- Table of Contents—Organization of the data package.
- Sample Summary—Cross reference to project sample identifications and laboratory sample identifications.
- Analytical/Preparation Methods Summary—Identifies the methods used to prepare and analyze the samples.
- Narrative— Summarizes the project-specific information and any pertinent information concerning data quality. The narrative documents sample delivery and condition upon receipt, and any analytical difficulties or anomalies encountered during sample preparation and analysis.

- QC Data Association Summary—Comparison of sample results to the project and laboratory DOQs and association of project samples to laboratory QC.

- Analytical Data Report—Summarized analytical data for all samples and associated quality assurance samples including as appropriate: data flags, duplicate analysis results, surrogate recovery results, method blank results, laboratory control sample results, and matrix spike/matrix spike duplicate/post digestion spike (MS/MSD/PDS) results.

- Chain-of-custody (COC) documentation

Each analytical data package will include the identification and signature or initials of each analyst who handles the test samples. The Laboratory Project Manager will certify via signature the contents of each analytical data package. Analytical data packages will be transmitted in Acrobat® PDF format. Acrobat® PDF files will be transmitted to A-Line and its testing consultants using Eurofins' secure file transfer protocol (FTP) portal website.

11.5.1 Organic Analyses

The organic analytical data packages will include the following:

- Sample Results
- Raw Sample Data
  - Sample Data
  - Tentatively Identified Compound Data for VOC or SVOC RCl by GC/MS
- • Standards Data
  - Initial Calibration Summary(s) and Raw Data
  - Continuing Calibration Summary(s) and Raw Data
  - Initial Calibration(s) Tuning Raw Data (GC/MS only)
  - Continuing Calibration(s) Tuning Raw Data (GC/MS only)
- Raw QC Data
  - Method Blank Data
  - Tentatively Identified Compound Data for VOC or SVOC RCl by GC/MS
  - MS/MSD Data and Evaluation Reports
  - Laboratory Control Standard Data and Evaluation Reports
- Miscellaneous data
  - Sample Data Review Checklist
  - Calibration Data Review Checklists
  - Run Logs
  - Extraction sheets.
  - Sample Results
- Example Calculations

11.5.2 Non-Metal Inorganic Analyses

The data packages for other inorganic analyses will include the following:

- Sample Results

- QC Summary
  - Method Blank Report
  - Sample Duplicate report
  - MS/MSD Data and Evaluation Report(s)
  - Laboratory Control Sample Data and Evaluation Report
- • Raw Data
  - Data Review Checklist
  - Sample, Standards, and Quality Control Data
  - Distillation, Extraction, and Sample Preparation Sheets
  - Standards Preparation Logs
  - Run Logs

11.6 DATA REPORTING

11.6.1 Project Reporting Format

The outlines for the final test reports are presented in Figures 11-1 and 11-2.

11.6.2 Detection Limit Definitions

The detection limit for each project target analyte will be derived according to the referenced analytical method and the laboratory's standard operating procedures. The laboratory will provide detection limits for each analyte. There are a number of types of detection limits associated non-isotope dilution analytical methods. The U.S. EPA Office of Solid Waste (OSW) in the "Human Health Risk Assessment Protocol" (RA Protocol) published in July 1998 defines the following detection limits:

> *<u>Instrument Detection Limit (IDL)</u>-the smallest signal above background that an instrument can reliably detect, but not quantify. Also, commonly described as a function of the signal-to-noise (S/N) ratio.*

> *<u>Method Detection Limit (MDL)</u>-the minimum concentration of a substance that can be measured (via non-isotope dilution methods) and reported with 99 percent confidence that the analyte concentration is greater than zero, and is determined from analysis of a sample in a specific matrix type containing the analyte. The MDL is considered the lowest level at which a compound can be reliably detected. The MDL is based on statistical analyses of laboratory data. In practice, the MDLs are determined on analytical reagents (e.g., water) and not on the matrix of concern. MDLs for a given method, are laboratory and compound specific. The determine the MDL as specified in 40 CFR Part 136, Appendix A, at least seven replicate samples with a concentration of the compound of interest near the estimated MDL are analyzed. The standard deviation among these analyses is calculated and multiplied by 3.14. The result of the calculation becomes the MDL. The factor of 3.14 is based on a t-test with six degrees of freedom and provides a 99 percent confidence that the analyte can be detected at this concentration.*

Reliable Detection Limit (RDL)-the detection level recommended by the National Environmental Research Laboratory in Cincinnati, Ohio. The RDL is defined as 2.63 times the MDL. The RDL is a total of eight (8) standard deviations above the MDL development test data (3.14 times 2.63).

Reporting Limit (RL)-the laboratory determined detection, normally the lowest calibration standard.

The risk assessment protocol recommends that non-isotope dilution methods quantify non-detects using the method MDL and the derived RDL.

Component 2 of the EPA Region 6 Hazardous Waste Combustion Unit Permitting Manual uses the term sample quantitation limit (SQL). The SQL is the matrix-specific MDL. The SQL may be equal to the laboratory-specific MDL or some factor greater than (e.g., 5X-10X) the laboratory-specific MDL that takes into consideration matrix specific interferences or sample serial dilutions.

Isotope dilution methods quantify non-detects using estimated detection limits (EDLs) as defined in SW-846 Method 8290A. The EDL is defined as follows:

EDL (from SW-846 Method 8290A) -*"The sample specific estimated concentration of a given analyte required to produce a signal with a peak height of 2.5 times the background signal level."*

The laboratory will provide the MDL or SQL for each non-isotope dilution analyte on the analytical certificate. The laboratory will maintain documentation and validation for the reported MDL. If matrix interference(s) occurs or serial dilutions are necessary, the sample specific MDL (SQL) will be reported. If a sample specific MDL (SQL) is applicable, the analytical data package shall include the documentation of the serial dilutions or other measures taken to determine the detection limit. EDLs are sample-specific and analyte-specific, and will be provided on the analytical certificate for each sample and each analyte.

11.6.3 Detection Limits and Data Reduction

Analytical results for all analyses that are reported as "not-detect" in compliance demonstration samples will be handled in the following manner. The analytical result will be reported as "non-detect" and the appropriate detection limit as discussed above will be shown. In subsequent calculations, the following rules will apply for data reporting and performance demonstrations:

- For analyses of single component samples (e.g., feed or residue samples) that are reported as non-detect, the values will be accompanied by a "less than" ("<") and/or a data flag that denotes a non-detect result was obtained. .

- For analyses of single component samples (e.g., feed or residue samples) that are reported as non-detect, any subsequent calculations using detection limit values will be accompanied by a "less than" ("<") sign.
- For analyses of multi-component samples (e.g., VOST), where multiple analytical results must be combined or summed for use in subsequent calculations and the calculations involve the use of one or more non-detect values in combination with one or more detectable values, the final calculated values shall also include "<".
- For analyses of multi-component samples where all of the multiple analytical results are non-detect values, the final calculated values shall include a data flag such as "ND" or "U" with the "<" to indicate that the target analyte was non-detect in all of the relevant sample fractions.
- Where destruction and removal efficiency (DRE), system removal efficiency (SRE), or similar performance measurements are calculated using emissions rates reported with "<" or non-detect flagged values, the resulting performance measurement will be accompanied by a "greater than" (">") sign.

In accordance with 40 CFR 63.1208(b)(1)(iii), by operating the Method 23 sampling train a minimum of 180 minute (3 hours) to sample a minimum of 2.5 dry standard cubic meters of stack gas during each sampling run, any dioxin/furan congener that is non-detect is allowed to be counted as zero in determining compliance. For this test program, a sampling time of 240 minutes is planned to a sample volume of 4.0 dry standard cubic meters is targeted. For the analyses of the Method 23 samples, if a fraction is non-detect for a specific dioxin/furan congener, the specific congener's EDL will be reported. For calculating total dioxin/furan emissions, the EDL value will be used for non-detect results. In calculating 2,3,7,8-tetrachlorinated dibenzo-p-dioxin (TCDD) toxicity equivalent (TEQ) emissions, any 2,3,7,8-chlorinated dioxin/furan congener that is non-detect will be counted as zero.

For calculating PCB emissions, the MDL value will be used for non-detect results.

For calculating VOC and SVOC RCl, HCl, and Cl_2 emissions, the MDL value will be used for non-detect results.

For calculating particulate matter emissions, 0.5 mg will be used for non-detect results.

11.6.4 Other Quality Control Data Reporting

The following quality assurance measures will be discussed in the analytical data validation report prepared by the Quality Assurance Officer:

- Sample holding times
- Sample surrogate recovery results
- Duplicate results
- MS/MSD results
- Blank train results
- Reagent blank results (if analyzed)
- Trip and field blank results
- RPD and RSD evaluations of accuracy or precision

These data will be evaluated against the target DQOs. Any data that fall outside of the DQO limits will be flagged, footnoted, and assessed relative to the performance and emissions testing objectives. The data from the field blanks and trip blanks will be used to assess possible contamination from field handling and transport of the samples to the laboratory. The reagent blank and blank train results will be used to assess contamination resulting from reagents used, sample handling, and sample recovery procedures. Any blank results that may have impacted performance and emissions testing results or evaluations will be flagged, footnoted, and discussed in the test report and analytical data validation report.

11.6.5 Final Case Files

At a minimum, the following documents will be retained as part of the facility operating upon the completion of the project. These files will be maintained at the A-Line facility for a period of at least five (5) years or until the next compliance test is completed, whichever occurs later:

- All legal documents and orders,
- All field documents including those used for preliminary field activities,
- Copies of all analytical data,
- Copies of the final report and background documents, and
- All correspondence relating to the project as well as corrective action requests.

The test report will be maintained on-site in hard copy form and electronically (Acrobat® PDF format on computer hard drive and/or flash drive). Supporting documentation (test report appendices such as the stack sampling report, PCB spiking report, analytical data packages, etc.) will be maintained on-site electronically (PDF format on computer hard drive and/or flash drive). Final versions of the test report and supporting documentation (stack sampling report, PCB spiking report, analytical data packages, etc.) will be maintained electronically by A-Line in a files system that is not connected to the internet. Files maintained there can only be accessed by A-Line personnel.

Figure 11-1. Example MRF Test Report Outline

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12.0 ROUTINE MAINTENANCE PROCEDURES AND SCHEDULES

12.1 SAMPLING EQUIPMENT

All equipment used in emission testing measuring systems must be maintained in good operating order. To achieve this objective, a routine preventive maintenance program is necessary. Procedures used in this program follow those outlined in Maintenance Calibration and Operation of Isokinetic Source Sampling Equipment, Publication No. APTD-05-76 and Volume III of the Quality Assurance Handbook for Air Pollution Measurement Systems.

The potential impact of equipment malfunction on data completeness is minimized through two complementary approaches. First, an equipment maintenance program is part of routine operations. The maintenance program's strengths include:

- Trained technicians experienced in the details of equipment maintenance and fabrication,
- Adequate spare parts inventory, and
- The availability of tools and specialized equipment.

The second approach is based upon equipment redundancy. Backup equipment, spare parts and tools are included on the materials transported to the field for each sampling task. This approach allows the sampling team to respond to equipment breakage or malfunction in a timely fashion, minimizing the quantity of lost data.

For field equipment, preventive maintenance schedules are based on the results of routine inspections and on accumulated experience. At a minimum, equipment will be inspected prior to the beginning of and at the conclusion of each test. A record of each inspection (Figure 12-1) will be kept as part of the final case file. Maintenance schedules for continuous emissions monitors follow manufacturer's recommendations.

Each item of field test equipment is assigned a unique, permanent identification number. An effective preventive maintenance program is necessary to ensure data quality. Each item of equipment returning from the field is inspected before it is returned to storage. During the course of these inspections, items are cleaned, repaired, reconditioned and recalibrated where necessary. Each item of equipment transported to the field for this test program is inspected again before being packed to detect equipment problems that may originate during periods of storage. This minimizes lost time on the job site due to equipment failure. Occasional equipment failure in the field is unavoidable despite the most rigorous inspection and maintenance procedures. For this reason, adequate spare parts are kept in a central location so the sampling contractor can quickly respond to the job site with replacement equipment for all critical sampling train components.

12.2 LABORATORY INSTRUMENTS

The laboratories perform regular maintenance on all analytical instruments. An inventory of replacement parts is kept to prevent downtime. Manufacturers' service representatives are also contracted, as required, for major instrument repairs.

Preventive and routine maintenance is covered in each of the laboratories' QA Manuals and SOPs or in accordance with manufacturer's recommendations (i.e., instrument manuals). Daily maintenance (such as replacement of injector septa, etc.) is covered in instrument SOPs. Inoperative equipment is tagged as non-usable until repairs are performed. Logbooks are maintained for each instrument to record usage, maintenance, and repairs.

12.3 PROCESS INSTRUMENTS

On-site personnel perform regular maintenance on all process instrumentation. Routine and preventive maintenance programs are used. Where appropriate, manufacturers' recommendations for maintenance of process instruments are followed. Operators conduct daily reviews of process instrumentation by noting suspicious or inconsistent readings. Maintenance logs are used to record the frequency and type of repairs necessary for process instruments. Process instruments used to demonstrate compliance with operating limits will be calibrated prior to the test. Records of these calibrations will be included in the final test report.

Equipment Inspection Record

A-Line T.D.S., Inc., Tonkawa, OK

Date/Time of inspection: _____

Equipment Inspected:

1) _____

Condition: Good See Problems Section Below

2) _____

Condition: Good See Problems Section Below

3) _____

Condition: Good See Problems Section Below

4) _____

Condition: Good See Problems Section Below

5) _____

Condition: Good See Problems Section Below

Problems Noted:

_____

_____

_____

_____

Action Taken

_____

_____

_____

Inspector's Signature_____

Figure 12-1. Example Equipment Inspection Record Form

13.0 ASSESSMENT PROCEDURES FOR ACCURACY, PRECISION, & COMPLETENESS

The QA activities implemented in this study will provide a basis for assessing the accuracy and precision of the analytical measurements. Section 5.0 discusses the QA activities that will generate the accuracy and precision data for each sample type. The generalized forms of the equations that will be used to calculate accuracy and precision are presented below.

13.1 ACCURACY

When a reference standard material is used in the analysis, percent Accuracy (A) will be calculated as follows:

$$A = \frac{\text{Found concentration}}{\text{True concentration}} \times 100$$

Percent analyte Recovery (R) will be calculated as follows:

$$R = \frac{X - N}{S} \times 100$$

Where X is the experimentally determined value, N is the amount of native material in the sample, and S is the amount of spiked material of the species being measured. Recoveries are used to determine accuracy when standards are not available, or are not appropriate for a given matrix.

13.2 PRECISION

When less than three analyses of the same parameter are available, precision will be calculated as a Relative Percent Difference (RPD) from the average of replicate measurements according to:

$$\text{RPD} = \frac{(X_1 - X_2)}{\text{Average } X} \times 100$$

Where X_1 and X_2 are the highest and lowest results of replicate measurements.

Where three or more analyses of the same parameter are available, the precision will be determined as the Relative Standard Deviation (RSD) according to:

$$\text{RSD} = \frac{\text{Standard deviation}}{\text{Average X}} \times 100$$

13.3 COMPLETENESS

Completeness of data generated from a test program is usually calculated as follows:

$$\%\,\text{Completeness} = \frac{\text{Valid data}}{\text{Expected data}} \times 100$$

Data completeness is defined in Section 5.0 of this QAPP as the percentage of valid data collected from the total number of valid tests conducted. Three valid test runs, at each test condition, are required for the test to be completed. If an individual sample from a test run is lost or broken, the data for that individual analytical parameter may not be 100% complete. This, however, may not invalidate the test run. The completeness objective for this test program is to generate sufficient data for the regulatory agencies to judge the performance of the system.

14.0 AUDIT PROCEDURES, CORRECTIVE ACTION, AND QA REPORTING

14.1 PERFORMANCE AND SYSTEM AUDITS

This section presents information related to the procedures used by the QA staff to assess conformance of the project staff to the specifications contained in the relevant project controlling documents. Further, auditing may be employed to assess the ability of subcontractors to successfully perform the work.

14.1.1 Field Surveillance

The Test Coordinator assigned to the project will actively evaluate the operations at the site during testing to ensure that work is being performed in accordance with the various project controlling documents and associated standard operating procedures. Checklists appropriate to the activities may be used. The field surveillance will cover, but is not necessarily be limited to, such areas as:

- Conformance to SOPs
- Completeness and accuracy of documentation
- Chain of custody procedures
- Compliance with Health and Safety requirements.

The Test Coordinator will be present on-site for the testing. The Test Coordinator is there to observe and provide overall direction of testing and sampling activities. Review includes unit operations, sampling train preparation, process and emissions sampling activities, process and emissions sample recovery, and recovered sample management.

14.1.2 Performance Evaluations (Analytical Audits)

At the time of this test plan publication, EPA's Stationary Source Audit Sample Program (SSASP) is suspended. From EPA's website:

https://www.epa.gov/emc/emc-technical-support#audit

"*List of Accredited Audit Sample Providers and Audit Samples*

The general provisions to 40 CFR Parts 60 and 63 (see §60.8(g)(1) and §63.7(c)(2)(iii)(A)) require that the owner or operator obtain audit samples if the audit samples are "commercially available" and have defined "commercially available" as two or more independent accredited audit sample providers (AASP) to have blind audit samples available for purchase. Since there are no longer two providers, the requirement to obtain these audit samples is no longer in effect until such time as another independent AASP has audit samples available for purchase.

When there are two or more AASP with audit samples available for purchase, we will update this webpage with the name or names of the providers and audit sample(s)

available for purchase. At that time, this information must be listed on the EMC website for 60 days before audits are required again."

14.1.3 Laboratory Audits

The selected laboratory is audited and accredited annually under the National Environmental Laboratory Accreditation Program (NELAP). Refer to QAPP Attachment C. However, A-Line or its appointed representative may choose to audit the laboratory at any time during the course of this test project to assess the laboratory's ability to successfully perform the work and to ensure mutual agreement between A-Line and the laboratory with regard to the scope of work, QA/QC requirements, and deliverable requirements. Reasonable notice will be provided prior to any on-site inspection of the laboratory.

14.2 CORRECTIVE ACTION

The following procedures have been established to ensure that nonconforming conditions, such as malfunctions, deficiencies, deviations, and errors are promptly investigated, documented, evaluated and corrected. Every person employed in the test program is expected to function as a QC inspector to ensure the quality of the final product. Quality, as it relates to this project, is defined as "performing the work according to the agreed upon specifications contained in the Test Plan and relevant SOPs or causing the specification to be changed *in a controlled manner*." Each individual is encouraged to identify any condition adverse to the successful completion of the work or any modification to the specifications that might result in a better end product. These improvements might be framed in terms of higher quality, greater safety, greater efficiency, and/or lower cost.

14.2.1 Field

When a nonconforming condition or an opportunity for improvement is noted at the site or contractor location, the corrective action provisions of this plan will be invoked to identify the condition and recommend corrective action. Condition identification, cause, reference documents and the corrective action planned to be taken will be documented.

“Non-conformances” are identified on a case-by-case basis. Field corrections and adjustments will be made as necessary. Such field corrections or adjustment will be communicated and documented in the test report quality assurance discussion as they may impact compliance determinations or data acceptance. The laboratory report narrative will similarly address any minor variances, e.g., surrogate results outside of DQOs limits due to matrix interference. A formal “non-conformance” report will only be generated and communicated for significant changes or deviations from the test plan or QAPP that could impact compliance determinations or data acceptance.

A Corrective Action Request (CAR), as shown in Figure 14-1, should be used to identify the adverse condition or opportunity for improvement, reference document(s) and recommended corrective action(s). The CAR is directed to the Test Coordinator. The Test Coordinator affixes his signature and the date to

the corrective action block that states the cause of the condition(s) and corrective action(s) to be taken. The Test Coordinator is responsible for first notifying the regulatory agency representative of any problems or deviations from the QAPP, or the test plan identified in the CAR.

14.2.2 Laboratory

The laboratories' QA Manuals and the related SOPs, contain detailed discussions of corrective actions to be taken if established criteria fail during laboratory analysis. The laboratory has the responsibility to immediately notify the Test Coordinator when any analytical QC nonconformance occurs, so a mutually acceptable course of action can be pursued.

14.3 QA REPORT

The Test Coordinator will include in the final test report that addresses the following:

- Overview of activities and significant events related to QA/QC
- Summary of any audit results
- Review of corrective action request status
- Laboratory QA/QC reports
- Data validation results
- Summary of significant changes in procedures or QA/QC programs
- Recommendations.

The Test Coordinator will include the information in the final test report. Additionally, the QAO's analytical data validation report is included with the final test report. The analytical data validation report compares the data to the data quality objectives (DQO) delineated in the QAPP and includes assessment of the data usability. The Test Coordinator can provide formal written reports daily during testing to A-Line and any regulatory officials present.

Corrective Action Request

Number:
Date:
File Name:
Client: A-Line T.D.S., Inc., Tonkawa, OK

REQUEST

To:

You are hereby requested to take corrective actions indicated below and as otherwise determined by you (A) to resolve the noted condition and (B) to prevent it from recurring. Your written response is to be returned to the project Test Coordinator or other responsible manager by.

Condition:

Reference Documents:

Recommended Corrective Actions:

_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date

RESPONSE

Cause of Condition:

Resolution:

Prevention:

Affected Documents:

Test Coordinator	Date
Responsible Party	Date
Test Coordinator Follow-up	Date

Figure 14-1. Example Corrective Action Request Form

QAPP ATTACHMENT A

STACK SAMPLING TRAIN SPECIFICATION SHEETS AND FLOW CHARTS

METHOD 23

Specification Sheet for EPA Method 23

Source Location:	MRF Stack
Pollutant(s) to be Determined:	Polychlorinated Biphenyls (PCB), Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans (PCDD/PCDF), and Semivolatile Organic Compound (SVOC) Chlorinated Organics (RCI)
Other Parameters to be Determined from Train Data:	Dry Gas Sampled Volume, Gas Temperature, Density, Moisture, and Flow Rate

Parameter	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Sampling Time per Run	N/A	240 minutes
No. of Sample Traverse Points	N/A	24
Sample Time per Point	N/A	10 minutes
Sampling Rate	N/A	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Nickel, Quartz, Stainless Steel or	Hastelloy
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass	Titanium
Effective Probe Length	N/A	5 feet
Probe Temperature Set-Point	248˚F±25˚F	248˚F±25˚F
Train Setup		
Filter	Filter	Filter
Condenser	Condenser	Condenser
XAD-2 Module	XAD-2 Module	XAD-2 Module
Empty Knockout Impinger	Empty Knockout Impinger	Empty Knockout Impinger
Two DI Water Iimpingers	Two DI Water Iimpingers	Two DI Water Iimpingers
Empty impinger	Empty impinger	Empty impinger
Silica Gel Impinger	Silica Gel Impinger	Silica Gel Impinger
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.84
Pitot Tube Calibration by	Geometric or Wind Tunnel	Geometric
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4˚F	1.0˚F
∆P Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
∆H Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury or Aneroid

Specification Sheet for EPA Method 23

Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate Glass	Borosilicate Glass
Filter Support Material	Glass Frit	Glass Frit
Cyclone Material	N/A	None
Filter Heater Set-Point	248˚F±25˚F	248˚F±25˚F
Filter Material	Glass Fiber	Glass Fiber - Methylene Chloride Extracted

Other Components		
Adsorbent Module	XAD-2 Trap	XAD-II Adsorbent Trap
Location	Before 1st Impinger	After filter and condenser
Operating Temperature	< 68˚F	<68˚F

Impinger Train Description		
Type of Glassware Connections	Ground Glass or Equivalent	Ground Glass with Silicone O-Ring
Connection to Probe or Filter by	Direct Glass Connection	Flexible Teflon Line
Number of Impingers	Five (5)	Five (5)
Impinger Stem Types		
Impinger 1	Modified Greenburg-Smith	Shortened Stem (open tip)
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Greenburg-Smith	Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 5	Modified Greenburg-Smith	Modified Greenburg-Smith

Gas Density Determination		
Sample Collection	Multi-point integrated	Multi-Point Integrated
Sample Collection Medium	Flexible Gas Bag	Vinyl or Tedlar Bag
Sample Analysis	Orsat or Fyrite Analyzer	CEM Analyzer

Sample Recovery Equipment and Reagents		
Probe Brush Material	Inert Bristle (e.g., Nylon, Teflon)	Teflon Mat
Solvent Reagents	Acetone/Toluene	Acetone/Methylene Chloride/Toluene
Solvent Rinse Wash Bottle Material	Glass or Teflon	Amber Glass
Filter Storage Container	Amber Glass Jar/Glass Petri Dish	Glass Petri Dish
Probe Rinse Storage Containers	Glass	Amber Glass
Impinger Water Container	Glass	Amber Glass

Specification Sheet for EPA Method 23

Sample Recovery

Recovered Samplng Train Fractions	1. Filter in Petri Dish (Container 1)	1. Filter in Petri Dish (Container 1)
	2. XAD-2 Resin Module	2. XAD-2 Resin Module
	3. Acetone and Toluene Probe, Filter Holder, Condenser, and Connecting Glassware Rinses Combined (Container 2)	3. Acetone and and Methylene Chloride Probe, Filter Holder, Condenser, and Connecting Glassware Rinses Combined
		4. Toluene Probe, Filter Holder, Condenser, and Connecting Glassware Rinses (Container 2B)
	4. Impinger Water, and Acetone and Toluene Solvent Rinses of Impingers (Container 3)	5. Impinger Water and Deionized Water Rinses (Container 3A)
		6. Acetone and Methylene Chloride Solvent Rinses of Impingers (Container 3B)
		7. Toluene Rinses of Impingers (Container 3C)
	5. Silica Gel Impinger	8. Weigh for Moisture Gain
		See Method 23 Sampling Train Recovery Flow Chart in QAPP

Analytical Information

Method 4 Moisture Determination	Gravimetric	Gravimetric
Sampling Train Component Preparation	See Method 23 Analytical Preparation Flow Chart in QAPP	See Method 23 Analytical Preparation Flow Chart in QAPP

Sample Name: Stack Gas Method 23 Sampling Train
PCDDs/PCDFs, PCBs, and SVOCs including PICs and R-Cls

Sampler: Stack sampling engineer

Locations: Exhaust stack sampling platform

Equipment: Method 23 sampling train as shown in Figure 1 of this table; clean and inspected glass fiber particulate filters sealed in petri dishes; prepared XAD-2 resin traps; amber glass sample bottles with Teflon-lined lids; cleaned aluminum foil; scale balance; glass graduated cylinder, as

- Method 23 Sampling Train (see Figure 1)
- Organic-free DI water (note that HPLC grade water is not an appropriate grade for use in this sampling train)
- Aluminum foil
- 500 mL amber Boston Round Bottle - acetone and methylene chloride rinses of the probe, nozzle, and front-half of the filter holder, combined with the acetone and methylene chloride rinses of the back-half of the filter holder behind the particulate filter, the coil condenser and connecting glassware
- 250 mL amber Boston Round Bottle – toluene rinses of the probe, nozzle, and front-half of the filter holder, combined with the toluene rinses of the back-half of the filter holder behind the particulate filter, the coil condenser and connecting glassware
- Glass Petri Dish - particulate filter sample
- XAD-2 Resin Tube
- 1 Liter Boston Round Bottle – condensate catch and impinger contents of impingers #1, #2, #3 and #4 with the D.I. Water rinses of the impingers and all connecting glassware (Note: A 1 gallon Wheaton jug may be necessary for this sample when high moisture volumes of condensate are expected.)
- 250 mL amber Boston Round bottle - acetone and methylene chloride rinses of the impingers and connecting glassware
- New Teflon squirt bottles for acetone, methylene chloride, and toluene rinses
- Graduated cylinder
- Digital weight scale
- Safety glasses or face shield
- Powder free Silver Shield, Nitrile or Latex gloves for handling Method 0010 sampling train equipment and samples
- Other site-specific safety equipment, as required

Frequency: Minimum of 180 minutes to sample a minimum of 2.5 dry standard cubic meters (dscm) of stack gas during each sampling run. Three (3) runs typically constitute a Test.

Procedure Summary: Stack gases are sampled iso-kinetically to collect Polychlorinated Dibenzo-p-Dioxins/Polychlorinated Dibenzofurans (PCDDs/PCDFs), Polychlorinated Biphenyls (PCBs), and semi-volatile organic compounds (SVOCs) on particulate filter media, on XAD-2 adsorbent resin media and in an aqueous fraction. The train components are recovered from the sampling train at the test site and shipped to an analytical laboratory for analysis.

In the laboratory, sample fractions are extracted and concentrated. The sample extracts are split and combined proportionally for PCDD/PCDF analysis, a second portion for PCB analysis, and a third portion for the SVOC analysis. The mass concentrations of PCDD/PCDF and PCB are determined using high resolution gas chromatograph/high resolution mass spectrometry (HRGC/HRMS) instrumentation. The mass concentrations of SVOCs are determined using standard resolution gas chromatograph/mass spectrometry (GC/MS) instrumentation.

The Method 23 sampling train includes a glass nozzle and probe. The probe is equipped with a heated borosilicate or quartz glass probe liner, and a heated borosilicate glass filter holder with a PTFE (Teflon®) or PTFE-coated wire filter support (frit). Behind the filter holder is a water-cooled coil condenser and chilled adsorbent resin trap, a condensate knockout impinger, two water impingers, a second empty impinger, and a silica gel impinger. A water pump is provided to circulate ice water through the coil condenser and the water jacket of the XAD-2 resin trap. (Note: The size and number of impingers can vary based on the expected moisture content of the sampled gas and/or impinger box space.) The impingers are placed in an ice bath. An airtight gas pump, dry gas flow meter, and flow rate meter complete the train components

The train construction, reagents, and cleaning solutions are prepared according to the procedures specified in the EPA methods referenced below. The pretest preparations include soaking the train glassware in hot (50°C) soapy (Alconox or equivalent) water, rinsing (3) three times each with hot water, and distilled/deionized water, and then drying in an oven for 2 hours at 400 °C. After cooling, the glassware is rinsed three (3) times each with pesticide grade methylene chloride ($MeCl_2$) and pesticide grade toluene. When the glassware is dry, all openings are covered with cleaned aluminum foil or clean glass plugs until sample train assembly takes place at the test site.

The particulate filters and the XAD-2 adsorbent resin tubes are prepared according to the Method 23 procedures summarized as follows:

- The filters are cleaned using toluene and dried in a stream of clean nitrogen. The cleaned filters are stored in a glass petri dish sealed with Teflon® tape.
- XAD-2 resin is cleaned by HPLC water rinses followed by Soxhlet extractions with HPLC water, methanol, and methylene chloride then dried using a flow of inert gas. An extract from a portion of the prepared XAD-2 resin is analyzed to confirm that the resin is free from significant background contamination. As an alternative to in-house resin cleaning, resin that is certified clean by laboratory analysis prior to use may be purchased from Supelco®, or other commercial laboratory suppliers.
- The glass adsorbent trap is loaded with approximately 35-40 grams of the XAD-2 resin and the open end of the trap is packed with clean glass wool. The adsorbent traps are spiked with isotopically-labeled sampling surrogates for monitoring PCDDs/PCDFs, PCBs and SVOCs. The ends of the adsorbent trap are capped, and the traps are wrapped in aluminum foil, sealed in a plastic bag, and stored in an insulated cold chest.

At the test site the sampling train is assembled in a clean area and the train components are handled in a manner that minimizes the potential for contamination from air or direct contact. The train glassware may be rinsed with acetone and/or methylene chloride before

assembly. A particulate filter is placed in the filter holder. Before each sampling run, the XAD-2 adsorbent trap weight is measured and recorded to the nearest 0.5 gram before installing in the train. The trap is wrapped with aluminum foil to protect from light and installed in the train. Impingers 1 and 4 are initially empty at the start of a run, impingers 2 and 3 each contain 100 ml of distilled deionized water, and impinger 5 contains 200 to 300 grams of indicating silica gel. All impingers are weighed separately to nearest 0.5 gram and installed in the sample train. No sealant grease is used in assembling the train.

The sampling point locations within the stack are determined in accordance with EPA Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish a stack gas velocity profile, stack temperature and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An analyzer is typically used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3A procedures. The stack gas moisture content is determined according to Method 4. Pretest and post-test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording are performed according to EPA Method 5 procedures.

The stack gas sampling is conducted following the procedures given in Method 23. The sample probe exit and filter assembly temperatures are maintained at 248°F ± 25°F, and the gas sample entering the adsorbent module is maintained to be less than 68°F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%.

After sampling, the probe is removed from the stack and a post-test leak check is conducted on the sampling train. The probe nozzle exterior is wiped off to remove particulate matter and covered with aluminum foil. After cooling, the probe's exterior is wiped down to remove external particulate matter, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized as follows:

- Particulate Filter - The filter is removed from the holder and frit using tweezers and placed back into the original Petri dish (Container 1). Any visible or loose particulate is brushed into the Petri dish with the filter. The container is sealed with Teflon® tape and then placed sealed in a plastic baggie and chilled on ice or by refrigeration.
- XAD-2 Adsorbent Resin Trap - The XAD-2 adsorbent resin trap is removed from the train and both ends are sealed with Teflon tape. Any residual recirculated cooling water is drained from the condenser side of the trap. The aluminum foil is removed and the XAD-2 adsorbent resin trap is then weighed to the nearest 0.5 gram and the weight recorded. The trap is then labeled, re-wrapped in aluminum foil to protect from light, sealed in a plastic baggie, and chilled on ice or by refrigeration.
- Front-Half and Back-Half Acetone Rinses - The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or connecting glassware are brushed and rinsed three (3) times with acetone. The acetone rinses are placed into a glass sample bottle (Container 2A). The back half of the filter holder, the filter support, transfer line (if used) and coil condenser are rinsed three (3) times with acetone. The acetone rinses are all combined in Container 2A.

- Front-Half and Back-Half Methylene Chloride Rinses - The front half and back half acetone chloride rinse procedure described above is repeated a second time using methylene chloride as the solvent. The methylene chloride rinse portions are all collected in the same glass sample bottle as the acetone rinses (Container 2A).

- Front-Half and Back-Half Toluene Rinses - The front half and back half acetone chloride and methylene chloride rinse procedure described above is repeated a third time using toluene as the solvent. The toluene rinse portions are collected in a separate glass sample bottle from the acetone and methylene chloride rinses (Container 2B). [Note: The toluene rinses are recovered separately to allow the performing laboratory to extract samples in the correct order, and to prevent toluene solvent interference from occurring during the SVOC analysis.]

- Condensate and Impinger Content - The contents of the knockout impinger and impingers 2, 3, and 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and observed for the presence or absence of film or color. Observations of film or color are recorded on the sample recovery sheet. The contents of the impingers are collected in a separate container (Container 3A).

- Impinger Deionized Water Rinses - The knockout impinger, impingers 2, 3, and 4 and connecting glassware are rinsed three (3) times with deionized water. The waters rinses are all collected in the same glass sample bottle as the impinger water (Container 3A).

- Impinger Acetone Rinses - The knockout impinger, impingers 2, 3, and 4 and connecting glassware are rinsed three (3) times with acetone. The acetone rinses are collected in separate glass sample bottle (Container 3B). [Note: Method 23 as revised March 2023 has the acetone rinses combined with the impinger water contents. The performing laboratory prefers the acetone rinses to be recovered in a separate container and not added to the impinger water.]

- Impinger Methylene Chloride Rinses - The acetone rinse procedure described above for the knockout impinger and impingers 2, 3 and 4 is repeated a second time using methylene chloride as the solvent. The methylene chloride rinses are collected in the same glass sample bottle as the acetone impinger rinses (Container 3B).

- Impinger Toluene Rinses - The acetone and methylene chloride rinse procedure described above is repeated a third time using toluene as the solvent. The toluene rinses are collected in a separate glass sample bottle (Container 3C) from the acetone and methylene chloride rinses. [Note: Method 23 as revised March 2023 contains instructions to place the toluene rinses in with the impinger water content. The performing laboratory prefers the toluene rinses to be recovered in a separate container for the reasons previously noted above and not added to the impinger water.]

- Silica Gel - The silica gel contents of impinger 5 are weighed to the nearest 0.5 g. The color and state of consumption of the silica gel is noted. Replace with fresh gel if more than 50% utilized.

A schematic diagram of the Method 23 Sampling Train recovery and cleanup procedures is provided as Figure 2.

Field Train Proof Blank samples are collected once during the field test program. A complete sampling train setup, including particulate filter and resin trap is assembled from glassware derived from the same preparation batch as the field samples will use. The field train proof blank will be constructed from glassware prepared for the test campaign but not yet used to collect field samples. The train is taken to the sampling area or platform, brought up to operating temperature, leak checked, and allowed to remain at that location for the duration of one sampling run. Upon completion of the final leak check, the Field Proof Blank Train samples are recovered from the train in the same location, and by the same person performing the setup and breakdown of the sampling trains for the actual sampling runs.

Reagent Blanks are collected for each solvent, media, and deionized water source as those used for the testing campaign. Reagent blanks will be collected from the acetone, methylene chloride, and toluene wash bottles used in recovering the sampling train components. A particulate filter and an XAD-2 resin trap will also be collected as reagent blanks. (Note: The reagent blanks may be archived at the laboratory and activated for analysis in the event that laboratory data indicate that a potential contamination problem has occurred.)

Sample Labeling and Storage Prior to and for Shipment to the Laboratory
Sample containers will be assigned unique numbers and labeled with the date and test run identification. The samples are inventoried as they are collected and again just prior to shipment from the test site to the laboratory. For on-site storage and shipment to the laboratory, samples will be packaged in insulated coolers. Prior to shipment, samples will be stored in a holding area separate from sources of contamination. Samples will be chilled using water ice prior to and during shipment to the laboratory. Completed request for analysis and chain of custody (RFA/COC) forms will accompany samples from the test site to the laboratory.

Sample Holding Times and Preservation
The extraction holding time for samples receiving the combination of PCDD/PCDF analysis, PCB analysis, and semi-volatile compound analysis is fourteen (14) days from the date of sample collection. The more restrictive 14-day holding times will be observed for all Method 23 sample fractions due to semi-volatile holding time requirements. The holding times for semi-volatile and PCB extracts from the time of extraction to the time of analysis is 40 days. The holding time for dioxin and furan extracts from the time of extraction to the time of analysis is 45 days.

The storage temperature of all samples from collection to delivery to the laboratory is ≤6ºC. Samples are to be protected from ultra-violet light.

References:

"Method 23 - Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans, Polychlorinated Biphenyls, and Polycyclic Aromatic Hydrocarbons from Stationary Sources", Appendix A, 40 CFR 60, March 20, 2023.

SW-846 Method 0023A, "Sampling Method for Polychlorinated Dibenzo-p-Dioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Emissions from Stationary Sources", Test Methods for Evaluating Solid Waste, SW-846, December 1996.

SW-846 Method 0010, "Modified Method 5 Sampling Train," September 1986

“Method 1 - Sample and Velocity Traverses for Stationary Sources”

“Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)”

“Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)”

“Method 4 – Determination of Moisture Content in Stack Gases”

“Method 5 – Determination of Particulate Emissions from Stationary Sources”

Source for Methods 1, 2, 3A, 4, 5 and 23: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

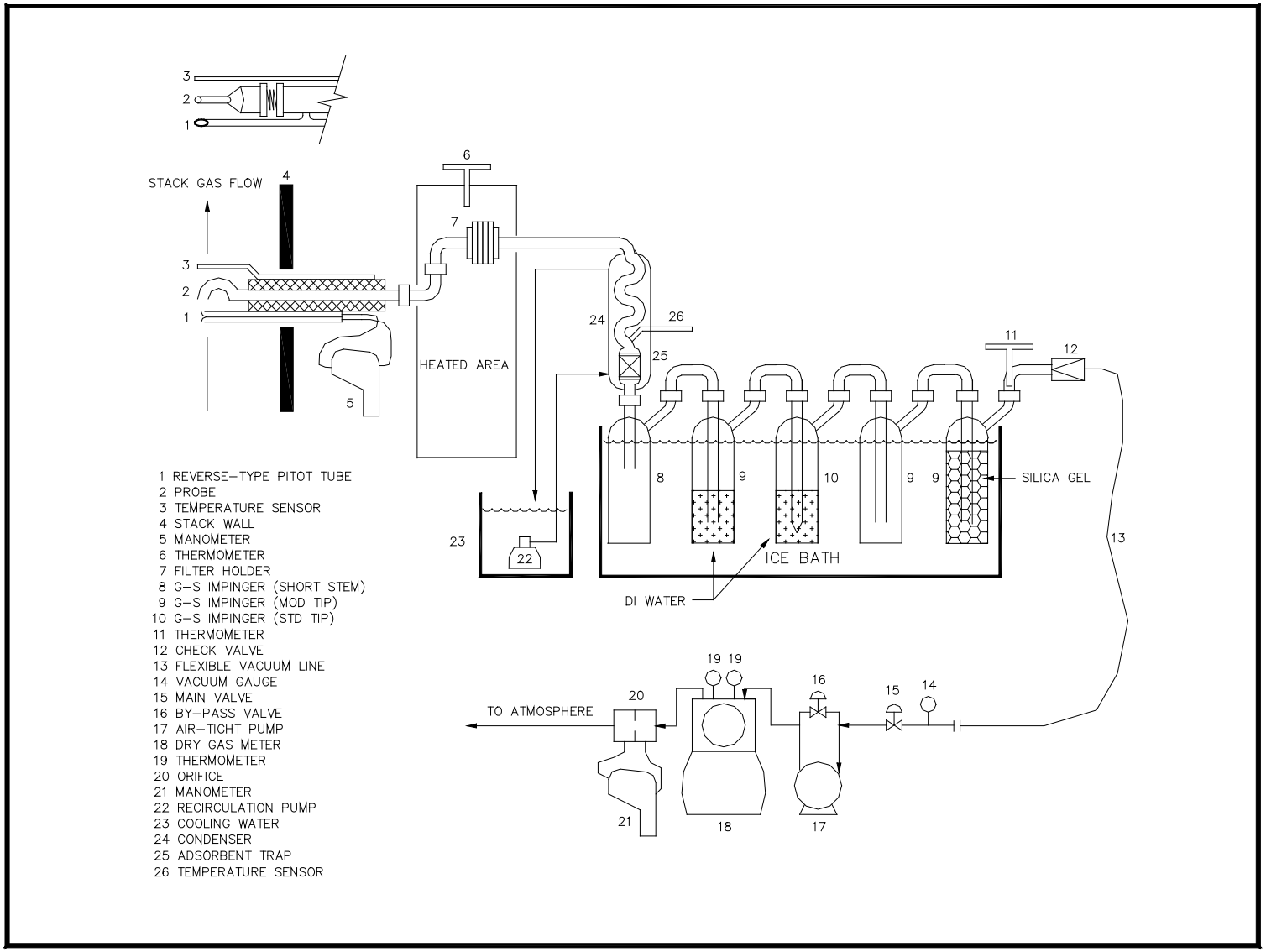


Figure 1. Method 23 Sample Train

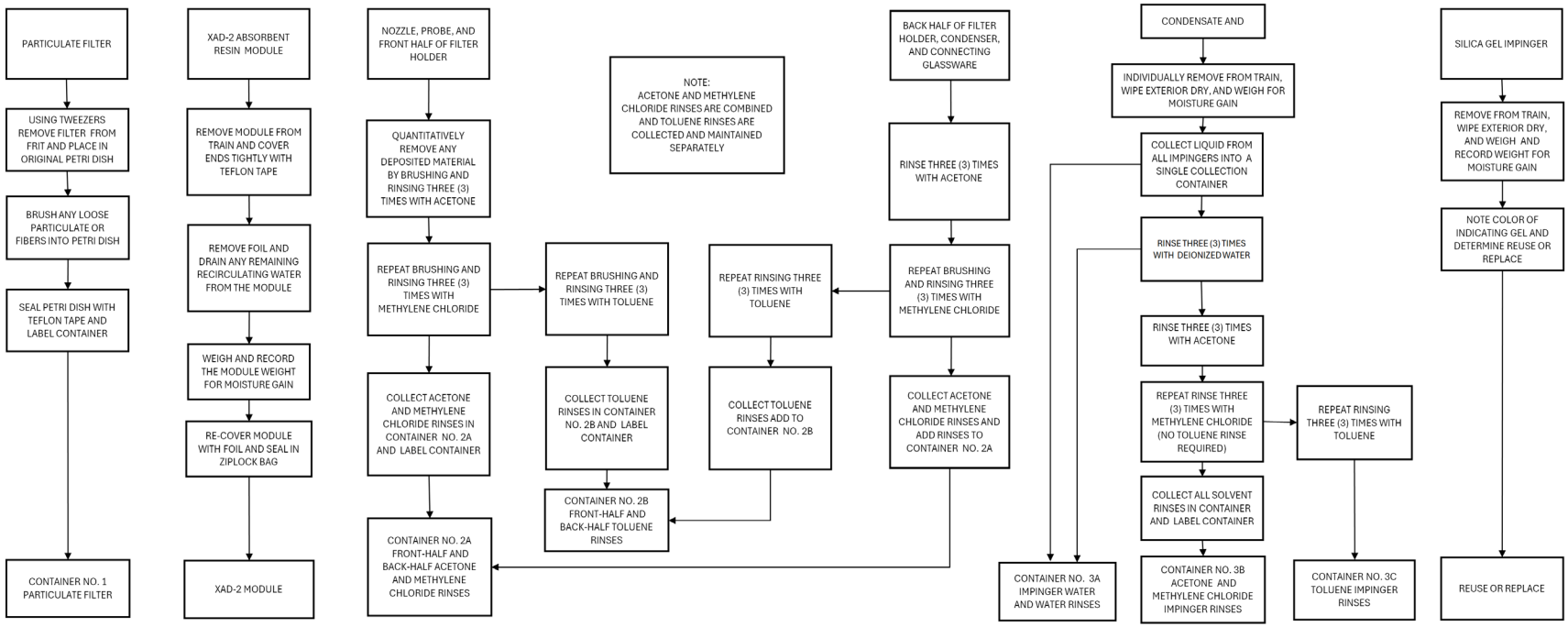


Figure 2. Method 23 PCDD/PCDF, PCB, and SVOC Sample Recovery

METHOD 26A

Specification Sheet for EPA Method 26A

Source Location:	MRF Stack
Pollutant(s) to be Determined:	Hydrogen Chloride and Chlorine (HCl/Cl_2)
Other Parameters to be Determined from Train Data:	Dry Gas Sampled Volume, Gas Temperature, Density, Moisture, and Flow Rate

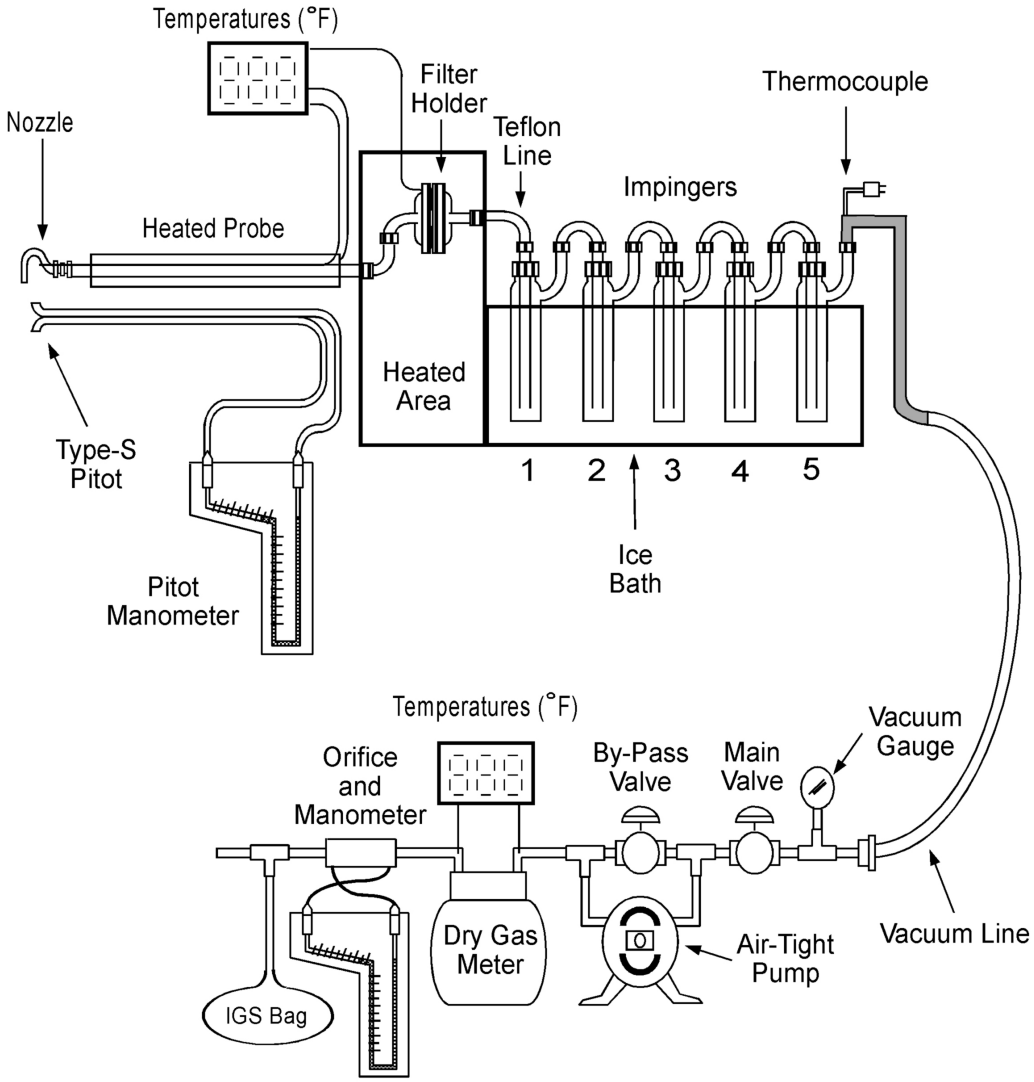
Parameter	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Sampling Time per Run	N/A	72 minutes
No. of Sample Traverse Points	N/A	24
Sample Time per Point	N/A	3 minutes
Sampling Rate	N/A	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Borosilicate or Quartz Glass	Hastelloy
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Borosilicate or Quartz Glass or Teflon	Titanium
Effective Probe Length	N/A	3 feet
Probe Temperature Set-Point	248˚F - 273˚F	248˚F - 273˚F
Train Setup		
Filter	Filter	Filter
Knockout Impinger (Optional)	Knockout Impinger w-H2SO4	Knockout Impinger w-H2SO4
Acid Impingers for HCl Capture	Two H2SO4 Iimpingers	Two H2SO4 Iimpingers
Optional Empty impinger	Empty impinger	N/A;Not used
Basic Impingers for Cl2 Capture	Two NaOH Iimpingers	Two NaOH Iimpingers
Silica Gel Impinger	Silica Gel Impinger	Silica Gel Impinger
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.84
Pitot Tube Calibration by	Geometric or Wind Tunnel	Geometric
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4˚F	1.0˚F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury or Aneroid
Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Borosilicate, Quartz Glass or Teflon	Quartz
Filter Support Material	Teflon Frit	Teflon
Cyclone Material	Glass or Teflon	None
Filter Heater Set-Point	248˚F - 273˚F	248˚F - 273˚F
Filter Material	Teflon Mat (Quartz, Optional High Temp>410˚F)	Quartz Fiber

Specification Sheet for EPA Method 26A

Other Components

Description	N/A	N/A
Location	N/A	N/A
Operating Temperature	N/A	N/A

EPA Method 26A
Sampling Train Configuration



Impinger Contents

Impinger 1	0.1N H_2SO_4
Impinger 2	0.1N H_2SO_4
Impinger 3	0.1N NaOH
Impinger 4	0.1N NaOH
Impinger 5	Silica gel

Modified EPA Method 26A
Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape

Teflon or Quartz Filter

Archive or discard

Container 3
Acid Impinger Catch
1000 ml HDPE

Knockout, acid impinger catch, back portion of filter holder

Measure and record volume by weight

Quantitatively transfer liquid to sample container

Rinse impingers and connecting glassware with D.I. water. Add to sample container

Seal container, shake to mix, label

Container 4
Alkaline Impinger Catch
1000 ml HDPE

Impingers 4 and 5 and connecting glassware

Measure and record volume by weight to plus or minus 1 ml or 0.5 g

Quantitatively transfer liquid to sample container

Rinse impingers and connecting glassware with D.I. water. Add to sample container

Add sodium thiosulfate (25 mg per ppm halogen-dscm of stack gas sampled)

Seal container, shake to mix, label, mark level

Container 5
Silica Gel
500 ml Polyethylene

Weigh the spent silica gel to the nearest 0.5 grams

Recycle silica gel

Container 6
0.1 N H2SO4
1000 ml HDPE

200 ml of 0.1N H2SO4 from rinse bottle diluted to approximate volume of samples

Container 7
0.1 N NaOH
1000 ml HDPE

200 ml of 0.1N NaOH from rinse bottle diluted to approximate volume of samples. Add same ratio of sodium thiosulfate solution to container

Container 8
D.I. Water Blank
250 ml HDPE

200 ml of D.I. water from rinse bottle

EPA Method 26A
Analytical Flowchart

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

Container 1
Quartz Filter

Record filter I.D. number on client weight sheet

Dessicate 24 hours in dessicator with anhydrous calcium sulfate, weigh, report results within 0.1 mg

Take second weight 6 hours after first weight

Repeat weighings until constant weight is achieved (<0.5 mg or 1% total weight change)

Record on client weight sheet

Archive for 12 months

Container 2
Acetone FH wash

Transfer to 250 ml tared Teflon® beaker liner

Record Teflon® beaker liner number, unit and run number

Evaporate to dryness under ambient temperature and pressure

Dessicate for 24 hours in dessicator with anhydrous calcium sulfate, weigh, report result within 0.1 mg

Take second weight 6 hours after first weight

Repeat weighings until constant weight is achieved (<0.5 mg or 1% total weight change)

Record on client weight sheet

Determine if further analysis is needed

Yes → Cover Teflon® beaker liners with watch glasses or plastic wrap to prevent contamination

No → **Archived Acetone Samples**

Sample stored within the Teflon® beaker liner in which they were evaporated to dryness

Teflon® beaker liners are sealed inside polyethylene sample container

Archive for 12 months

Containers 3 and 4

Quantitatively transfer each sample to a volumetric flask or graduated cylinder and dilute with water to a final volume within 50 ml of the largest sample

Analysis by ion chromatography for total chloride

Container 5
Silica Gel

Weigh to nearest 0.5 g. This can be done in the field

Reagent Blanks

Analyze by ion chromatography for total chloride

Audit Samples

Audit samples must be analyzed the same as field samples

Container 9
Acetone Blank (optional particulate analysis)

Measure acetone volumetrically or gravimetrically

Transfer to 250 ml tared Teflon® beaker liner

Evaporate to dryness at ambient temperature and pressure

Dessicate for 24 hours in dessicator with anhydrous calcium sulfate, weigh, report result within 0.1 mg

METHOD 5/202

Specification Sheet for EPA Method 5-202

Source Location:	MRF Stack
Pollutant(s) to be Determined:	Filterable Particulate Matter (FPM) and Condensable Particulate Matter (CPM)
Other Parameters to be Determined from Train Data:	Dry Gas Sampled Volume, Gas Temperature, Density, Moisture, and Flow Rate

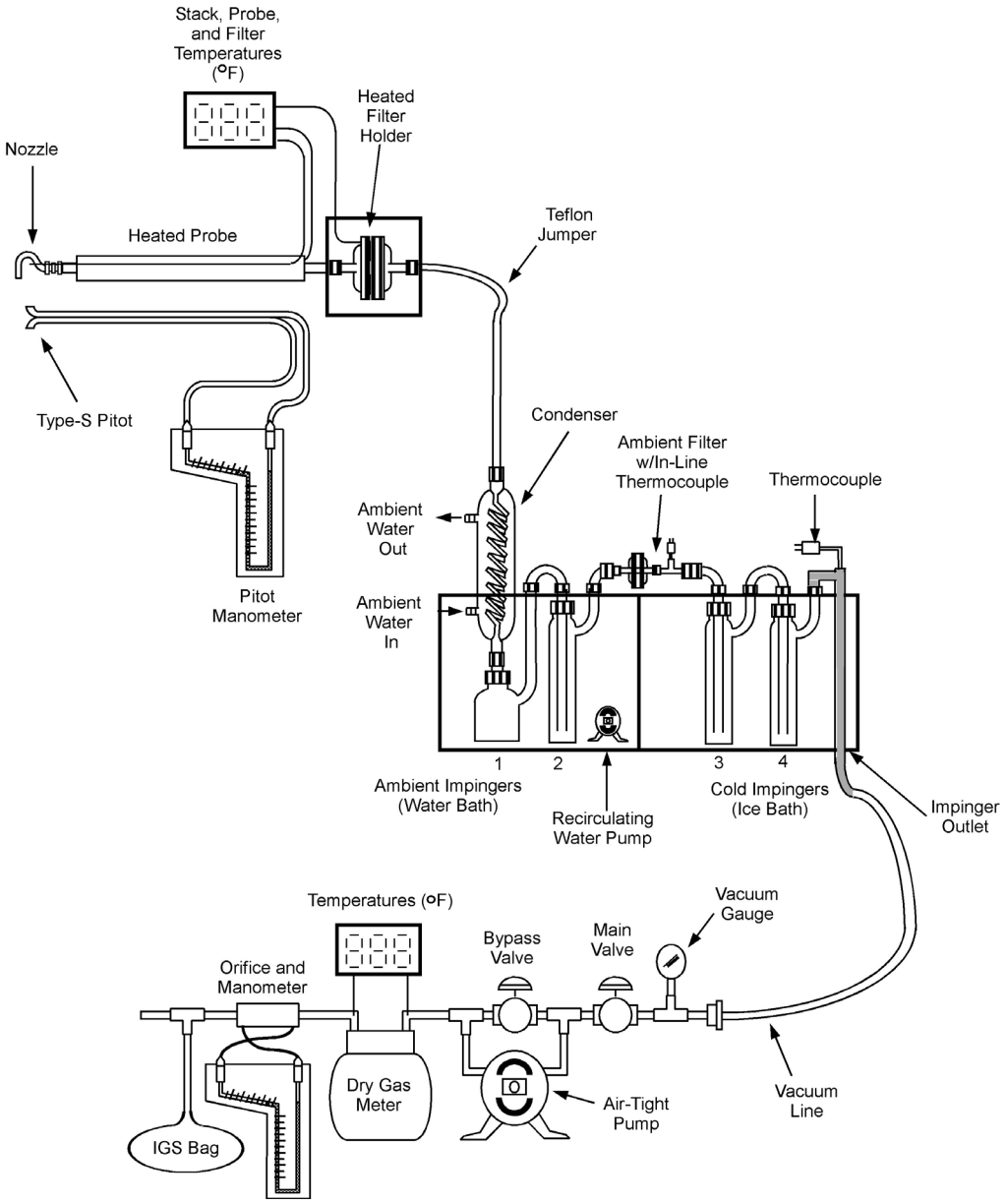
Parameter	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	120 minutes
No. of Sample Traverse Points	N/A	24
Sample Time per Point	N/A	5 minutes
Sampling Rate	Isokinetic (90-110%)	Isokinetic (90-110%)
Sampling Probe		
Nozzle Material	Stainless Steel or Glass	Hastelloy
Nozzle Design	Button-Hook or Elbow	Button-Hook
Probe Liner Material	Glass or Teflon	Titanium
Effective Probe Length	N/A	5 feet
Probe Temperature Set-Point	248˚F±25˚F	248˚F±25˚F
Velocity Measuring Equipment		
Pitot Tube Design	Type S	Type S
Pitot Tube Coefficient	N/A	0.84
Pitot Tube Calibration by	Geometric or Wind Tunnel	Geometric
Pitot Tube Attachment	Attached to Probe	Attached to Probe
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 cubic feet
Meter Size	N/A	0.1 dcf/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Wet Test Meter
Pump Type	N/A	Rotary Vane
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4˚F	1.0˚F
ΔP Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
ΔH Differential Pressure Gauge	Inclined Manometer or Equivalent	Inclined Manometer
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury or Aneroid
FPM Filter Description		
Filter Location	After Probe	Exit of Probe
Filter Holder Material	Quartz	Borosilicate Glass
Filter Support Material	Glass Frit	Glass Frit
Cyclone Material	N/A	None
Filter Heater Set-Point	248˚F±25˚F	248˚F±25˚F
Filter Material	Glass Fiber	Quartz Fiber
Other Components		
Description	Condenser	Condenser
Location	Before Impinger 1	Before 1st Impinger
Operating Temperature	≤85°F	≤85°F
Impinger Train Description		
Type of Glassware Connections	Leak-Free Glass Connectors	Ground Glass with Silicone O-Ring
Connection to Probe or Filter by	Direct or Flexible Connection	Flexible Teflon Line
Number of Impingers	4	4

Specification Sheet for EPA Method 5-202

Impinger Stem Types		
Impinger 1	Shortened Stem (open tip)	Shortened Stem (open tip)
Impinger 2	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 3	Modified Greenburg-Smith	Modified Greenburg-Smith
Impinger 4	Modified Greenburg-Smith	Modified Greenburg-Smith

CPM Filter Description

EPA Method 5/202
Sampling Train Configuration



<u>Impinger Contents</u>

Impinger 1	Empty
Impinger 2	Empty
Impinger 3	DI H_2O
Impinger 4	Silica Gel

EPA Method 5
Sample Recovery Flowchart

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)

Container 1
Quartz Filter
Petri Dish

↓

Remove with tweezers to original container. Brush any loose particulate or filter fibers into sample container

↓

If necessary fold in half and place into container

↓

Visual Inspection

Container 2
Front Half (FH) Rinse
500 ml Glass

↓

Probe liner, nozzle, cyclone or cyclone bypass and filter FH

↓

Brush/rinse 3X with acetone (6X for metal components)

↓

Visual Inspection

↓

Label container and measure volume by weight

Container 3*
Silica Gel

↓

Measure volume by weight, note any color change

↓

Recycle silica gel

*Containers 4 and 7 are only required when the testing includes a back half analysis and are superseded when only the filterable PM portion of Method 5 precedes Method 202 for condensable PM. Container 3 is also superseded when only the filterable PM portion of Method 5 precedes Method 202 for condensable PM.

Container 4*
Back Half (BH) Rinse
500 ml Plastic

↓

BH filter housing, Z-piece, impingers 1, 2, 3 and U-Bends

↓

Measure volume by weight

↓

Empty contents into labeled container

↓

Rinse with water

↓

Visual Inspection

↓

Label container and measure volume by weight

Blanks

Container 5
Filter Blank
Plastic Petri Dish

↓

Clean, unused tared filter

Container 6
Acetone Blank
500 ml Glass

↓

200 ml of acetone from rinse bottle. Record lot number

Container 7*
D.I. Water Blank
250 ml Plastic

↓

200 ml of water from rinse bottle

EPA Method 202
Sample Recovery Flowchart (1 of 2)

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degreesC)
- Samples must be maintained at or below 85 degrees F (30 degrees C) during shipping.

Post-Test N2 Purge*

Transfer water collected in condenser and water dropout impinger to back-up impinger; measure and record volume or weight

Conduct purge on condenser, back-up impinger and CPM filter with N2 at 14 LPM for one hour

Purge Notes:

- *Continue operating condenser recirculation pump and maintain gas temperature at exit of CPM filter >65°F but ≤85°F.*
- *If volume of water in moisture traps was not determined prior to purge, maintain trap temperature and keep gas temperature at exit of silica gel impinger below 68°F.*
- *At conclusion of purge, simultaneously turn off delivery and pumping systems.*
- *For high moisture sampling, weigh and change out silica gel prior to purging.*

CPM Container 1
Aqueous Liquid Impinger Contents & Rinses
950 ml Amber Glass

Back-half FPM filter holder, probe extension, condenser, dropout and back-up impingers, connecting glassware, front-half CPM filter holder

Measure and record impinger volume by weight

Empty contents into labeled container

Rinse 2X with deionized, distilled, ultra-filtered water and add to sample container

Visual Inspection

Mark liquid level and label container

CPM Container 2
Organic Rinses
950 ml Amber Glass

Back-half FPM filter holder, probe extension, condenser, dropout and back-up impingers, connecting glassware, front-half CPM filter holder

Rinse 1X with acetone and add to sample container

Rinse 2X with hexane and add to sample container

Visual Inspection

Mark liquid level and label container

CPM Container 3
Filter Sample
Petri Dish

CPM filter

Use tweezers and/or disposable surgical gloves to remove CPM filter and place in Petri dish

Visual Inspection

Label container

CPM Container 4**
Cold Impinger Water
500 ml Plastic

Cold impinger that follows the CPM filter

Quantitatively transfer liquid into sample container

Visual Inspection

Mark liquid level and label container

**If the water has been weighed in the field, it can be discarded.

CPM Container 5
Silica Gel

Measure volume by weight, note any color change

Recycle silica gel

EPA Method 202
Sample Recovery Flowchart (2 of 2)

- Tare all sample containers before sample collection
- Mark all liquid levels and final weights on the outside of each sample container
- Seal all sample containers with Teflon tape
- If recycling, bake silica gel for two hours at 350 degrees F (175 degrees C)
- Samples must be maintained at or below 85 degrees F (30 degrees C) during shipping.

CPM Container 6 Acetone Field Reagent Blank

Collect 200 ml of acetone from wash bottle into amber glass container

Visual inspection

Mark liquid level and label container

Collect one acetone blank for each lot of solvent used

CPM Container 7 Water Field Reagent Blank

Collect 200 ml of water from wash bottle into amber glass container

Visual inspection

Mark liquid level and label container

Collect one water blank for each lot used

CPM Container 8 Hexane Field Reagent Blank

Collect 200 ml of hexane from wash bottle into amber glass container

Visual inspection

Mark liquid level and label container

Collect one hexane blank for each lot of solvent used

CPM Container 9 Field Train Proof Blank* Inorganic Rinses

Prior to testing, rinse probe extension, condenser, impingers, connecting glassware and front-half CPM filter housing 2X with water

Collect rinses in plastic sample container

Visual inspection

Mark liquid level and label container

If glass ware was not baked a field train proof blank must be performed to demonstrate the cleanliness of the glassware. Baking the glassware is a CleanAir SOP

CPM Container 10 Field Train Proof Blank* Organic Rinses

After rinsing with water, rinse probe extension, condenser, impingers, connecting glassware and front-half CPM filter housing with acetone

Repeat procedure by rinsing 2X with hexane

Collect both rinses in amber glass container

Visual inspection

Mark liquid level and label container

Field Train Blank (required)

A minimum of one field train blank for each source category tested at facility is required.

Recover field blank after first or second run

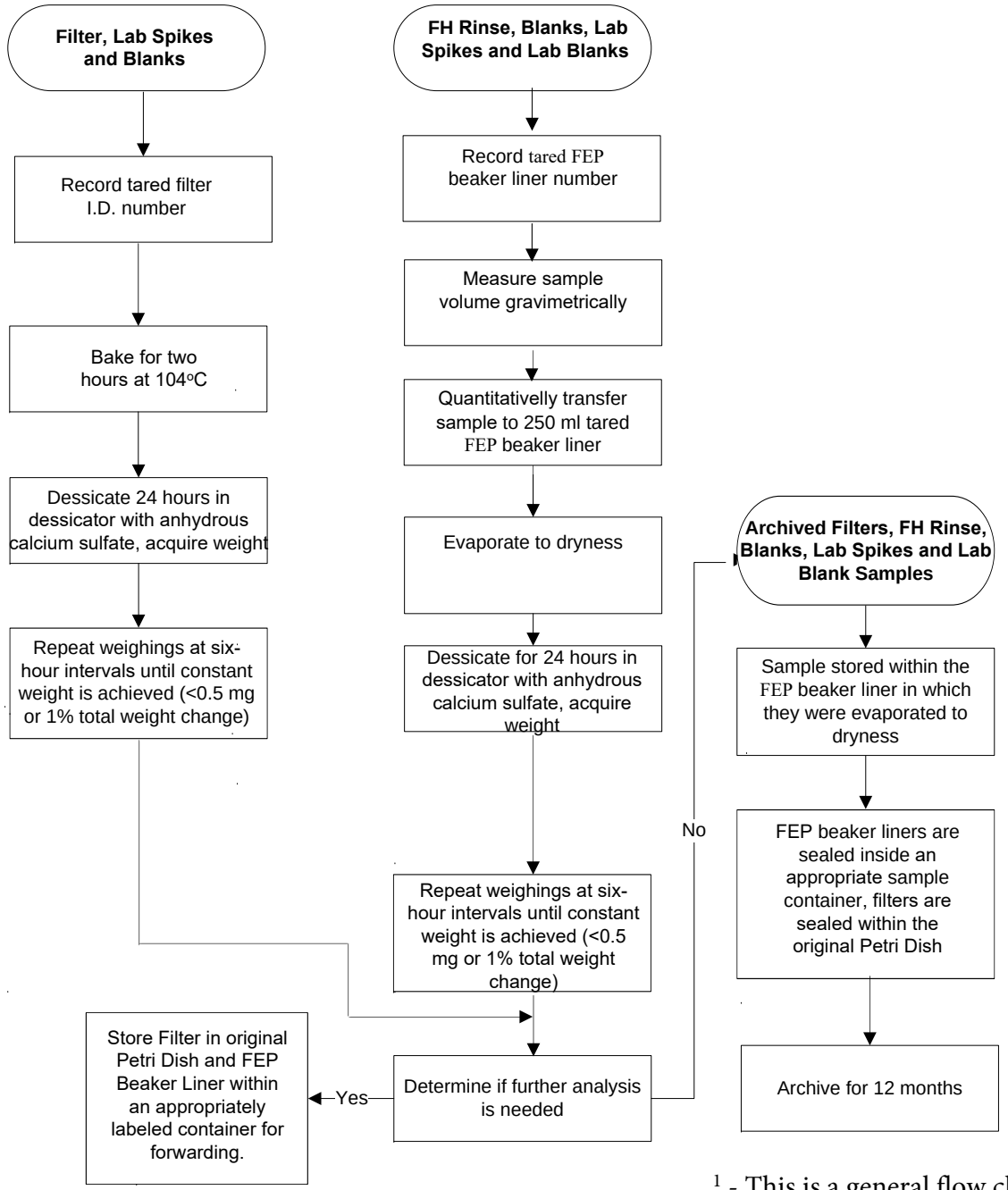
Assemble sampling train as it would be used for testing.

Prior to purge, add 100 ml water to first impinger and record data

Purge train and recover blank samples as described on Page 1 of 2

From field sample weight, subtract condensable particulate mass determined from blank train or 0.002 g, whichever is less.

EPA Method 5
General Analysis Flowchart[1]



[1] - This is a general flow chart. Actual analysis may be different depending on the source being tested.

EPA Method 202
Analytical Flowchart (1 of 2)

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

CPM Container 1
Aqueous Liquid Impinger Contents & Rinses

Measure liquid volumetrically or gravimetrically

Transfer inorganic contents into separatory funnel and add 30 ml of hexane

Drain off lower inorganic phase into a clean sample container or beaker

Drain off organic phase into a separate clean sample container or beaker, leaving a small amount of hexane in funnel

Repeat procedure twice with 30 ml hexane, combining the organic phase with each extraction

Inorganic Extraction

Transfer inorganic fraction from extraction into 250 ml tared Teflon® beaker liner

Evaporate to no less than 10 ml on a hot plate or in 105 degree C oven

Allow to dry at room temperature (not to exceed 85 degrees F). Ensure the water and volatile acids have completely evaporated before neutralizing nonvolatile acids in sample

Dessicate for 24 hours in dessiccator with anhydrous calcium sulfate

Weigh at intervals of 6 hours to constant weight and report results to nearest 0.1 mg

Organic Extraction

The extraction should yield around 90 ml of organic extract

Combine the organic extract of Container 1 with the organic train rinse in Container 2

CPM Container 2
Organic Rinses

Measure liquid volumetrically or gravimetrically

Transfer contents into 250 ml tared Teflon® beaker liner.

Add organic phases prepared from Containers 1 and 3. Evaporate to dryness at room temperature (<85oF) to less than 10 ml.

Dessicate for 24 hours in dessicator with anhydrous calcium sulfate

Weigh at intervals of 6 hours to constant weight and report results to nearest 0.1 mg

No constant weight

Redissolve residue in 100 ml of deionized, distilled ultra-filtered water

Titrate sample with 0.1 N NH_4OH to a pH of 7.0, record volume of titrant used.

Evaporate to no less than 10 ml using hot plate or 105 degree C oven

Allow to dry at room temperature (not to exceed 85 degrees F)

CPM Container 3
Filter Sample

Extract Filter

Inorganic Extraction

Fold filter into quarters and place in 50 ml extraction tube

Add 10 ml deionized, distilled ultra-filtered water to extraction tube (or sufficient to cover the filter)

Extract for at least 2 minutes in sonication bath; add to separate inorganic fraction Container 1

Repeat extraction twice more for a total of three extractions; add to Container 1

Organic Extraction

Add 10 ml hexane to exraction tube (or sufficent to cover filter)

Extract for at least 2 minutes in sonication bath; add to separate organic fraction Container 2

Repeat extraction twice more for a total of three extractions; add to Container 2

EPA Method 202
Analytical Flowchart (2 of 2)

- Log each sample in shipment and verify against chain-of-custody sheet
- Note liquid levels in the sample containers and confirm on the chain-of-custody sheet condition

CPM Container 4
Cold Impinger Water

Measure and record liquid volumetrically or gravimetrically

CPM Container 5
Silica Gel

Weigh to nearest 0.5 g and record weight

CPM Container 6
Acetone Field Reagent Blank

Transfer 150 ml of acetone from blank container to 250 ml tared clean beaker and evaporate to 10 ml at room temperature (not to exceed 85 degrees F) and pressure

Transfer beaker contents to 50 ml tared weighing tin and evaporate to dryness at room temperature (not to exceed 85 degrees F) and pressure

Dessicate for 24 hours in dessiccator with anhydrous calcium sulfate

Weigh at intervals of 6 hours to constant weight and report results to nearest 0.1 mg

CPM Container 7
Water Field Reagent Blank

Transfer 150 ml of water from blank container to 250 ml tared clean beaker and evaporate to approximately 10 ml in oven at 105 degrees C and pressure

Transfer beaker contents to 50 ml tared weighing tin and evaporate to dryness at room temperature (not to exceed 85 degrees F) and pressure

Dessicate for 24 hours in dessiccator with anhydrous calcium sulfate

Weigh at intervals of 6 hours to constant weight and report results to nearest 0.1 mg

CPM Container 8
Hexane Field Reagent Blank

Transfer 150 ml of hexane from blank container to 250 ml tared clean beaker and evaporate to 10 ml at room temperature (not to exceed 85 degrees F) and pressure

Transfer beaker contents to 50 ml tared weighing tin and evaporate to dryness at room temperature (not to exceed 85 degrees F) and pressure

Dessicate for 24 hours in dessiccator with anhydrous calcium sulfate

Weigh at intervals of 6 hours to constant weight and report results to nearest 0.1 mg

METHOD 0030

Specification Sheet for SW-846 Method 0030 (VOST)

Source Location:	MRF Stack
Pollutant(s) to be Determined:	Volatile Organics
Other Parameters to be Determined from Train Data:	Dry Gas Sampled Volume
Parameters to be Determined from Concurrently Operated Other Sampling Train Data:	Gas Temperature, Density, Moisture, and Flow Rate

Parameter	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	80 minutes
No. of Sample Traverse Points	N/A	N/A; Fixed Point
Sample Time per Point	N/A	20 minutes per Tube Set
Sampling Rate	N/A	1.0 liters per minute
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Borosilicate Glass or Quartz	Quartz
Effective Probe Length	N/A	3 feet
Probe Temperature Set-Point	Greater than 130˚C (266˚F)	300˚F±25˚F
Velocity Measuring Equipment		
Pitot Tube Design	N/A	None; Flow data obtained from concurrently operated isokinetic sampling train.
Pitot Tube Coefficient	N/A	N/A
Pitot Tube Calibration by	N/A	N/A
Pitot Tube Attachment	N/A	N/A
Metering System Console		
Meter Type	Dry Gas Meter	Dry Gas Meter
Meter Accuracy	±2%	±1%
Meter Resolution	N/A	0.01 liters
Meter Size	N/A	0.1 liter/revolution
Meter Calibrated Against	Wet Test Meter or Standard DGM	Standard DGM
Pump Type	N/A	Diaphragm
Temperature Measurements	N/A	Type K Thermocouple/Pyrometer
Temperature Resolution	5.4˚F	1.0˚F
∆P Differential Pressure Gauge	Inclined Manometer or Equivalent	Magnehelic
∆H Differential Pressure Gauge	Inclined Manometer or Equivalent	Magnehelic
Barometer	Mercury or Aneroid	Digital Barometer calibrated w/Mercury or Aneroid
Filter Description		
Filter Location	In-stack	In-Stack
Filter Holder Material	Glass or Quartz (integrated with probe	Quartz
Filter Support Material	N/A	N/A
Cyclone Material	N/A	None
Filter Heater Set-Point	N/A	N/A
Filter Material	Glass Wool	Quartz Wool Plug
Other Components		
Description	Tenax and Charcoal/Tenax Tubes	Tenax and Charcoal/Tenax Tubes
Location	Standard VOST	Standard VOST Design

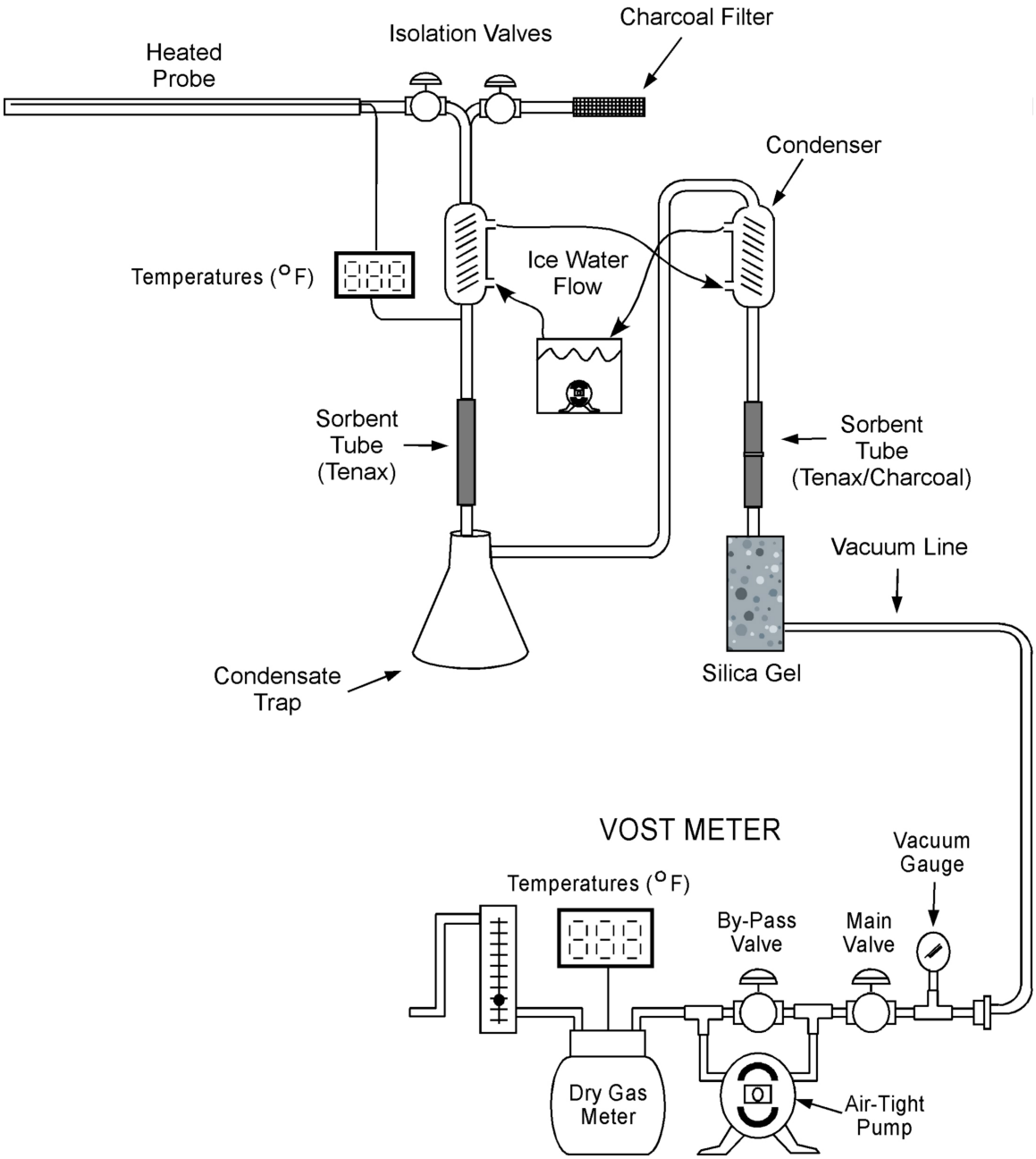
Specification Sheet for SW-846 Method 0030 (VOST)

Operating Temperature	Gas entering 1st sorbent trap must be <20 ˚C (68˚F)	<68˚F

Glassware Train Description

Type of Glassware Connections	Glass or Teflon with greaseless fittings	Screw Joint with Silicone Gasket
Connection to Probe or Filter by Glassware Types	N/A	Direct Glass Connection
Component 1	Coil condenser	Coil condenser
Component 2	Tenax trap (Inside/Inside or Inside/Outside type)	Tenax trap (Inside/Inside type)
Component 3	Erlenmeyer condensate collector	Erlenmeyer condensate collector
Component 4	Coil or tube condenser	Tube condenser
Component 5	Charcoal/Tenax trap (I/I or I/O type)	Tenax/Charcoal trap (Inside/Inside type)
Component 6	Silica Gel Dryer	Silica Gel Dryer

SW846 Method 0030
Sampling Train Configuration



SW846 0030
Sample Recovery Flowchart

- Seal all sample containers with Teflon tape
- Keep cartridges on cold packs until they are ready for analysis

Container 1
Tenax Sorbent Cartridge

Remove sorbent cartridge. Replace end caps and label accordingly

Container 2
Tenax/Charcoal Sorbent Cartridges

Remove sorbent cartridge. Replace end caps and label accordingly

Note: Samples 1-3 may be repeated multiple times for each test run.

Container 3

If condensate is collected, place in a 20 or 40 ml VOA vial

Fill vial to top with HPLC water so that no air is present in the vial

Containers 4 and 5
Field Blanks

Blank Tenax and Tenax/ charcoal traps are taken to sampling site; end caps are removed for the period of time required to exchange 2 pairs of traps on VOST

After the exchange, replace the end caps and label accordingly

Containers 6 and 7
Trip Blanks

At least one pair of blank cartridges shall be included with shipment of cartridges to site. The end caps are NOT to be removed

Container 8
VOA Vial
HPLC Water Blank

Collect 40 ml of HPLC water directly from squeeze bottle

SW846 0030
Analytical Flowchart

**Containers 1 and 2*
Sorbent Tube Pairs**

↓

Add internal standards

↓

Desorb each pair of tubes for 10 minutes at 180 degrees C with organic free nitrogen gas at a flow rate of 100 ml/min

↓

Collect desorbed gas stream onto analytical adsorbent trap (3% SP-2100, Tenax, silica gel, charcoal) after bubbling through organic free water

↓

Desorb analytical trap at 180 degrees C with organic free nitrogen carrier gas and pass desorbed gas stream directly into GC/MS unit

↓

Analysis by Low Resolution GC/MS

**Container 3
Water Condensate**

↓

Add internal standards

↓

Analyze by purge and trap GC/MS

*Note: Multiple pairs of tubes (up to five pairs) may be desorbed onto a single pair of Tenax and Tenax/charcoal cartridges to achieve maximum sensitivity. This combination tube is then analyzed according to the procedures illustrated.

Containers 4, 5, 6, 7

↓

Same as Containers 1 and 2

Container 8

↓

Same as Container 3

CEMS SPEC SHEETS

Specification Sheet for EPA Methods 3A, 7E and 10

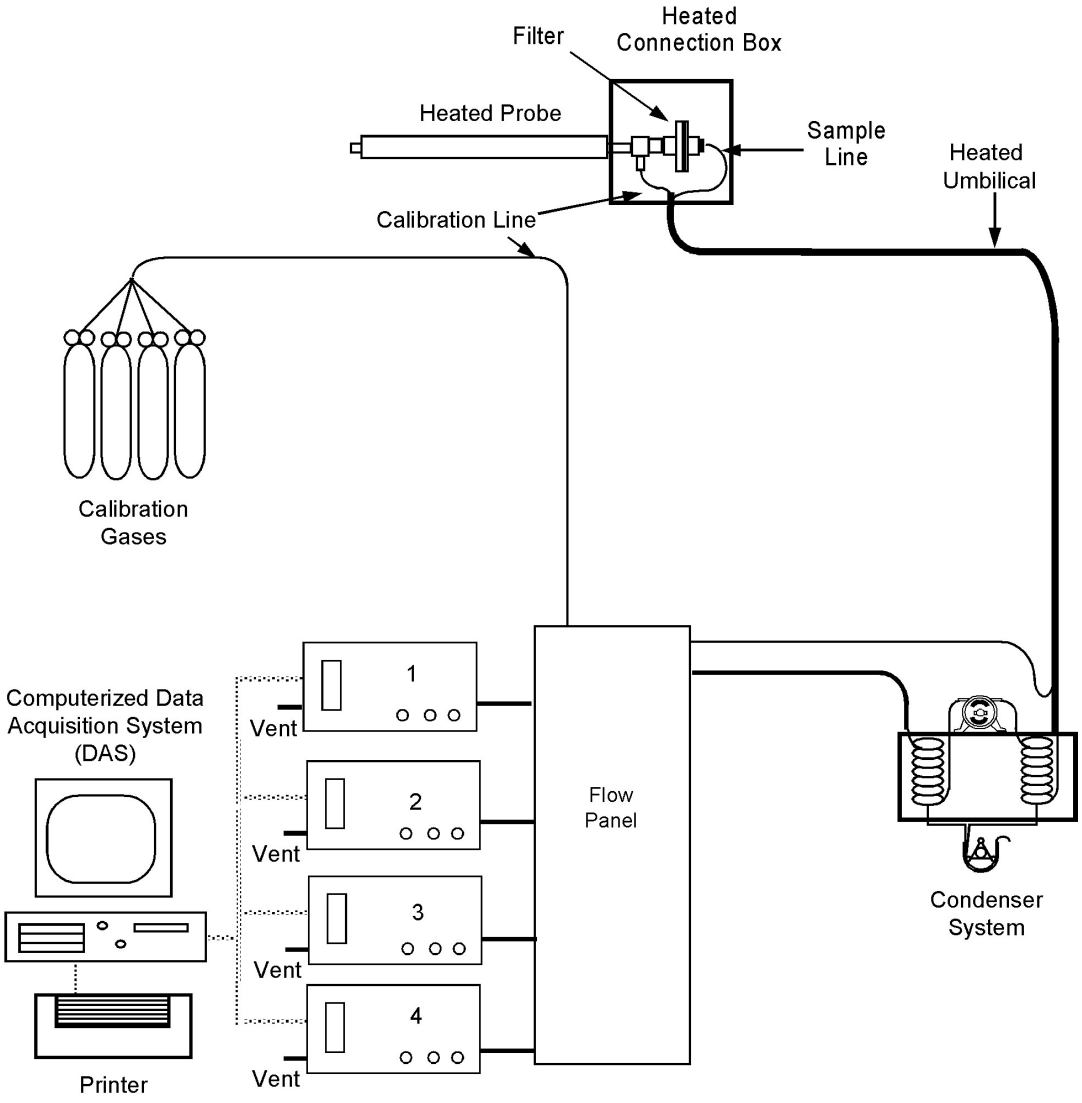
Source Location Name(s)	MRF Stack
Pollutant(s) to be Determined	Oxygen (O_2), Carbon dioxide (CO_2), Nitrogen oxides (NO_x) and Carbon monoxide (CO)
Other Parameters to be Determined from Train	None

	Standard Method Specification	Actual Specification Used
Pollutant Sampling Information		
Duration of Run	N/A	Continuous
No. of Sample Traverse Points	N/A	1
Sample Time per Point	N/A	NA
Sampling Rate	Constant Rate	Constant Rate
Sampling Probe		
Nozzle Material	N/A	None
Nozzle Design	N/A	N/A
Probe Liner Material	Stainless Steel or Pyrex Glass	Titanium
Effective Probe Length	Sufficient to Traverse Points	3 feet
Probe Temperature Set-Point	Prevent Condensation	Stack Temp
Particulate Filter		
In-Stack Filter	Yes	No
In-Stack Filter Material	Non-reactive to gas	N/A
External Filter	Yes	Yes
External Filter Material	Borosilicate, Quartz Glass Wool or Fiber Mat	Borosilicate Glass Fiber Mat
External Filter Set-Point	Prevent Condensation	248˚F±25˚F
Sample Delivery System		
Heated Sample Line Material	Stainless Steel or Teflon	Teflon
Heated Sample Line Set-Point	Prevent Condensation	248˚F±25˚F
Heated Sample Line Connections	Probe Exit to Moisture Removal System	Probe to Moisture Removal System
Moisture Removal System	Refrigerator-type condenser or similar	Refrigerator-type condenser
Sample Pump Type	Leak-Free, minimal response time	Diaphragm
Sample Pump Material	Non-reactive to sample gases	Teflon
Sample Flow Control	Constant Rate	Constant Rate (±10%)
Non-Heated Sample Line Material	Stainless Steel or Teflon	Teflon
Non-Heated Sample Line Connections	Moisture Removal to Sample Gas Manifold	Moisture Removal to Sample Gas Manifold
Additional Filters	Optional	Yes
Additional Filter Type	N/A	Particulate Removal
Additional Filter Location	Optional	Entrance to Sample Manifold
Filter Material	Non-reactive to sample gases	Glass Fiber
Analyzer Description		
Oxygen (O_2)	EPA Method 3A (Paramagnetic)	EPA Method 3A (Paramagnetic)
Carbon Dioxide (CO_2)	EPA Method 3A (NDIR)	EPA Method 3A (NDIR)
Sulfur Dioxide (SO_2)		
Nitrogen Oxides (NO_x)	EPA Method 7E (Chemiluminescent)	EPA Method 7E (Chemiluminescent)
Carbon Monoxide (CO)	EPA Method 10 (Gas filter Correlation IR)	EPA Method 10 (Gas Filter Correlation IR)
Total Hydrocarbon (THC)	N/A	
Hydrogen Chloride (HCl)	N/A	
Ammonia (NH_3)	N/A	

Specification Sheet for EPA Methods 3A, 7E and 10

	Standard Method Specification	Actual Specification Used
Instrument Span Range		
Oxygen (O_2)	≤ 1.33 x Expected Maximum	0-20%
Carbon Dioxide (CO_2)	≤ 1.33 x Expected Maximum	0-20%
Sulfur Dioxide (SO_2)	≤ 1.33 x Expected Maximum	0-100 ppm
Nitrogen Oxides (NO_x)	≤ 1.33 x Expected Maximum	0-100 ppm
Carbon Monoxide (CO)	≤ 1.33 x Expected Maximum	N/A
Total Hydrocarbon (THC)	N/A	N/A
Hydrogen Chloride (HCl)	N/A	N/A
Ammonia (NH_3)	N/A	N/A
Data Acquisition		
Data Recorder	Strip chart, Analog Computer or Digital Recorder	Digital Recorder
Recorder Resolution	0.5 Percent of Span	0.1 Percent of Span
Data Storage	Manually or Automatic	Automatic
Measurement Freq. ≤60 min. Sample Time	1-min. intervals or 30 measurements (less restrictive)	One reading per second
Recording Freq. ≤60 min. Sample Time	1-min. intervals or 30 measurements (less restrictive)	One Minute Average (60, 1 second readings)
Measurement Freq. >60 min. Sample Time	2-min. intervals or 96 measurements (less restrictive)	N/A
Recording Freq. >60 min. Sample Time	2-min. intervals or 96 measurements (less restrictive)	N/A
Calibration Gas Specifications		
Oxygen (O_2)	EPA Protocol 1	EPA Protocol 1
Carbon Dioxide (CO_2)	EPA Protocol 1	EPA Protocol 1
Sulfur Dioxide (SO_2)	N/A	
Nitrogen Oxides (NO_x)	EPA Protocol 1	EPA Protocol 1
Carbon Monoxide (CO)	EPA Protocol 1	EPA Protocol 1
Total Hydrocarbon (THC)	N/A	
Hydrogen Chloride (HCl)	N/A	
Ammonia (NH_3)	N/A	

EPA Methods 3A, 7E, 10
Sampling Train Configuration



	Manufaturer	Model	Principle of Operation
1	Servomex	1420C	Paramagnetic
2	Servomex	1415	NDIR
3	Thermo	42i HL	Chemiluminescence
4	Thermo	48i HL	Gas Filter Correlation IR

CleanAir

SPEC SHEET

Servomex 1420C O2 Analyzer

Rental and Application Notes

- Shipping Weight: 28 lbs.
- The analyzer measures the partial pressure of oxygen in the sample gas. Therefore, any change in sample pressure at the measuring cell will have an effect, which is proportional to the change in absolute pressure from the time of calibration.
- The Servomex 1420C/1415C can be plumbed together in a 19” rack mount. The combined weight is 44 lbs.
- These units are compatible with the older 1400B series

	Specifications
Weight	12 lbs
Dimensions	19” x 7” x 14”
Power	120VAC
Output	0-1v non-isolated or 4-20mA
Range	O2 0-25%, 0-100%
Response Time	<3 seconds
Accuracy	+/- 0.1%
Flow Rate	1 - 6 L/min
Inlet Pressure	1 - 10 psig
Vent Pressure	11.8-15.9 psia
Linearity	+/- 0.1%
Repeatability	+/- 0.1%
Zero Drift	< + 0.002% O2/hour
Span Drift	< + 0.002% O2/hour
Relative Humidity	0 - 90% non-condensing
Storage Temperature	-4° F to 158° F

CleanAir

SPEC SHEET

Servomex 1415 CO2 Analyzer

Rental and Application Notes

- Shipping Weight: 28 lbs.
- The Servomex 1420C/1415C can be plumbed together in a 19” rack mount. The combined weight is 44 lbs.
- These units are compatible wiith the older 1400B series

	Specifications
Weight	12 lbs
Dimensions	19” x 7” x 14”
Power	120VAC
Output	0-1v non-isolated or 4-20mA
Range	0-20 & 25% CO2
Response Time	<10 seconds
Accuracy	1% of selected range
Flow Rate	1 - 6 L/min
Inlet Pressure	1 - 10 psig
Vent Pressure	13.1 to 16.0 psia
Linearity	1% of selected range
Repeatability	1% of selected range
Zero Drift	2% of full scale/week
Span Drift	1% of reading/day
Relative Humidity	0% - 90% non-condensing
Storage Temperature	-4° F to 158° F

CleanAir

SPEC SHEET

Thermo 42iHL NO_X, NO, NO_2 Analyzer

Rental and Application Notes

- Shipping Weight: 62 lbs. w/accessories (2 pumps= 36 lbs.) (1 pump= 30 lbs)
- Meets USEPA requirements for RFNA-1289-074
- User programmable software allows individual measurement range settings to be stored in memory for subsequent recall and NO, NO_2, NO_x hourly average storage for up to one month
- Dual range and autorange capability
- Can be remotely controlled with bi-directional RS-232 communication port, or ethernet port
- Rack mountable for integrated CEMS
- Independent calibration and outputs for NO, NO_2, and NO_x
- Calibration gases available for rent

	Specifications
Detection	Chemiluminescence
Unit Weight	47 lbs.
Dimensions	16.75"x 8.62"x 23"
Power Requirements	115 VAC @ 300W
Outputs	Analog: 6 voltages; 0-100mv, 1V, 5V, 10V Digital: 1 power fail, 10 digital relays, alarm output relay logic, 100mA @ 200VDC
Inputs	16 digital inputs (standard) 8 0-10VDS analog inputs (optional)
Ranges	CleanAir suggested range: 0-500ppm Manufacturer ranges: 0-10ppm to 5000ppm
Rise/Fall Times (0-90%)	NO mode: 2.5 seconds NO_x mode: 5.0 seconds
Operating Temperatures	0-45°C
Sample Temperature	Ambient
Flow Rate	25 ccm With bypass, 2 SCFH
Detection Limit	0.05ppm
Span Drift	±1% FS over 24 hours
Zero Drift	±0.050ppm over 24 hours
Linearity	±1% FS
Warm-up Time	90 minutes to stabilize

CleanAir

SPEC SHEET

Thermo 48iHL CO Analyzer

Rental and Application Notes

- Shipping Weight: 55 lbs.
- Meets USEPA requirements for RFCA-0981-054
- Analog data outputs with selectable voltages
- Can be remotely controlled with bi-directional RS-232 communication port, or ethernet port
- Rack mountable for integrated CEMS
- On board diagnostics, can be performed locally and remotely
- Calibration gases available for rent

	Specifications
Detection	Gas filter correlation
Unit Weight	49 lbs.
Dimensions	16.75”x 8.62”x 23”
Power Requirements	115 VAC @ 275W
Outputs	0-10V, RS232/RS485, TCP/IP, 10 status relays (standard) 4-20 mA isolated current output (optional)
Inputs	16 digital inputs (standard) 8 0-10VDS analog inputs (optional)
Ranges	CleanAir suggested range: 0-1000ppm to 20,000ppm Manufacturer ranges: 0-10ppm to 20,000ppm
Rise/Fall Times (0-90%)	1 minute (30 second averaging)
Operating Temperatures	0-45°C
Sample Temperature	Ambient
Flow Rate	0.5-2 LPM
Detection Limit	4.0ppm
Span Drift	±2% FS over 24 hours
Zero Drift	<4.0ppm over 24 hours
Linearity	±2% FS
Warm-up Time	2 hours to stabilize

EXAMPLE METHOD 1 AND METHOD 4 DATA SHEETS

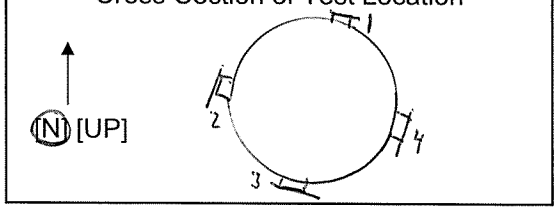
TEST LOCATION: STACK

UNIT: BOILER 8

VELOCITY & CYCLONIC FIELD DATA SHEET

Client	INVISTA	Project No.	13669
Plant	ORANGE, TX	Date	10/16/2018
Meter Operator	M. OLESZKO	Employee #	668
Probe Operator	J. LOW	Employee #	854
Source of Moisture and Molecular Weight Data	PREVIOUS DATA		

Cross-Section of Test Location



Amb. Temp. (°F)		Bar. Press.	(in. Hg) [mbar]
Pitot Cp	0.823	Probe I.D. No.	67-6P-6
Duct Diameters from Disturbance			
Downstream	9.8	Upstream	5.2
First point all the way [In] [Out]		Port Len. (in.)	28.75"
Gas Flow [In] [Out] of page	OUT		
Duct Dimensions (in.)	117.25"		

Run	PRE-1	Load		Post-Test Leak Check:	Pass ☒ Fail ☐
Start Time	1110	Stop Time	1122	Post Pitot Condition Check:	Good ☒ Bad ☐
Static Press. (in. H_2O)					

Traverse Point Number	Velocity Head ΔP (in.H_2O)	Stack Temp. T_s (°F)	Veclocity Pressure at 0^0 (in. H_2O)	Rotation Angle α giving 0 v.p.	Notes
1-1	0.16	315	0.00	0°	
2	0.18	316	0.04	4°	
3	0.18	314	0.00	0°	
1-1	0.17	319	0.03	5°	
2	0.18	319	0.06	4°	
3	0.16	318	0.05	6°	
2-1	0.19	319	0.00	0°	
2	0.18	321	0.01	1°	
3	0.17	320	0.01	2°	
3-1	0.18	321	0.00	0°	
2	0.19	321	0.00	1°	
3	0.16	321	0.00	0°	
Total	*5.0177	3829		23	
Average	0.4181	318.6667		1.9167	

* Sum of square roots.

Circle correct bracketed units on data sheet.

Run		Load		Post-Test Leak Check:	Pass ☐ Fail ☐
Start Time		Stop Time		Post Pitot Condition Check:	Good ☐ Bad ☐
Static Press. (in. H_2O)					

Traverse Point Number	Velocity Head ΔP (in.H_2O)	Stack Temp. T_s (°F)	Veclocity Pressure at 0^0 (in. H_2O)	Rotation Angle α giving 0 v.p.	Notes
Total	*				
Average					

* Sum of square roots.

QA/QC_____

Date_____

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Impinger Weight Sheet

Client Invista		Unit Name / Location Blr 8 Stack	
Plant Orange	Job No. 13669	Method 5 - TX23	

Balance Calibration Check			
Balance ID	3028350 1069	Reference Weight Mass (g)	500.2
Reference Weight ID	100002 25498	Reference Weight Reading (g)	499.5

Check must be performed once per day per job. Reference Weight Mass must agree with Reference Weight Reading to within ±0.5 g.

Run No.	1	Filter Type	Quartz	Sample Box No.	1
Date	09/15/18 10/16/18	Lot No.	180831-64-01	pH	N/A
Analyst	PWK	Filter No.	49161	Rinse	DI H_2O

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)
Impinger 1	DI H_2O	854.3	784.3	70.0
Impinger 2	DI H_2O	777.0	759.4	17.6
Impinger 3	Empty	660.7	655.7	5.0
Impinger 4	S.G	906.9	896.1	10.8
Impinger 5				
Impinger 6				
Impinger 7				

QA/QC PWK
Date 10/17

Total Weight (gm)
92.6
103.4

Run No.	2	Filter Type	Quartz	Sample Box No.	2
Date	09/15/18 10/16/18	Lot No.	180831-64-01	pH	N/A
Analyst	PWK	Filter No.	49162 PWK 09/15	Rinse	DI H_2O

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)
Impinger 1	DI H_2O	821.4	761.3	60.1
Impinger 2	DI H_2O	782.0	760.8	21.2
Impinger 3	Empty	667.5	662.7	4.8
Impinger 4	S.G	851.7	840.5	11.2
Impinger 5				
Impinger 6				
Impinger 7				

QA/QC PWK
Date 10/17

Total Weight (gm)
86.1
97.3

Run No.	3	Filter Type	Quartz	Sample Box No.	3
Date	09/15/18 10/16/18	Lot No.	180831-64-01	pH	N/A
Analyst	PWK	Filter No.	49163	Rinse	DI H_2O

	Contents	Gross Weight (gm)	Tare Weight (gm)	Net Weight Gain (gm)
Impinger 1	DI H_2O	816.0	756.0	60.0
Impinger 2	DI H_2O	780.8	757.4	23.4 PWK
Impinger 3	Empty	667.7	662.6	~~5.4~~ 5.1
Impinger 4	S.G	869.1	855.9	13.2
Impinger 5				
Impinger 6				
Impinger 7				

QA/QC PWK
Date 10/17

Total Weight (gm) PWK
~~83.8~~ 88.5
102.0 101.7

Note: Sample trains loaded 09/15 J. sealed Used + Recovered 10/16/18

QA/QC
Date PWK 10/17/18

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FDS004B-ImpingerWt.xls, August 2004
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EXAMPLE SAMPLING TRAIN CHECKLISTS

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Was contamination minimized; glassware clean, openings covered and the train assembled in a manner that minimized contamination?	
Was the train assembled as identified in Method 23?	
Were each of the impingers and the XAD resin trap weighed and the weights recorded on the Method 4 data sheet as the train was assembled?	
Was the XAD resin trap wrapped with aluminum foil to protect from light?	
Were weather conditions adverse to sampling? If so, describe measures taken to protect sampling equipment.	
Was the sampling area kept clean and orderly during testing?	
Was the XAD-2 resin prepared by the laboratory that will perform the analysis?	
Were O_2 and CO_2 measured by Orsat or CEMS?	
Was the probe marked or other provisions made to ensure proper nozzle placement at traverse points?	
Was the glass fiber filter inspected before being placed in the filter holder?	
Were pre and post test leak checks conducted on the pitot tube? Were leak checks performed during each port change?	
Was the sample gas temperatures monitored and recorded on field data sheets? (entering resin and exiting last impinge should be $\leq$ 68°F and the filter box and probe should be 248$\pm$25°)	

Observation	Comment
Was sampling time uniform at each traverse sample point?	
Were the sample train and consoles adequately monitored by operators and were log sheets maintained?	
Was the nozzle sealed if removed from the stack at the completion of the run prior to recovery?	
Was particulate matter carefully wiped off external surfaces at the completion of the run?	
Did protracted or frequent “holds” occur during the test? Describe.	
Was a blank train setup identical to the actual sampling train, leak checked and heated to temperature?	
Were reagent blanks collected?	
Are the field data sheets clear and completely filled out?	
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Were the sampling probe and impinger (cold box) disconnected and separated from the filter (hot box) at the port location? Was the filter holder removed from the hot box at the port location? If so, were all component openings sealed with Teflon tape before relocating?	
Was particulate matter visible on the filter? Describe.	
Was the filter removed with tweezers and loose material inside the filter bell collected? Was the filter and any additional matter sealed in the original glass petri dish?	
Was the XAD resin trap weighed and the weight recorded on the Method 4 sheet?	
Were openings of the XAD resin trap sealed and wrapped with aluminum foil and labeled?	
Was each of the impingers weighed and the weight recorded on the Method 4 data sheet as the train was disassembled?	
Did the recoveries include triplicate acetone and methylene chloride rinses of the probe, nozzle, filter holder, condenser, and connecting glassware with all rinses collected in a single sample container?	
Did the recoveries include triplicate toluene rinses of the probe, nozzle, filter holder, condenser, and connecting glassware with all rinses collected in a discrete single sample container separate from the acetone and methylene chloride rinses?	
Was the entirety of the impinger liquid (condensate) collected?	

Observation	Comment
Was each impinger triplicate rinsed with deionized water and the rinses added to the recovered condensate?	
Were each impinger and connecting glassware triplicate acetone and methylene chloride rinsed with all rinses collected in a single sample container?	
Were each impinger and connecting glassware triplicate toluene rinsed with all rinses collected in a discrete single sample container separate from the acetone and methylene chloride rinses?	
Were solvent rinses identified and placed into amber glass bottles with Teflon-lined lids?	
Were reagents blanks collected?	
Was the blank train recovered in the same manner as the sample train?	
Were all samples properly labeled, liquid levels marked and stored on ice?	
Were COC and RFAs completed?	
Was sample tracking and labeling done in a manner to assist the laboratory in processing samples and understandable?	
Was the recovery area kept clean?	

Observation	Comment
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Was contamination minimized; glassware clean, openings covered and the train assembled in a manner that minimized contamination?	
Was the train assembled as identified in Method 202?	
Were weather conditions adverse to sampling? If so, describe measures taken to protect sampling equipment.	
Was the sampling area kept clean and orderly during testing?	
Were O_2 and CO_2 measured by Orsat or CEMS?	
Was the probe marked or other provisions made to ensure proper nozzle placement at traverse points?	
Were pre and post test leak checks conducted on the pitot tube? Were leak checks performed during each port change?	
Was the sample gas temperature monitored and recorded on the field data sheets? (exiting the last impinger should be $\leq$ 68°F and filter box and sample probe maintained at 248$\pm$25°)	
Was sampling time uniform at each traverse sample point?	
Were the sample train and consoles adequately monitored by operators and were log sheets maintained?	
Was the nozzle sealed if removed from the stack at the completion of the run prior to recovery?	
Was particulate matter carefully wiped off external surfaces at the completion of the run?	

Observation	Comment
Did protracted or frequent “holds” occur during the test? Describe.	
Are the field data sheets clear and completely filled out?	
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Was the train disassembled in part at the port location? If so, were component openings sealed before relocating?	
Was the filter removed with tweezers and loose material inside the filter bell collected? Was the filter and any additional matter sealed in the original glass petri dish?	
Were the primary filter and ambient filter both recovered intact without loss of particulate?	
Did the “front half” (probe, nozzle, and front half of filter holder) recovery include rinse of components with acetone?	
Did the “ambient” filter recovery include rinses of components with acetone and hexane?	
Were reagents blanks collected?	
Were all samples properly labeled and any liquid levels marked?	
Were COC and RFAs completed?	
Was sample tracking and labeling done in a manner to assist the laboratory in processing samples and understandable?	
Was the recovery area kept clean?	

Observation	Comment
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Was contamination minimized; glassware clean, openings covered and the train assembled in a manner that minimized contamination?	
Was the train assembled as identified in Method 26A?	
Was each of the impingers weighed and the weights recorded on the Method 4 data sheet as the train was assembled?	
Were weather conditions adverse to sampling? If so, describe measures taken to protect sampling equipment.	
Was the sampling area kept clean and orderly during testing?	
Were O_2 and CO_2 measured by Orsat or CEMS?	
Was the probe marked or other provisions made to ensure proper nozzle placement at traverse points?	
Was the glass fiber filter inspected before being placed in the filter holder?	
Were pre and post test leak checks conducted on the pitot tube? Were leak checks performed during each port change?	
Was the sample gas temperature monitored and recorded on the field data sheets? (exiting the last impinger should be $\leq$ 68°F and filter box and sample probe maintained at 248$\pm$25°)	
Was sampling time uniform at each traverse sample point?	

Observation	Comment
Were the sample train and consoles adequately monitored by operators and were log sheets maintained?	
Was the nozzle sealed if removed from the stack at the completion of the run prior to recovery?	
Was particulate matter carefully wiped off external surfaces at the completion of the run?	
Did protracted or frequent “holds” occur during the test? Describe.	
Were reagent blanks collected?	
Are the field data sheets clear and completely filled out?	

Observation	Comment
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Was condensate present in the sample train "front half" or did the filter appear wet? If so, explain actions taken?	
Were the sampling probe and impinger (cold box) disconnected and separated from the filter (hot box) at the port location? Was the filter holder removed from the hot box at the port location? If so, were all component openings sealed with Teflon tape before relocating?	
Was particulate matter visible on the filter? Describe.	
Was the filter removed with tweezers and loose material inside the filter bell collected? Was the filter and any additional matter sealed in the original glass petri dish?	
Was the filter recovered intact without loss of particulate?	
Did the "front half" (probe, nozzle, and front half of filter holder) recovery include rinse of components with acetone collected in a single bottle?	
Was each of the impingers weighed and the weight recorded on the Method 4 data sheet as the train was disassembled?	
Did the hydrogen chloride sample catch include recovery of the optional knockout condenser, sulfuric acid impingers, and rinse of components with DI water?	
Did the chlorine sample catch include the sodium hydroxide impingers and a rinse of components with DI water?	

Observation	Comment
Was the pH of the sodium hydroxide impinger catch > 8.0?	
Was the thiosulfate added to the chlorine catch?	
Were the hydrogen chloride and chlorine catches collected into labeled amber glass bottles with Teflon lined lids or polyethylene bottles?	
Were reagents blanks collected?	
Were all samples properly labeled and liquid levels marked?	
Were COC and RFAs completed?	
Was sample tracking and labeling done in a manner to assist the laboratory in processing samples and understandable?	
Was the recovery area kept clean?	

Observation	Comment
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
Was contamination minimized; glassware clean, openings covered and the train assembled in a manner that minimized contamination?	
Was the train assembled as identified in Method 0030?	
Were weather conditions adverse to sampling? If so, describe measures taken to protect sampling equipment.	
Was the sampling area kept clean and orderly during testing?	
Were pre and post test leak checks of the sample train conducted? Were leak checks performed each time the tube set was changed?	
Was sample gas temperatures monitored and recorded on field data sheets? (probe temperature should be 130°C and entering the Tenax cartridge should be <20°C)	
What were the test plan target rate (liters per minute) and total liters per sorbent tube set?	
Did the volume of sample not exceed 20 liters for each tube set?	
Were the sorbent cartridges prepared by the laboratory performing the analysis?	
Were the sample train and consoles adequately monitored by operators and were log sheets maintained?	
Was the nozzle sealed if removed from the stack at the completion of the run prior to recovery?	

Observation	Comment
Did protracted or frequent “holds” occur during the sample run? Describe.	
Were field blanks (reagent blanks &/or trip blanks) collected according to the plan?	
Are the field data sheets clear and completely filled out?	

Observation	Comment
General Observations and Comments	

Facility Name: _____ Unit: _____

Test/Run: _____ Signature _____

Date: _____ Start Time: _____ Stop Time: _____

Observation	Comment
With each sorbent tube change event, were the adsorbent traps capped after removal from the train and placed back into the original storage vials?	
Were at least four (4) sorbent tube sets collected during the test run?	
What were the test plan target rate (liters per minute) and total liters per sorbent tube set?	
Was the total condensate sample collected at the conclusion of the test run?	
Was the condensate sample collected into a glass VOA vial with a Teflon septum screw cap? Was organic free water added to the condensate vial to ensure no air bubbles were present?	
Was a sorbent tube set field blank collected?	
Was a sorbent tube set trip blank collected?	
Were the condensate vials and adsorbent tubes properly labeled and stored on ice promptly after recovery?	
Was a condensate blank collected?	
Were COC and RFAs completed?	
Was sample tracking and labeling done in a manner to assist the laboratory in processing samples and understandable?	
Were volatile sample media and samples kept separate from other samples?	

Observation	Comment
Was the recovery area kept clean?	
General Observations and Comments	

ATTACHMENT B

RESUMES AND CERTIFICATIONS FOR KEY PROJECT PERSONNEL

TEST COORDINATOR

CHRIS MCBRIDE

CHRIS MCBRIDE, P.E

Education

B.S., Chemical Engineering, Rose-Hulman Institute of Technology, Terre Haute, Indiana; 1985

Chemical Officer Basic Course, U.S. Army Chemical Center & School, Ft. McClellan, Alabama; October, 1985

Registration

Professional Engineer (PE), Tennessee (2000)

Certifications

OSHA 29 CFR 1910.120 40-hour Training and 8-hour Supervisor's Course

Affiliations

Coalition for Responsible Waste Incineration (CRWI)

American Institute of Chemical Engineers (AIChE)

Publications & Presentations

Author of over 10 Technical Publications and Presentations

Patents

United States Patent No. 5,881,654: Combustion Apparatus for Highly Energetic Materials; Fleming, J., Barkdoll, M., Westbrook, R. & McBride, C.; March 16, 1999.

CAREER SUMMARY

Mr. McBride is a Principal of Focus Environmental, Inc. and has more than 30 years of experience in hazardous and non-hazardous waste thermal treatment primarily in permitting, performance/trial burn test planning/execution, and combustion and emission control process optimization. This experience is concentrated in complying with the following US EPA rules:

- Hazardous Waste Combustor Maximum Achievable Control Technology (HWC MACT)
- Resource Conservation and Recovery Act (RCRA) Incinerators, and Boiler and Industrial Furnace (BIF)
- Toxic Substances Control Act (TSCA)
- Industrial, Commercial, and Institutional (ICI) Boiler MACT.

The types of units include rotary kiln, liquid, and fixed/movable hearth incinerators; liquid, solid, and vapor fuel-fired fired boilers; thermal oxidizers; process heaters; hydrochloric acid production furnaces; thermal desorption systems; munitions treatment units; and pathological waste crematories. His focus is planning and executing compliance tests to maximize flexibility and range of operation while complying with the applicable performance and emissions standards. His most recent work experience is management of the initial destruction efficiency testing of the Chemours Company, Fayetteville, North Carolina thermal oxidizer for treatment of emissions from poly- and per-fluorinated alkyl substances (PFAS) manufacturing operations. Testing was performed in conformance with the requirements of a Consent Decree.

Mr. McBride also has experience in the process design, and mass and energy balance modeling of the combustion systems and emissions control equipment. His prior experience was as a process engineer for an US Army facility for thermal treatment of conventional small arms, pyrotechnic, smoke, and incendiary munitions and associated waste materials that involved operation of rotary kiln, liquid, fixed/movable hearth, and fluidized bed incinerators Additional experience include contract oversight for the construction, commissioning, operation, and decommissioning of the in the U.S. Army Chemical Agent BZ Demilitarization Facility at Pine Bluff Arsenal (PBA), Arkansas.

SELECTED PROJECT EXPERIENCE

Performance Testing/Trial Burns

Prepared test plans and/or managed the performance/trial burn testing of hazardous waste thermal treatment units for the following commercial clients:

- Chemours Company thermal oxidizer destruction efficiency testing for treatment of emissions from PFAS manufacturing operations
- Clean Harbors (3 sites, 5 units)
- Occidental Chemical Company (3 sites, 5 units)
- LyondellBasell Chemical Company (2 sites, 4 units)
- DuPont Chemical Company (3 sites, 6 units)
- INVISTA S.à r.l. (5 units)
- General Electric
- Merichem-Sasol
- Sterling Chemical (3 units)
- Eli Lilly and Company (3 sites, 7 units)
- Eastman-Kodak
- Hexion US (formerly Momentive Specialty Chemicals and Resolution Performance Materials (2 units)
- Merck, Sharp & Dohme Quimica (MSDQ) (2 units)
- G.D. Searle (later Pfizer)
- Ascend Materials (formerly Solutia)
- Elf-AtoChem (now ATOFINA)
- Albemarle Corporation (now SI Group, Inc.)
- 3M Company
- Reynolds Aluminum
- Bayer Corporation (later Celanese) (2 units, 2 sites)
- Georgia Gulf
- Huntsman Petrochemical Corporation
- Linde Gas North America
- Rohm and Haas
- Teva Active Pharmaceutical Ingredients (TAPI) (2 units).

Weldon Spring Ordnance Works, Weldon Spring, Missouri. Process design and contracting for remediation treatment of explosives (TNT and DNT) contaminated soils and wooden pipeline components.

RCRA Part B Permit Renewals for Occidental Chemical Corporation, LyondellBasell Chemical Company, and Merck, Sharp & Dohme Quimica.

Syngenta's Yalding facility located southwest of Maidstone, Kent, UK. Provided technical oversight during performance testing of the thermal desorption treatment of pesticide contaminated soils.

Aberdeen Pesticide Dumps Site (APDS), Aberdeen, North Carolina. Prepared the test plan and managed the performance test for thermal desorption unit treating contaminated soils.

Bayou Bonfouca and Southern Shipbuilders Superfund Sites, Slidell, Louisiana. Managed the trial burn testing for IT Corporation's Hybrid Thermal Treatment System (HTTS®) unit treating contaminated soils and sediments.

IT Corporation's HTTS® unit at the dioxin contaminated Times Beach Site, Times Beach, Missouri. Prepared the waste characterization, trial burn plan, and delisting plan sections of the RCRA permit application.

U.S. Army Chemical Agent/Munitions Disposal System (USACAMDS), Tooele, Utah Demonstration test burn for the metal parts furnace treating ton containers with nerve agent GB (Sarin) heels.

IT Corporation's HTTS® unit at the dioxin contaminated Times Beach Site, Times Beach, Missouri. Prepared the waste characterization, trial burn plan, closure plan, and operator training plan for the RCRA/TSCA permit application to thermally treat PCB and dioxin wastes.

Merck, Sharp & Dohme Quimica rotary kiln incineration system, Barceloneta, Puerto Rico. Prepared the waste characterization, material and energy balances modeling, and preliminary process design.

Merck, Sharp & Dohme Quimica rotary kiln incineration system, Barceloneta, Puerto Rico. Prepared the RCRA permit application.

Merck Co., Inc. rotary kiln pathological waste incineration system and waste mangement facility, Rahway, New Jersey. Prepared the material and energy balances modeling, process selection assessment, and preliminary process design.

Indian Head Naval Surface Warfare Center, Indian Head, Maryland. Prepared the waste characterization, material and energy balances modeling, process selection assessment, and preliminary process design for the treatment of energetic wastes.

STATE OF TENNESSEE
DEPARTMENT OF
COMMERCE AND INSURANCE

MR CHRIS EUGENE MCBRIDE

ID NUMBER: 103719 31384
LIC STATUS: ACTIVE
EXPIRATION DATE: January 31, 2026

STATE BOARD OF ARCHITECTURAL AND ENGINEERING EXAMINERS
PROFESSIONAL ENGINEER
THIS IS TO CERTIFY THAT ALL REQUIREMENTS OF THE STATE OF TENNESSEE HAVE BEEN MET

MR CHRIS EUGENE MCBRIDE
4000 ANTIOCH CHURCH RD W
LENOIR CITY TN 37772

13752560

State of Tennessee

STATE BOARD OF ARCHITECTURAL AND ENGINEERING EXAMINERS
PROFESSIONAL ENGINEER
MR CHRIS EUGENE MCBRIDE

This is to certify that all requirements of the State of Tennessee have been met.

ID NUMBER: 103719
LIC STATUS: ACTIVE
EXPIRATION DATE: January 31, 2026

IN-1313
DEPARTMENT OF
COMMERCE AND INSURANCE

STACK SAMPLING TEAM LEADER

BILL ANSELL

CleanAir

Bill Ansell

Midwest Engineering Group Technical Leader and Sr. Project Manager

Professional Profile

Mr. Ansell has over 30 years of experience in the environmental field in the areas of air emissions testing and consulting. He was initially hired as a Field Engineer. Since 1988, Mr. Ansell has been involved with projects utilizing EPA, ASTM, NIOSH, ASME methods from the planning stage through field execution and reporting. In addition, Mr. Ansell has extensive process and control device knowledge across a variety of industries including:

- municipal and medical waste combustors;
- petrochemical industries and refineries;
- utility and institutional coal, oil, and natural gas-fired boilers;
- foundries and steel mills;
- simple and combined cycle gas turbines;
- printing and coating facilities;
- automotive assembly plants;
- glass plants;
- food processing facilities;
- ammunition plants; and
- pulp and paper mills, as well as other industrial sources.

Mr. Ansell was responsible for projects performed in 30 states as well as China, South Korea, Puerto Rico, Morocco, and the Bahamas.

Relevant Experience

Automotive Assembly Plant; Mishawaka, IN

Project Manager and Field Test Leader for a VOC capture and destruction efficiency test program conducted on the e-coat, prime, and topcoat paint lines at an automotive assembly plant. Project included verifying that enclosures surrounding paint lines met criteria for permanent and temporary total enclosures per EPA Method 204. VOC emissions from five sources to the control device, as well as fugitive VOC emissions from 16 sources, were determined simultaneously, following EPA Methods 1-4, 25A, and 204B. Tests were conducted with a nine-man test crew

Yeast Production Facility; Memphis, TN

Project Manager and Field Test Leader for annual VOC emission test programs to meet requirements of the facility's Title V Permit and 40 CFR 63, Subpart CCCC - National Emissions Standards for Hazardous Air Pollutants: Manufacturing of Nutritional Yeast. Client monitors brew ethanol concentrations during production instead of installing fermenter exhaust monitors. NESHAP requires testing to develop a brew to exhaust correlation calculation relating the brew ethanol concentration during fermentation to THC emissions concentration as propane. Test programs were conducted over complete production batches, 13 to 31 hours in duration requiring multiple test crews for 24-hour coverage on-site.

Paper Mill; Rhinelander, WI

Project Manager and Field Test Leader for a VOC capture and destruction efficiency test program on a thermal oxidizer system serving a paper coater line. The test program included the construction of a temporary total enclosure (TTE), including a fugitive vent system to prevent VOC concentrations from building up within the enclosure, which surrounded the coater to allow the VOC capture efficiency to be determined and the process to be operated normally.

Project Manager and Field Test Leader for performance and compliance test programs on coal and natural gas-fired boilers, including the initial certification and annual RATA for SO_2, NO_X, CO, HCl, and PM CEMS, as well as sorbent trap mercury emissions testing.

Coal-Fired Power Plant (Wet Scrubber); Huntington, UT

Project Manager and Field Test Leader for a wet flue gas desulfurization (FGD) system performance guarantee test program at a coal-fired power plant. The FGD test program included determining SO_2 emissions from the FGD system as well as determining overall FGD system pressure drop, stoichiometry ratio, gypsum oxidation level and percent solids dewatering. The sound pressure levels for new operating equipment related to the FGD system, including slurry pumps and ID Booster Fans, were measured as well.

Limestone slurry and gypsum slurry samples were collected and analyzed to determine reagent / byproduct quality, limestone consumption rates and scrubber stoichiometry. Preliminary particulate, SO_2 and SO_3 results were determined on-site.

Coal-Fired Power Plant (SCR, ACI, Dry FGD); Big Stone City, ND

Project Manager and Field Test Leader for a boiler pressure part modification and separated over fire air (SOFA) system, dry flue gas desulfurization (DFGD) system, activated carbon injection (ACI) system, selective catalytic reduction (SCR) system, and centrifugal ID fan system performance guarantee test program on a coal-fired boiler. The boiler pressure and SOFA tests included measuring pressure losses, heat output, and unburned carbon. The SCR performance tests included measuring pressure loss, power consumption, SO_2, SO_3, NO_X and ammonia emissions and ammonia distribution. The ACI system tests included measuring flue gas flow rate and composition, powdered activated carbon (PAC) injection rate, and sound pressure levels around ACI process equipment. The DFGD system tests included measuring flue gas flow rate and composition, filterable and condensable particulate matter (FPM and CPM), SO_2, SO_3, HCl, lime stoichiometry, power consumption, pressure loss, and sound pressure levels around specified DFGD equipment. The ID Fan performance tests included measuring flue gas temperatures, static and total pressures, and 3-D flow rates, including pitch and yaw angles and axial velocity.

The test program was conducted in a single mobilization using a 13-man test crew over an 11-day period. Preliminary analytical results for SO_2, SO_3, HCl, FPM, and ammonia were performed on-site by CleanAir personnel.

Coal-Fired Power Plant (SNCR and SCR); Healy, AK

Project Manager and Field Test Leader for SCR and SNCR performance guarantee test programs on two coal-fired boilers: one with SNCR system and one with SCR system. The SNCR test program included determining ammonia slip and ammonia emissions. The SCR test program included determining NO_X removal efficiency, SO_2 to SO_3 oxidation rate, and ammonia slip. Preliminary analytical results for SO_2, SO_3, and ammonia were performed on-site by CleanAir personnel.

Petrochemical Refinery; Morris, Illinois

Project Manager and Test Leader for multiple test programs on polyethylene and polypropylene production processes and waste gas flares at a petrochemical facility. The test programs included determining concentrations and mass emission rates of THCs and specific VOCs. VOC sampling programs included both collecting integrated grab samples in Tedlar bags or impingers for analysis by gas chromatography (GC) with multiple detectors, as well as direct interface sampling with GC/FID.

Test programs ranged from two-day test programs with two crew members to week-long, round the clock test programs with large test crews at multiple sources. Most test programs included on-site sample analysis using GC/FID.

Coal-Fired Power Plant (SCR, DSI, and AH); Fruitland, NM

Project Manager and Test Leader for a performance test program conducted on dry sorbent injection (DSI), SCR, and tri-sector air pre-heater (APH) systems installed on a coal-fired boiler. The DSI and SCR testing included the determination of SO_2 to SO_3 conversion rate, NO_X removal efficiency, NO_X to ammonia distribution, ammonia slip, boundary to boundary and intermediate pressure drops, power consumption, sound pressure levels of system components, hydrated urea and hydrated lime consumption, and particulate emissions from material handling duct collectors.

Tri-sector APH testing included determining primary and secondary air draft losses and flue gas draft loss. The air to gas leakage across the APH, as well as outlet temperature (without leakage), were also determined.

The test program was conducted in a single mobilization using a 15man test crew over an 11-day period. Preliminary analytical results for SO_2, SO_3, HCl, FPM, and ammonia were performed on-site by CleanAir personnel.

Combined Cycle Gas Turbine; Bundang, South Korea

Project Manager for an emissions test program conducted on a combined cycle gas turbine generator to collect data for completing construction permits for future similar installations in the United States. Pollutant emissions determined included FPM and CPM, NO_X, CO, THC, methane, ethane, propane, propylene, iso-butane, butane and butene. Preparation and mobilization for the project, including the shipment of all test equipment and reagents, were conducted in a period of less than two weeks.

Professional Certifications & Qualifications

OSHA 10-Hour
Hazardous Materials Shipping Certification
NSC CPR/AED Certification
NSC First-Aid Certification

Qualified Source Testing Individual (QSTI) Test Exams (Certificate No. 2008-271):

- Group 1 (Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods)
- Group 2 (Manual Gaseous Pollutants Source Sampling Methods)
- Group 3 (Gaseous Pollutants Source Sampling Methods)
- Group 4 (Hazardous Metals Measurement Methods)

Qualified Individual (QI)

Field Test Leader	Field Laboratory	Project Manager
Performance Specification 11 (PS11 – Particulate Matter)	SW-846 Test Method 0011 (Aldehydes & Ketones)	SW-846 Test Method 0030/0031 (Volatile Organic Compounds)
Performance Specification 12B (PS12B – Mercury Using Sorbent Trap)	EPA Method 22 (Fugitive Emissions)	EPA Methods 23 / SW-846 0010/0023A (PCDD/PCDF/SVOC)
EPA Method 25 (Total Gaseous Non-Methane Organics)	Trace Metals	EPA Method 204 (Permanent or Temporary Total Enclosure)
SW-846 Test Method 0061 / EPA Method 306 (Chromium)	Conditional Test Method 027 (Ammonia)	Other Test Method 29 (Hydrogen Cyanide)
Modified EPA Conditional Test Method 013 Controlled Condensation Method	CARB Method 501 (Size Distribution of Particulate Matter)	

Education

Southern Illinois University; Carbondale, Illinois
Bachelor of Science in Mechanical Engineering Technology, 1988

William Rainey Harper College; Palatine, Illinois
Associate of Arts in Liberal Arts, 1985

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

WILLIAM F. ANSELL, Jr.

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 6TH DAY OF JULY 2022 AND EFFECTIVE UNTIL JULY 5TH, 2027

Peter R. Westlin, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Tommy Lotz, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE
NO.
2008-271

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

WILLIAM F. ANSELL, Jr.

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 24TH DAY OF APRIL 2024 AND EFFECTIVE UNTIL APRIL 23RD, 2029

Peter R. Westlin, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Tommy Lotz, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE
NO.
2008-271

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

WILLIAM F. ANSELL, Jr.

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 7TH DAY OF JULY 2022 AND EFFECTIVE UNTIL JULY 6TH, 2027

Peter R. Westlin, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Tommy Lotz, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE
NO.
2008-271

SOURCE EVALUATION SOCIETY
CORPORATE SEAL
1995
NORTH CAROLINA

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

WILLIAM F. ANSELL, Jr.

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT METHODS

ISSUED THIS 24TH DAY OF APRIL 2024 AND EFFECTIVE UNTIL APRIL 23RD, 2029

Peter R. Westlin, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Tommy Lotz, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE
NO.
2008-271

SOURCE EVALUATION SOCIETY
CORPORATE SEAL
1995
NORTH CAROLINA

ALTERNATE STACK SAMPLING TEAM LEADER

ERIC DOAK

ERIC DOAK

Project Engineer / Project Manager

PROFESSIONAL PROFILE

Mr. Doak has over 22 years of experience in all aspects of environmental air testing involving compliance, diagnostic, guarantee, performance and experimental work. Responsibilities have included location leader, laboratory work/on-site analysis, job leading and report writing.

Mr. Doak has extensive experience in performing EPA Methods 1-4, 5, 5B, 5F,6, 6C, 7E, 8, 9, 10, 11, 12, 13B, 15A, 16A, 17, 18, 19, 20, 22, 23, 25, 25A, 26, 26 modified (ammonia), 26A, 29, 30B, 30B modified (speciated mercury), 101A, 104, 108, 201A, 202, 205, 301, 306, 316, 320; conditional test methods (CTM) 011, modified 013B/ASTM-CCM (Controlled Condensation Method), 027, ASTM_D6784 -02 (Ontario-Hydro Method), Solid Waste 846 methods 0010, 0011, 0061 and Performance Specifications (PS) 2, 3, 4, 4A, 8, 8A, 12B and 15.

Since 1994, he has been involved with projects at many different facilities including coal fired power plants, natural gas turbines, municipal waste incinerators, hazardous waste incinerators, cement kilns, steel mills, paper mills, oil refineries, chemical plants, biomass, Marcellus shale gas compressor stations and other specialty industries,

As a Project Engineer, Mr. Doak was the leader of many projects in the field working with clients and crew members to finish projects efficiently and safely as possible. Mr. Doak has been a Qualified Stack Testing Individual (QSTI) in Groups 1-4 for 10 years. He has also written site specific test plans, test protocols, cost estimates, proposals, test reports and performed on-site visits. In addition, Mr. Doak has also managed several smaller projects for the Eastern Region from writing the test plan to the final report.

As a lab technician, Mr. Doak has extensive laboratory experience, performing gravimetric analysis; sulfates and chlorides analysis by titration, ion specific electrode analysis for ammonia, as well as ion chromatography analysis for sulfate, chloride and ammonia. He also ran the Eastern Region laboratory from 1995 to 2001, where he was responsible for packing chemicals and glassware in addition to performing sample analysis and generating lab reports for a multitude of projects.

As a technician, Mr. Doak has performed instrument calibrations, equipment maintenance and repair and many continuous improvement projects. He has a wide array of experience with continuous emissions monitoring systems (CEMS), including the ECOM analyzer, Horiba -250 portable gas analyzer, FTIR MKS MG2000 analyzer and Clean Air's proprietary Multiple Access Sampling System (MASS) used for balancing a selective catalytic reduction (SCR) system. Along with the responsibilities mentioned above, Mr. Doak is the lead operator of Clean Air's acquired mercury IRM CEM. He has generated an operating manual and has provided training to individuals regarding its proper use.

Mr. Doak has also worked on many international projects, traveling to several countries including Philippines, Ghana, Trinidad, Hong Kong, Taiwan, Sweden and Canada.

Project Experience

Covanta Energy

Performed compliance testing on stack and inlet to SDA, visible emissions, field test leader, and manager of the field lab at over twenty municipal solid waste (MSW) incinerator facilities. A multitude of test methods were performed including EPA Methods 1-5, 6C, 7E, 9, 10, 12, 13B, 18, 22, 23/0010, 26, 29, 101A, 201A, 202 and SW-846 0061.

Bechtel Corporation, Mauban, Philippines

Performed compliance and guarantee testing on a pulverized coal-fired power plant. Responsibilities included air monitoring equipment and observation of opacity at various emissions sources.

China Light & Power (CLP), Tuen Mun Hong Kong

Performed guarantee testing on a coal-fired power plant. Performed Method 5B testing vertically with a 33 ft. probe with help from local plant workers.

Indiantown Cogeneration L.P., Indiantown, Florida

Performed visible emissions at various emissions sources, on-site ammonia slip results across SCR beds, three relative accuracy test audits (RATA) and coordinating PM on the stack. Also led a crew in performing the five-year compliance testing for the site.

Wheeling-Pittsburgh Steel Corporation, Steubenville, Ohio

Led a crew of seven and coordinated testing with 3 shift supervisors sequentially for PM testing at three different locations during the steel making process.

Babcock Borsig Power, Kentucky

Conducted testing program on ECOM-S+ analyzer at the inlet and outlet of an SCR bed to determine the effectiveness of the catalyst beds.

Mitsubishi Power, Florida Power and Light

Conducted CEMS and particulate testing used to tune three gas fired combustion turbines with a HRSG (Heat Recovery Steam Generator) and provided analysis and results for guarantee testing.

Columbia Gas, West Virginia

Conducted compliance testing on 4-stroke lean-burn compressor engines using CEMS and an FTIR.

Professional Certifications

Qualified Source Testing Individual (QSTI) Test Exams (Certificate No.2007-062):

- Group I (Manual Gas Volume and Flow Measurements and Isokinetic Particulate Sampling Methods)
- Group II (Manual Gaseous Pollutants Source Sampling Methods)
- Group III (Gaseous Pollutants Source Sampling Methods)
- Group IV ((Hazardous Metals Measurement Sampling Methods)

EDUCATION

Community College of Allegheny County
AS, Chemistry. 1989

Pennsylvania State University
Bachelor of Science in Chemical Engineering, 1992

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

ERIC C. DOAK

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GAS VOLUME MEASUREMENTS AND ISOKINETIC PARTICULATE SAMPLING METHODS

ISSUED THIS 7TH DAY OF JANUARY 2022 AND EFFECTIVE UNTIL JANUARY 6TH, 2027

Peter R. Westlin, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2007-062

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

ERIC C. DOAK

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

MANUAL GASEOUS POLLUTANTS SOURCE SAMPLING METHODS

ISSUED THIS 3RD DAY OF FEBRUARY 2022 AND EFFECTIVE UNTIL FEBRUARY 2ND, 2027

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2007-062

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

ERIC C. DOAK

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

GASEOUS POLLUTANTS INSTRUMENTAL SAMPLING METHODS

ISSUED THIS 15TH DAY OF DECEMBER 2021 AND EFFECTIVE UNTIL DECEMBER 14TH, 2026

Peter R. Westlin, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2007-062

B-21

SOURCE EVALUATION SOCIETY

Qualified Source Testing Individual

LET IT BE KNOWN THAT

ERIC C. DOAK

HAS SUCCESSFULLY PASSED A COMPREHENSIVE EXAMINATION AND SATISFIED EXPERIENCE REQUIREMENTS IN ACCORDANCE WITH THE GUIDELINES ISSUED BY THE SES QUALIFIED SOURCE TEST INDIVIDUAL REVIEW BOARD FOR

HAZARDOUS METALS MEASUREMENT SAMPLING METHODS

ISSUED THIS 5TH DAY OF FEBRUARY 2021 AND EFFECTIVE UNTIL FEBRUARY 4TH, 2026

Peter R. Westlin, QSTI/QSTO Review Board

J. Wade Bice, QSTI/QSTO Review Board

Peter S. Pakalnis, QSTI/QSTO Review Board

Karen D. Kajiya-Mills , QSTI/QSTO Review Board

Tina Sanderson, QSTI/QSTO Review Board

Bruce Randall QSTI/QSTO Review Board

CERTIFICATE NO. 2007-062

SOURCE EVALUATION SOCIETY CORPORATE SEAL 1995 NORTH CAROLINA

B-22

SPIKING MANAGER

R. SCOTT NEAL

RESUME: ROBERT SCOTT NEAL

CAREER SUMMARY: MORE THAN 28 YEARS OF PERTINENT EXPERIENCE WITH >25 YEARS OF GENERAL MANAGEMENT EXPERIENCE INCLUDING , (1) SUPERVISION OF MILITARY AND MAJOR CIVILIAN SUPPLY TRAIN OPERATIONS, AND (2) MORE THAN 5 YEARS EXPERIENCE AS PLANT MANAGER OF A PROCESSING PLANT INCLUDING PROCESS DESIGN; EQUIPMENT SELECTION, PROCUREMENT, AND INSTALLATION; AND PLANT PRE-COMMISSIONING, STARTUP, & OPERATION AND (3) TWELVE 14 YRS. IN THE HAZARDOUS WASTE MANAGEMENT INDUSTRIES CONDUCTING AND MANAGING SPIKING PROJECTS. WITH SPECIAL TALENT FOR RESOURCEFUL PROBLEM SOLVING AND BRINGING PROJECTS TO COMPLETION HAS LEAD TO SUCCESSFULLY COMPLETING > 225 SPIKING PROJECTS FOR HWC AND THERMAL TREATMENT FACILITIES SINCE 2004.

PERSONAL PROFILE: EXPOSURE TO VARIOUS ASPECTS OF BUSINESS IN CLUDING MANAGEMENT, FINACE, ACCOUNTING, HUMAN RESOURCES, MARKETING AND MERCHANDISING. SPECIAL TALENT FOR USING INNOVATED AND RESOUREFUL METHODS IN PROBLEM SOLVING, TIME MANAGEMENT AND PLANNING. ADAPTABLE, QUICK EARNER HIGHLY MOTIVATED AND GOAL ORIENTATED.

PROFESSIONAL EXPERIENCE:

SSI, INC. 2010-PRESENT
PASADENA, TEXAS. PROJECT MANAGER

RESPONSIBILITIES INCLUDE: ALL ASPECTS OF SSI' SPIKING MATERIALS PREPARATION AND SPIKING SERVICES DELIVERY TO FACILITIES CONDUCTING HWC MACT CPTS, MINIBURNS, RCRA (& TSCA) TRIAL BURNS AND BIF TESTS AND HWC MACT CPTS AND VENT INCINERATORS (TOUS) CONDUCTING MON, HON, PHARMA, PAI, ETC MACT CPTS. IS DIRECTLY RESPONSIBLE FOR ALL SSI PROJECTS FROM INITIAL PROJECT DEFINITION & COSTING, PROPOSAL PREPARATION, PROJECT PLANNING INCLUDING EQUIPMENT SELECTION, SPIKING MATERIALS SPECIFICATION AND COMPOSITION CERTIFICATION, OFF-SITE TECHNICAL & TROUBLE-SHOOTING SUPPORT TO SSI TECHNICIANS DURING ON-SITE SPIKING EFFORTS, AND SPIKING REPORT PREPARATION AND SPIKING RATE RESULTS CERTIFICATION. DIRECT RESPONSIBILITY FOR CERTIFICATION OF SPIKING MATERIAL COMPOSITION AND REPORTED SPIKING RATE RESULTS.

ESS, INC. 2004-2010
PEARLAND, TEXAS. OPERATIONS MANAGER

RESPONSIBILITIES INCLUDE: PLANNED, MANAGED, &/OR REPORTED THE RESULTS OF HWC COMPREHENSIVE PERFORMANCE TESTS (CPTS), TRIAL BURNS (TBS), MINIBURNS (MBS), AND BOILER & INDUSTRIAL FURNACE (BIF) CERTIFICATION/RE-CERTIFICATION OF COMPLIANCE (COC/RCOC) TESTS.

ALL OPERATION FUNCTIONS FOR THE PROJECT, INCLUDING: (1) SPIKING MATERIALS PREPARATION, (2) PRE-MOB AND PRE- & POST-TEST VERIFICATION OF SPIKING EQUIPMENT OPERABILITY AND ACCURACY, (3) SATISFACTION OF ALL CLIENT'S SPIKING RATE REQUIREMENTS, AND (4) CAPTURE OF ALL SPIKING MATERIAL COMPOSITION, SPIKING RATE, AND QA/QC DATA FOR THIS PROJECT.

SUMMARY: EIGHT (8) YEARS OF EXPERIENCE DIRECTLY RELATED TO HAZARDOUS WASTE COMBUSTION (HWC): (1) REGULATIONS, (2) TESTING (INCLUDING SPIKING), (3) COMPLIANCE, AND (4) OPERATIONS. SUCCESSFULLY COMPLETED MORE THAN 125 SPIKING PROJECTS FOR HWC AND THERMAL TREATMENT FACILITIES SINCE 2004. CONTRIBUTED TO THE DEVELOPMENT OF SEVERAL SPIKING TECHNIQUES THAT ARE NOW CONSIDERED INDUSTRY STANDARDS &/OR BEST PRACTICES. CONSISTENTLY PRODUCED A WIDE RANGE OF INNOVATIVE SOLUTIONS TO CHALLENGES ENCOUNTERED THROUGHOUT CAREER.

EUNICE RICE MILL, INC 1995-2004
EUNICE, LOUISIANA PLANT MANAGER

RESPONSIBILITIES INCLUDE: PROCESS DESIGN; EQUIPMENT SELECTION, PROCUREMENT, AND INSTALLATION; AND PLANT PRE-COMMISSIONING, STARTUP, & OPERATION. DEVELOPED AND IMPLEMENTED COORPARATE POLICIES AND PROCEDURES. HIRED AND TRAINED ALL STAFF. HEADED UP QUALITY CONTROL PROGRAM TO MEET FGIS (USDA) STANDARDS.

NORTHLAND FROZEN FOODS 1992-1995
LE COMPTE, LOUISIANA PLANT MANAGER

RESPONSIBILITIES INCLUDE: PROCESS DESIGN; EQUIPMENT SELECTION, PROCUREMENT, AND INSTALLATION; AND PLANT PRE-COMMISSIONING, STARTUP, & OPERATION. DEVELOPED AND IMPLEMENTED COORPARATE POLICIES AND PROCEDURES. HIRED AND TRAINED ALL STAFF.

USAF 1989-1992
CIVIL ENGINEERING PRODUCTION/DAMAGE CONTROL MANAGER
PANAMA CITY, PANAMA - OPERATION JUST CAUSE
DHAHRAN, SAUDI ARABIA - OPERATION DESSERT STORM
CARIBOU, ME – LORING AIR FORCE BASE

PROFESSIONAL ACHIEVEMENTS:
1. WROTE AND IMPLEMENTED SAFETY PROGRAMS THAT EXCEEDED OSHA STANDARDS AND HELD SAFETY MEETINGS, RESULTING IN NO LOSE TIME OR OSHA REPORTABLE INCEDENTS DURNING EMPLOYMENT HISTORY.
2. HONORABLE DISCHARGED FROM USAF.

EDUCATION:
ST EDMOND HIGH SCHOOL -1988
LOUISIANA STATE UNIVERSITY OF EUNICE -1989
USAF -1989-1992
OVER 2,500 LOGGED HRS OF PLANT SAFETY AND ORIENTATIONS

SAMPLE CUSTODIAN

JAMES WHITEHEAD

Education

B. S., Civil & Environmental Engineering, University of Tennessee, 2024

Registrations

Engineer-In-Training Tennessee (2024)

Certifications

OSHA 40-hour Training

JAMES W. WHITEHEAD, E.I.T.

CAREER SUMMARY

Mr. Whitehead is an engineer at Focus Environmental, Inc. and is a registered Engineer-In-Training (E.I.T.) in Tennessee. He has experience in reviewing drawings and testing data from large projects. These projects involve thermal treatment and air pollution control systems to treat hazardous or non-hazardous waste materials, as well as contaminated soils and sediments. These projects have been conducted for clients in diverse industries, including waste management, oil and gas, site remediation, organic chemical, pharmaceutical, and explosives.

Mr. Whitehead has worked on several different projects that have utilized a thermal treatment technology for processing waste materials. These projects have used several types of thermal technologies, including thermal desorption systems, rotary kiln incinerators, and thermal oxidizers. These systems have been equipped with a broad range of feed material handling, air pollution control, and treated solids handling equipment.

Mr. Whitehead's experience includes reviewing and editing equipment specifications and design plans, systematically inputting and organizing data in spreadsheets for subsequent analytical processing, reviewing and creating PFDs and P&IDs, reviewing incineration design drawings, and research involving the advanced technology of carbon impregnation with reactive reagents.

SELECTED PROJECT EXPERIENCE

Clean Harbors, Eldorado, Arkansas - Entered test result data into spreadsheets for later analysis. The data consisted of information regarding PCBs and PAHs concentrations in solid and liquid hazardous waste to be fed to two different incineration systems. This data consisted of information for eight test runs.

U.S. Army Explosive Waste Incinerator Design -Assisted in gathering quotes for specific incineration equipment and writing specifications for the incineration design. Created digital drawings for the incineration system including PFDs and P&IDs. Assisted in the creation of a proposal and cost estimation that covered the project.

Nelson, Bien Hoa, Vietnam - Reviewed documents/reports for final approval and reviewed drawings for the completion of the thermal desorption equipment design. The report reviewed was the overall master plan of the incineration system and its process. The reviewing of drawings process included commenting on incorrect/correct 3D-images of the thermal desorption and emissions control equipment and sending the comments back for corrections or documentation.

Confidential, Thermal Oxidizer Design - Various MEB conditions were evaluated for the desired design of the incineration system and reported to the client for observation. Several sets of field test data were compiled to complete accurate graphical information that was used for subsequent analysis.

Evonik - Comprehensive Performance Test - Reviewed a comprehensive performance test plan and ensured the materials in the plan were updated and accurate to achieve the goals of the test.

Bracewell - Analyzed data and assisted in determining if certain waste materials could be processed by an incinerator.

Clean Harbors, El Dorado, Arizona – Assisted with data reduction and organization using spreadsheets. The data consisted of values collected during a multi-day stack test. The purpose of the tests was to evaluate the incinerator's performance in destroying various waste chemicals, including PFAS.

IperionX Titanium Processing Design – Created digital PFD drawings for the titanium furnace system.

Experience and Background

2024-Present Engineer at Focus Environmental, Inc., Knoxville, Tennessee

2022-2023 Engineering Intern/Technician at Environmental Consulting Services, Knoxville Tennessee

- Safely traveled and completed tasks in Middle TN, East TN, and Maine
- Performed concrete testing (Air and Water content)
- Completed laboratory tasks (Concrete Cylinder Compressive Strength Tests, Atterberg Limit Tests, Proctor Tests, Soil Classification)
- Observed/inspected several construction site phases (Rebar Inspection, Vibro Pier Inspection, Fire Retardant for Steel Inspection)
- Completed Geotechnical tests in Maine with several other technicians and general managers (MASW and Refraction Tests)

LABORATORY PROJECT MANAGER

COURTNEY ADKINS

PERSONNEL RESUME

COURTNEY
ADKINS
Project Manager Supervisor

QUALIFICATIONS SUMMARY

Ms. Adkins has worked in the environmental industry since 2007 and is currently the Project Manager Supervisor specializing in Source Air and Specialty Projects. Ms. Adkins holds a Bachelor of Science degree in Biology from Lincoln Memorial University. She coordinates and manages complex projects through all phases of laboratory operations. She maintains communications with clients and serves as a liaison between clients and laboratory operations. Her experience also includes sample receipt, log-in, confirming and verifying analytical test parameters, reviewing reports and invoicing. Ms. Adkins also has several years of experience in the extraction of routine and non-routine sample matrices using EPA approved methods.

PROFESSIONAL EXPERIENCE

SENIOR PROJECT MANAGER / MANAGER OF PROJECT MANGEMENT | *Eurofins Knoxville – 2023 to Present*
In addition to specialty project management, oversight of the local Project Managers, Project Management Assistants, and Sample Receiving Staff. Works with the specialty sales team on proposals and business development plans.

PROJECT MANAGER | *Eurofins Knoxville – 2017 to 2023*
Oversight of specialty projects from development to report and invoice generation. Worked with clients to review quality assurance project plans and data review checklists. Served as a client advocate to ensure that the laboratory met the analytical needs of the client as well as scheduled sampling media delivery and sample courier services. Participated in on-site client visits as well as on-site sample collection and project management.

PROJECT MANAGEMENT ASSISTANT | *2010 to 2017*
Worked under the guidance of a senior project manager to generate detailed cost estimates, review sample logins, place sampling media and bottle orders. Served as a point of contact for clients. Acted as a back-up for the senior project manager. Served as a back-up for sample receipt and login. Maintained face-to face client contact by participating in on-site client visits and meetings.

CHEMIST, SPECIALTY ORGANICS EXTRACTION LABORATORY | *2007 to 2010*
Performed extractions, preparations, and clean-ups of dioxins/furans and PCBs from a variety of raw sample matrices. Prepared source air sampling media for field collection.

EDUCATION

- B.S. Biology, Lincoln Memorial University – Harrogate, TN (2007)

PROFESSIONIAL AFFILIATIONS

- Source Evaluation Society Member
- Air and Waste Management Association Member

PUBLICATIONS

- Patti B. Bales, William C. Anderson, Courtney M. Adkins "The Sampling and Analysis Strategy for the Characterization of Selected Perfluorinated Alkyl Substances (PFAS) in Stack Gas" Annual Conference of the Pacific Northwest International Section (PNWIS) of the Air and Waste Management Association (AWMA), Butte, MO (October 2019)
- I.C. MacGregor, A. Frank, B.A. Seay, J.T. Eastep, G.A. Fenton, J.R. Thorn, M. Schumitz, D.M. Schumitz, D. Heiss, S.S. Buehler, M.W. McCauley, K. Abrams, K. Dasu, P.M. Meeter, W. Fritz, L. Kammer, W.C. Anderson, C. Adkins, and K. Begin, "PFAS Mass Balance and Emission Factors at a Wastewater Treatment Plant and Collocated Sewage Sludge Incinerator" presented at the 12th International Conference on Remediation of Chlorinated and Recalcitrant Compounds (May 2022)

QUALITY ASSURANCE OFFICER

TERESA BALES

TERESA BALES

Education

B.S., Environmental Science, University of West Alabama (formerly Livingston University), Livingston, Alabama; 1980

Certifications

OSHA 29 CFR 1910.120 40-hour Training and current refresher

Transportation Worker Identification Credentials

Association of Reciprocal Safety Councils, Inc.
Basic Plus training and current refresher

Publications & Presentations

Eicher, Anthony R., Teresa White, and Ron McLeod, Evaluation of the Recovery of Volatile Organic Compounds on Solids Sorbents Used in Stack Gas Sampling Systems, International Thermal Treatment Conference, New Orleans, Louisiana, May 2002.

Holcomb, D.H., C. H. Vail, and T. M. White, Establishing Risk-Based Acceptable Ambient Air Concentrations and Offsite Ambient Air Monitoring, Remediation of Chlorinated and Recalcitrant Compounds Conference, Monterey, California, May, 2000.

CAREER SUMMARY

Ms. Bales has more than 36 years (including 20 years with Focus) of experience serving clients with projects to achieve compliance with regulatory requirements. Her primary objective is to support clients' with test and analytical data quality assurance and validation requirements.

Ms. Bales experience includes providing data validation services, serving as the quality assurance officer (QAO) for compliance testing projects, auditing, working as a laboratory analyst, and performing regulatory compliance inspections. Her previous experience is serving as a program manager for a state environmental regulatory agency. Ms Bales has developed Field Sampling and Analysis Plans, Feedstream Analysis Plans, Quality Assurance Project Plans, and Operations and Maintenance Plans for a variety of clients. She has also assisted clients with their Resource Conservation and Recovery Act (RCRA) Part B renewal applications. Her validation and/or quality assurance services have been provided for projects conducted under a number of regulatory programs including Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), RCRA, Clean Air Act (CAA), Clean Water Act (CWA), Toxic Substance Control Act (TSCA), Food and Drug Administration (FDA), and various state regulatory programs. She also has experience in complying with waste transportation regulations and industry guidelines, including U.S. Department of Transportation (DOT) regulations and International Air Transport Association (IATA).

SELECTED PROJECT EXPERIENCE

Associate Scientist, Focus Environmental, Knoxville, TN. Primary responsibilities include providing analytical data review (data validation) for compliance with project specific quality objectives, managing data validation projects, and serving as QAO for compliance testing projects. Data validation services for each project includes providing a comprehensive data validation report with summary tables of deviations from the prescribed data quality objectives and their affect on the quality of the analytical data. QAO responsibilities include preparation of Quality Assurance Project Plans (QAPPs), coordination with analytical laboratories to ensure sample analytical activities meet the data quality objectives of the project and all records are properly reported; performing on-site audits to ensure that proper sampling procedures are being followed and samples are being properly secured and preserved; ensuring that any non-compliance with required protocols are addressed and documented using Corrective Action Request (CARs); and reviewing sampling and analytical data and reporting findings for inclusion in the project reports. Other responsibilities include development, Field Sampling Plans (FSPs), Sampling and Analysis Plans (SAPs), Feedstream Analysis Plans (FAPs), Operations and Maintenance Plans (O&MPs), providing laboratory audits, and providing technical assistance to Project Managers to address various QA issues.

Associate Scientist, Focus Compliance & Validation Services (a Division of Focus Environmental), Knoxville, TN. Primary responsibilities included activities required to perform compliance validation for computer systems regulated as medical devices by FDA. Compliance validation activities include review of computer system capabilities and upgrades to determine the activities requiring validations, developing and executing test protocols. Additional activities include performing compliance audits, performing reviews and updates to facility Standard Operating Procedures (SOPs), and reviewing and updating computer system specifications/configurations.

Data Validation Project Manager, IT/Quanterra Field Analytical Services, Knoxville, TN. Primary responsibility involved supervisory reviews of analytical data validation conducted by junior data validators for consistency and accuracy. Additional responsibilities included management of personnel to meet project schedule and budget requirements. Projects included QA/QC review (data validation) of data from the U.S. Department of Energy Hazardous Waste Remedial Actions Program (HAZWRAP), validation of data for compliance with U.S. EPA Contract Laboratory Program (EPA-CLP) requirements, and validation of data and development of validation guidelines from project SOPs for non-CLP data. Other responsibilities include writing analytical data validation reports, developing sampling and quality assurance plans, and providing technical assistance to clients as necessary.

Environmental Quality Coordinator over the Water Quality Management Unit, Louisiana Department of Environmental Quality, Baton Rouge, Louisiana. Responsible for the overall coordination and supervision of the activities of the personnel in this unit. These activities included development and negotiations of work plans and applications to obtain federal grant money, managing state contracts including tracking invoices and submittal of deliverables, managing U.S. Environmental Protection Agency (EPA) grants to assure that all grant commitments were met and that moneys were spent appropriately, development and implementation of the states Non-point Source Pollution program, and the development and updating of Water Quality Management Plan documents.

Environmental Quality Specialist, Louisiana Department of Environmental Quality, Baton Rouge, Louisiana. Responsibilities included inspection of state and federally permitted facilities for compliance with National Pollutant Discharge Elimination System (NPDES) and state water regulations, inspection of un-permitted facilities to identify possible discharge sources, responding to citizen's complaints, collecting water, fish, and sediment samples for analysis, setting up and managing a wet chemistry laboratory for the regional office, performing chronic and acute biotoxicity analysis, and assisting in stream surveys.

Environmental Specialist, Industrial Waste Division, Oklahoma State Department of Health, Oklahoma City, Oklahoma. Responsibilities included enforcing RCRA and State Industrial Waste Regulations. This included inspection of waste generators, transporters and treatment-storage-disposal facilities (TSD), providing technical assistance to facilities concerning industrial and hazardous waste issues, response to and follow-up monitoring of spills and clean-ups, and work with DOT regulations to provide assistance to facilities during the transition from using individual state manifests to the RCRA uniform manifest system.

A-LINE ENVIRONMENTAL, SAFETY, AND HEALTH (ESH) MANAGER

ALEX ESCH

Alex Esch

9600 South Main Street Tonkawa, Oklahoma 74653
(580) 628-1276 | alexesch34@gmail.com

WORK EXPERIENCE

Feb. 2025/ Present **A-Line TDS, Inc.**
Director of Operations

- Managing the operations across the facility for production, environmental, health, and safety.
- Analyzing, creating, and reporting department processes for maximum efficiency.
- Representing the company nationwide and explaining in depth recycling processes.

Aug. 2023/ Feb. 2025 **A-Line TDS, Inc.**
Operations Manager / EHS Manager

- Oversight of the oil operations to ensure outgoing oil sales are met and deploying preventative maintenance, production, and safety.
- Oversight of the Data Entry operations is to ensure all electrical equipment is documented and reported accurately. Creating detailed reports of the equipment received keeps all parties in compliance with investment recovery and environmental reporting.

Nov. 2017/ Feb. 2025 **A-Line TDS, Inc.**
Environmental, Health, and Safety Manager

- Ensuring all rules and regulations are followed thoroughly with DOT, EPA, OSHA, and NFPA.
- Evaluating safety for the environment, equipment, and processes in the following categories: refinery, laboratory, DOT, maintenance, traveling crews, general laborers, contractors, and office.
- Developing, managing, and implementing on site standard operating procedures internally and externally for satisfaction of production while maintaining a fundamental safety program.
- Perform proper and responsive training for 135+ facility members.
- Being the Responsible Official for all reporting requirements for OSHA, DEQ of Oklahoma, and the EPA. Annual reports are the PCB report, Tier II, and Toxic Release Inventory.
- Identifying risks and trends and then taking appropriate action to minimize or eliminate them.
- Handling cases with workers compensation claims, accidents, and federal and state officials.
- Providing a vast amount of knowledge related to permits, certifications, and EHS plans for audits.
- Being on call 24/7 in the event of a situation or emergency.

Sep. 2017/ Jan. 2018 **A-Line TDS, Inc.**
Operations Services – Assistant Manager

- Managing the contents of all items received on a manifest/BOL brought by transportation.

Aug. 2016/ Sep. 2017 **A-Line TDS, Inc.**
Process Operator & Laboratory Technician

- Removing Polychlorinated Biphenyls, known as PCBs, from transformer oil by creating sodium dispersion from its origin.
- Testing oil for PCBs by using a SHIMADZU Gas Chromatography.
- Manually and using computer operated controls to operate pumps and valves.
- Data tracking of oil flow and production. (Railcars, tankers, storage tanks, and processing tanks)
- Eliminating water from PCB and mineral oil by operating two dehydrators and a centrifuge.
- Oil management of PCB levels and water concentration levels measured by parts per million.
- Troubleshooting and performing maintenance work to ensure the longevity of equipment.

May. 2016/ Aug. 2016 **A-Line TDS, Inc.**
Transformer Dismantler – Crew Lead

- In charge of a 12-person crew to dismantle electrical equipment.
- Operating heavy equipment such as cranes, material handlers, forklifts, and general power tools.
- Overseeing five workstations to ensure safety and production was efficiently performed.

ACADEMIC QUALIFICATIONS

Mar. 2017 **Northern Oklahoma College – Process Technology**

May 2016 **Tonkawa High School**

CERTIFICATIONS

- OSHA 30 Hour – General Industry
- OSHA 40 Hour HAZWOPPER – GHS and OSHA Hazardous Communication
- Certified Environmental Specialist
- Heart Saver CPR AED & First Aid
- TWIC Card – Transportation Worker Identification Credential
- Drug and Alcohol Reasonable Suspicion Testing
- Department of Transportation (DOT) Training

SKILLS AND ASSETS

- Motivated work ethic
- Strong Communication (Oral and written)
- Multi-tasker
- Advanced in Microsoft Office
- Problem solver / trouble shooter

ATTACHMENT C

EUROFINS CERTIFICATIONS

EUROFINS LIST OF CERTIFICATIONS

Accreditation/Certification Summary

Laboratory: Eurofins Knoxville

All accreditations/certifications held by this laboratory are listed. Not all accreditations/certifications are applicable to this report.

Authority	Program	Identification Number	Expiration Date
	AFCEE	N/A	
ANAB	Dept. of Defense ELAP	L2311	02-13-27
ANAB	Dept. of Energy	L2311.01	02-13-27
ANAB	ISO/IEC 17025	L2311	02-13-27
Arkansas DEQ	State	88-0688	06-17-25
Colorado	State	TN00009	02-28-26
Connecticut	State	PH-0223	10-01-26
Florida	NELAP	E87177	06-30-25
Georgia (DW)	State	906	07-27-25
Hawaii	State	NA	07-27-25
Kansas	NELAP	E-10349	10-31-25
Kentucky (DW)	State	90101	12-31-25
Louisiana (All)	NELAP	03079	06-30-25
Louisiana (DW)	State	LA019	12-31-25
Maryland	State	277	03-31-26
Michigan	State	9933	07-27-25
Nevada	State	TN00009	07-31-25
New Hampshire	NELAP	2999	01-18-26
New Jersey	NELAP	TN001	06-30-25
New York	NELAP	10781	04-01-26
North Carolina (DW)	State	21705	07-31-25
North Carolina (WW/SW)	State	64	12-31-25
Oklahoma	State	9415	08-31-25
Oregon	NELAP	TNI0189	01-01-26
Pennsylvania	NELAP	68-00576	12-31-25
Tennessee	State	02014	07-28-25
Texas	NELAP	T104704380	08-31-25
US Fish & Wildlife	US Federal Programs	058448	07-31-25
USDA	US Federal Programs	525-22-279-18762	10-06-25
Utah	NELAP	TN00009	07-31-25
Virginia	NELAP	460176	09-14-25
Washington	State	C593	01-19-26
West Virginia (DW)	State	9955C	01-31-26
West Virginia DEP	State	345	04-30-25
Wisconsin	State	998044300	08-31-25

EUROFINS FLORIDA CERTIFICATION

State of Florida
Department of Health, Bureau of Public Health Laboratories
This is to certify that

E87177

EUROFINS KNOXVILLE
5815 MIDDLEBROOK PIKE
KNOXVILLE, TN 37921

has complied with Florida Administrative Code 64E-1,
for the examination of environmental samples in the following categories

DRINKING WATER - DIOXIN, NON-POTABLE WATER - EXTRACTABLE ORGANICS, NON-POTABLE WATER - GENERAL CHEMISTRY, NON-POTABLE WATER - METALS, NON-POTABLE WATER - PESTICIDES-HERBICIDES-PCB'S, NON-POTABLE WATER - VOLATILE ORGANICS, SOLID AND CHEMICAL MATERIALS - EXTRACTABLE ORGANICS, SOLID AND CHEMICAL MATERIALS - GENERAL CHEMISTRY, SOLID AND CHEMICAL MATERIALS - METALS, SOLID AND CHEMICAL MATERIALS - PESTICIDES-HERBICIDES-PCB'S, SOLID AND CHEMICAL MATERIALS - VOLATILE ORGANICS, BIOLOGICAL TISSUE - EXTRACTABLE ORGANICS, BIOLOGICAL TISSUE - PESTICIDES-HERBICIDES-PCB'S, AIR AND EMISSIONS - EXTRACTABLE ORGANICS, AIR AND EMISSIONS - PESTICIDES-HERBICIDES-PCB'S, AIR AND EMISSIONS - VOLATILE ORGANICS

Continued certification is contingent upon successful on-going compliance with the NELAC Standards and FAC Rule 64E-1 regulations. Specific methods and analytes certified are cited on the Laboratory Scope of Accreditation for this laboratory and are on file at the Bureau of Public Health Laboratories, P. O. Box 210, Jacksonville, Florida 32231. Clients and customers are urged to verify with this agency the laboratory's certification status in Florida for particular methods and analytes.

Date Issued: July 01, 2024 Expiration Date: June 30, 2025

Marie-Claire Rowlinson, PhD, D(ABMM)
Bureau of Public Health Laboratories
DH Form 1697, 7/04
NON-TRANSFERABLE E87177-40-07/01/2024
Supersedes all previously issued certificates

Laboratory Scope of Accreditation

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Drinking Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 1613B	10120602	Dioxin	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5105	1,1,1,2-Tetrachloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5105	1,1,1,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5160	1,1,1-Trichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5160	1,1,1-Trichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5110	1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5110	1,1,2,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5165	1,1,2-Trichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5165	1,1,2-Trichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4630	1,1-Dichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4630	1,1-Dichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4640	1,1-Dichloroethylene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4640	1,1-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4670	1,1-Dichloropropene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4670	1,1-Dichloropropene	EPA 8260D	10307127	Volatile Organics	4/25/2023
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9453	1,2,3,4,7,8-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9453	1,2,3,4,7,8-Hxcdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9471	1,2,3,4,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9471	1,2,3,4,7,8-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9456	1,2,3,6,7,8-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9456	1,2,3,6,7,8-Hxcdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9474	1,2,3,6,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9474	1,2,3,6,7,8-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9459	1,2,3,7,8,9-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9459	1,2,3,7,8,9-Hxcdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9477	1,2,3,7,8,9-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9477	1,2,3,7,8,9-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9540	1,2,3,7,8-Pecdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9540	1,2,3,7,8-Pecdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9543	1,2,3,7,8-Pecdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9543	1,2,3,7,8-Pecdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
5150	1,2,3-Trichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5150	1,2,3-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5180	1,2,3-Trichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5180	1,2,3-Trichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5210	1,2,4-Trimethylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5210	1,2,4-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4635	1,2-Dichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4635	1,2-Dichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4655	1,2-Dichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4655	1,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
6220	1,2-Diphenylhydrazine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6220	1,2-Diphenylhydrazine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6220	1,2-Diphenylhydrazine	EPA 8270E	10242543	Extractable Organics	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5215	1,3,5-Trimethylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5215	1,3,5-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4660	1,3-Dichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4660	1,3-Dichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
8952	2,2',3,3' + 2,2',3,4 + 2,3',4',6 - Tetrachlorobiphenyls (BZ 40 + 41 + 71)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8952	2,2',3,3' + 2,2',3,4 + 2,3',4',6 - Tetrachlorobiphenyls (BZ 40 + 41 + 71)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8919	2,2',3,3',4,4' + 2,3,4,4',5,6 - Hexachlorobiphenyls (BZ 128 + 166)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8919	2,2',3,3',4,4' + 2,3,4,4',5,6 - Hexachlorobiphenyls (BZ 128 + 166)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9095	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9095	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9101	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9101	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9102	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9102	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8916	2,2',3,3',4,4',6 + 2,2',3,3',4,5,6 - Heptachlorobiphenyls (BZ 171 + 173)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8916	2,2',3,3',4,4',6 + 2,2',3,3',4,5,6 - Heptachlorobiphenyls (BZ 171 + 173)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9104	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9104	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8934	2,2',3,3',4,5,5',6 + 2,2',3,3',4,5,5',6' - Octachlorobiphenyls (BZ 198 + 199)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8934	2,2',3,3',4,5,5',6 + 2,2',3,3',4,5,5',6' - Octachlorobiphenyls (BZ 198 + 199)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9107	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9107	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9110	2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9110	2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9111	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9111	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9115	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9115	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8921	2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4,5,6+2,3,3',4' ,5,6 - Hexachlorobiphenyls (BZ 129+138+160+163)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8921	2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4,5,6+2,3,3',4' ,5,6 - Hexachlorobiphenyls (BZ 129+138+160+163)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9117	2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9117	2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9119	2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9119	2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9121	2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9121	2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9122	2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9122	2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8939	2,2',3,3',5 + 2,2',4,4',5 - Pentachlorobiphenyls (BZ 83 + 99)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8939	2,2',3,3',5 + 2,2',4,4',5 - Pentachlorobiphenyls (BZ 83 + 99)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9123	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9123	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9124	2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9124	2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9125	2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9125	2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8924	2,2',3,3',5,6 + 2,2',3,4,5,6' - Hexachlorobiphenyls (BZ 134 + 143)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8924	2,2',3,3',5,6 + 2,2',3,4,5,6' - Hexachlorobiphenyls (BZ 134 + 143)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8927	2,2',3,3',5,6' + 2,2',3,5,5',6 - Hexachlorobiphenyls (BZ 135 + 151)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8927	2,2',3,3',5,6' + 2,2',3,5,5',6 - Hexachlorobiphenyls (BZ 135 + 151)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9126	2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9126	2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9130	2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9130	2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9131	2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9131	2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8941	2,2',3,4,4' + 2,3,4,5,6 + 2,3,4',5,6 - Pentachlorobiphenyls (BZ 85 + 116 + 117)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8941	2,2',3,4,4' + 2,3,4,5,6 + 2,3,4',5,6 - Pentachlorobiphenyls (BZ 85 + 116 + 117)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8917	2,2',3,4,4',5,5' + 2,3,3',4',5,5',6 - Heptachlorobiphenyls (BZ 180 + 193)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8917	2,2',3,4,4',5,5' + 2,3,3',4',5,5',6 - Heptachlorobiphenyls (BZ 180 + 193)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8918	2,2',3,4,4',5',6 + 2,2',3,4,5,5',6 - Heptachlorobiphenyls (BZ 183 + 185)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8918	2,2',3,4,4',5',6 + 2,2',3,4,5,5',6 - Heptachlorobiphenyls (BZ 183 + 185)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9135	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9135	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9137	2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9137	2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9136	2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9136	2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9138	2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9138	2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8928	2,2',3,4,4',6 + 2,2',3,4,4',6' - Hexachlorobiphenyls (BZ 139 + 140)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8928	2,2',3,4,4',6 + 2,2',3,4,4',6' - Hexachlorobiphenyls (BZ 139 + 140)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9139	2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9139	2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8948	2,2',3,4',5 + 2,2',4,5,5' + 2,3,3',5',6 - Pentachlorobiphenyls (BZ 90 + 101 + 113)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8948	2,2',3,4',5 + 2,2',4,5,5' + 2,3,3',5',6 - Pentachlorobiphenyls (BZ 90 + 101 + 113)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9144	2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9144	2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8929	2,2',3,4',5,6 + 2,2',3,4',5',6 - Hexachlorobiphenyls (BZ 147 + 149)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8929	2,2',3,4',5,6 + 2,2',3,4',5',6 - Hexachlorobiphenyls (BZ 147 + 149)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9145	2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9145	2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9146	2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9146	2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9148	2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9148	2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9150	2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9150	2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9147	2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9147	2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8901	2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,6+2,3',4,4',6+2,3',4',5',6-PeCB(BZ86+87+97+109+119+125)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8901	2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,6+2,3',4,4',6+2,3',4',5',6-PeCB(BZ86+87+97+109+119+125)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8947	2,2',3,4,6 + 2,2',3,4',6 - Pentachlorobiphenyls (BZ 88 + 91)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8947	2,2',3,4,6 + 2,2',3,4',6 - Pentachlorobiphenyls (BZ 88 + 91)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8951	2,2',3,4',6' + 2,2',4,5,6' - Pentachlorobiphenyls (BZ 98 + 102)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8951	2,2',3,4',6' + 2,2',4,5,6' - Pentachlorobiphenyls (BZ 98 + 102)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9156	2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9156	2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9157	2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9157	2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9161	2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9161	2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9162	2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9162	2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8957	2,2',3,5' + 2,2',4,4' + 2,3,5,6 - Tetrachlorobiphenyls (BZ 44 + 47 + 65)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8957	2,2',3,5' + 2,2',4,4' + 2,3,5,6 - Tetrachlorobiphenyls (BZ 44 + 47 + 65)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8956	2,2',3,5 + 2,3',5',6 - Tetrachlorobiphenyls (BZ 43 + 73)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8956	2,2',3,5 + 2,3',5',6 - Tetrachlorobiphenyls (BZ 43 + 73)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9164	2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9164	2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8949	2,2',3,5,6 + 2,2',4,4',6 - Pentachlorobiphenyls (BZ 93 + 100)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8949	2,2',3,5,6 + 2,2',4,4',6 - Pentachlorobiphenyls (BZ 93 + 100)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9165	2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9165	2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9167	2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9167	2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8958	2,2',3,6 + 2,2',4,6' - Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8958	2,2',3,6 + 2,2',4,6' - Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9170	2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9170	2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9171	2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9171	2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9173	2,2',3-Trichlorobiphenyl (BZ 16)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9173	2,2',3-Trichlorobiphenyl (BZ 16)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8931	2,2',4,4',5,5' + 2,3',4,4',5',6 - Hexachlorobiphenyls (BZ 153 + 168)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8931	2,2',4,4',5,5' + 2,3',4,4',5',6 - Hexachlorobiphenyls (BZ 153 + 168)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9176	2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9176	2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8959	2,2',4,5' + 2,3',4,6 - Tetrachlorobiphenyls (BZ 49 + 69)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8959	2,2',4,5' + 2,3',4,6 - Tetrachlorobiphenyls (BZ 49 + 69)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9179	2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9179	2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9181	2,2',4,5-Tetrachlorobiphenyl (BZ 48)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9181	2,2',4,5-Tetrachlorobiphenyl (BZ 48)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8961	2,2',4,6 + 2,2',5,6' - Tetrachlorobiphenyls (BZ 50 + 53)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8961	2,2',4,6 + 2,2',5,6' - Tetrachlorobiphenyls (BZ 50 + 53)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9182	2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9182	2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9185	2,2',4-Trichlorobiphenyl (BZ 17)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9185	2,2',4-Trichlorobiphenyl (BZ 17)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8966	2,2',5 + 2,4,6 - Trichlorobiphenyls (BZ 18 + 30)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8966	2,2',5 + 2,4,6 - Trichlorobiphenyls (BZ 18 + 30)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9187	2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9187	2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9188	2,2',6-Trichlorobiphenyl (BZ 19)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9188	2,2',6-Trichlorobiphenyl (BZ 19)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9189	2,2'-Dichlorobiphenyl (BZ 4)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9189	2,2'-Dichlorobiphenyl (BZ 4)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
4665	2,2-Dichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4665	2,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270C	10185805	Extractable Organics	4/25/2023

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Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270D	10186035	Extractable Organics	4/25/2023
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270E	10242543	Extractable Organics	4/25/2023
8967	2,3,3' + 2,4,4' - Trichlorobiphenyls (BZ 20 + 28)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8967	2,3,3' + 2,4,4' - Trichlorobiphenyls (BZ 20 + 28)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8932	2,3,3',4,4',5 + 2,3,3',4,4',5' - Hexachlorobiphenyls (BZ 156 + 157)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8932	2,3,3',4,4',5 + 2,3,3',4,4',5' - Hexachlorobiphenyls (BZ 156 + 157)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9190	2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9190	2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9191	2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9191	2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9192	2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9192	2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8937	2,3,3',4,5' + 2,3',4',5,5' - Pentachlorobiphenyls (BZ 108 + 124)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8937	2,3,3',4,5' + 2,3',4',5,5' - Pentachlorobiphenyls (BZ 108 + 124)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9194	2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9194	2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9196	2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9196	2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9197	2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9197	2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9200	2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9200	2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9201	2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9201	2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9204	2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9204	2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9205	2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9205	2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9202	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9202	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8938	2,3,3',4',6 + 2,3,4,4',6 - Pentachlorobiphenyls (BZ 110 + 115)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8938	2,3,3',4',6 + 2,3,4,4',6 - Pentachlorobiphenyls (BZ 110 + 115)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9208	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9208	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9209	2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9209	2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9210	2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9210	2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9211	2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9211	2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9214	2,3,3',5-Tetrachlorobiphenyl (BZ 57)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9214	2,3,3',5-Tetrachlorobiphenyl (BZ 57)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9213	2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9213	2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8962	2,3,3',6 + 2,3,4,6 + 2,4,4',6 - Tetrachlorobiphenyls (BZ 59 + 62 + 75)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8962	2,3,3',6 + 2,3,4,6 + 2,4,4',6 - Tetrachlorobiphenyls (BZ 59 + 62 + 75)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8968	2,3,4 + 2,3',4' - Trichlorobiphenyls (BZ 21 + 33)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8968	2,3,4 + 2,3',4' - Trichlorobiphenyls (BZ 21 + 33)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9055	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9055	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9005	2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9005	2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9000	2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9000	2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8963	2,3,4,5 + 2,3',4',5 + 2,4,4',5 + 2,3',4',5' - Tetrachlorobiphenyls (BZ 61 + 70 + 74 + 76)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8963	2,3,4,5 + 2,3',4',5 + 2,4,4',5 + 2,3',4',5' - Tetrachlorobiphenyls (BZ 61 + 70 + 74 + 76)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9223	2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9223	2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9226	2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9226	2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9233	2,3,4',5-Tetrachlorobiphenyl (BZ 63)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9233	2,3,4',5-Tetrachlorobiphenyl (BZ 63)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9232	2,3',4,5-Tetrachlorobiphenyl (BZ 67)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9232	2,3',4,5-Tetrachlorobiphenyl (BZ 67)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9231	2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9231	2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9480	2,3,4,6,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9480	2,3,4,6,7,8-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9236	2,3,4',6-Tetrachlorobiphenyl (BZ 64)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9236	2,3,4',6-Tetrachlorobiphenyl (BZ 64)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9549	2,3,4,7,8-Pecdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9549	2,3,4,7,8-Pecdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9240	2,3',4-Trichlorobihenyl (BZ 25)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9240	2,3',4-Trichlorobihenyl (BZ 25)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9241	2,3,4'-Trichlorobiphenyl (BZ 22)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9241	2,3,4'-Trichlorobiphenyl (BZ 22)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8969	2,3',5 + 2,4,5 - Trichlorobiphenyls (BZ 26 + 29)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8969	2,3',5 + 2,4,5 - Trichlorobiphenyls (BZ 26 + 29)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9242	2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9242	2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9245	2,3,5-Trichlorobihenyl (BZ 23)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9245	2,3,5-Trichlorobihenyl (BZ 23)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9246	2,3',5'-Trichlorobihenyl (BZ 34)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9246	2,3',5'-Trichlorobihenyl (BZ 34)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9248	2,3',6-Trichlorobihenyl (BZ 27)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9248	2,3',6-Trichlorobihenyl (BZ 27)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9247	2,3,6-Trichlorobiphenyl (BZ 24)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9247	2,3,6-Trichlorobiphenyl (BZ 24)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9612	2,3,7,8-TCDF	EPA 1613B	10120602	Extractable Organics	11/7/2023
9612	2,3,7,8-TCDF	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9249	2,3'-Dichlorobiphenyl (BZ 6)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9249	2,3'-Dichlorobiphenyl (BZ 6)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6835	2,4,5-Trichlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6835	2,4,5-Trichlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6835	2,4,5-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
9255	2,4',6-Trichlorobihenyl (BZ 32)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9255	2,4',6-Trichlorobihenyl (BZ 32)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6840	2,4,6-Trichlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6840	2,4,6-Trichlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6840	2,4,6-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
9257	2,4-Dichlorobiphenyl (BZ 7)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9257	2,4-Dichlorobiphenyl (BZ 7)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9256	2,4'-Dichlorobiphenyl (BZ 8)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9256	2,4'-Dichlorobiphenyl (BZ 8)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6000	2,4-Dichlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6000	2,4-Dichlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6000	2,4-Dichlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6130	2,4-Dimethylphenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6130	2,4-Dimethylphenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6130	2,4-Dimethylphenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6175	2,4-Dinitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6175	2,4-Dinitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6175	2,4-Dinitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270E	10242543	Extractable Organics	4/25/2023
9258	2,5-Dichlorobiphenyl (BZ 9)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9258	2,5-Dichlorobiphenyl (BZ 9)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9259	2,6-Dichlorophenyl (BZ 10)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9259	2,6-Dichlorophenyl (BZ 10)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270E	10242543	Extractable Organics	4/25/2023
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260D	10307127	Volatile Organics	4/25/2023
8915	2-Chlorobiphenyl (BZ 1)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8915	2-Chlorobiphenyl (BZ 1)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5795	2-Chloronaphthalene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5795	2-Chloronaphthalene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5795	2-Chloronaphthalene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5800	2-Chlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
5800	2-Chlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
5800	2-Chlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
4535	2-Chlorotoluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4535	2-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4860	2-Hexanone	EPA 8260B	10184802	Volatile Organics	4/25/2023
4860	2-Hexanone	EPA 8260D	10307127	Volatile Organics	4/25/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6385	2-Methylnaphthalene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6385	2-Methylnaphthalene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6385	2-Methylnaphthalene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270E	10242543	Extractable Organics	4/25/2023
6460	2-Nitroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
6460	2-Nitroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
6460	2-Nitroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
6490	2-Nitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6490	2-Nitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6490	2-Nitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
9060	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9060	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9015	3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9015	3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8965	3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8965	3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9260	3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9260	3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9262	3,3',4,5-Tetrachlorobiphenyl (BZ 78)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9262	3,3',4,5-Tetrachlorobiphenyl (BZ 78)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9261	3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9261	3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9263	3,3',4-Trichlorobihenyl (BZ 35)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9263	3,3',4-Trichlorobihenyl (BZ 35)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9264	3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9264	3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9265	3,3',5-Trichlorobihenyl (BZ 36)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9265	3,3',5-Trichlorobihenyl (BZ 36)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5945	3,3'-Dichlorobenzidine	EPA 8270C	10185805	Extractable Organics	4/25/2023
5945	3,3'-Dichlorobenzidine	EPA 8270D	10186035	Extractable Organics	4/25/2023
5945	3,3'-Dichlorobenzidine	EPA 8270E	10242543	Extractable Organics	4/25/2023
8925	3,3'-Dichlorobiphenyl (BZ 11)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8925	3,3'-Dichlorobiphenyl (BZ 11)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8914	3,4 + 3,4' - Dichlorobiphenyls (BZ 12 + 13)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8914	3,4 + 3,4' - Dichlorobiphenyls (BZ 12 + 13)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8970	3,4,4',5-Tetrachlorobiphenyl (BZ 81)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8970	3,4,4',5-Tetrachlorobiphenyl (BZ 81)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9266	3,4,4'-Trichlorobiphenyl (BZ 37)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9266	3,4,4'-Trichlorobiphenyl (BZ 37)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9267	3,4,5-Trichlorobihenyl (BZ 38)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9267	3,4,5-Trichlorobihenyl (BZ 38)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9268	3,4',5-Trichlorobihenyl (BZ 39)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9268	3,4',5-Trichlorobihenyl (BZ 39)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9271	3,5-Dichlorobiphenyl (BZ 14)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9271	3,5-Dichlorobiphenyl (BZ 14)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9272	3-Chlorobiphenyl (BZ 2)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9272	3-Chlorobiphenyl (BZ 2)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6465	3-Nitroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
6465	3-Nitroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
6465	3-Nitroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
9273	4,4'-Dichlorobiphenyl (BZ 15)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9273	4,4'-Dichlorobiphenyl (BZ 15)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5660	4-Bromophenyl phenyl ether	EPA 8270C	10185805	Extractable Organics	4/25/2023
5660	4-Bromophenyl phenyl ether	EPA 8270D	10186035	Extractable Organics	4/25/2023
5660	4-Bromophenyl phenyl ether	EPA 8270E	10242543	Extractable Organics	4/25/2023
5700	4-Chloro-3-methylphenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
5700	4-Chloro-3-methylphenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
5700	4-Chloro-3-methylphenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
5745	4-Chloroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
5745	4-Chloroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
5745	4-Chloroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
9274	4-Chlorobiphenyl (BZ 3)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9274	4-Chlorobiphenyl (BZ 3)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5825	4-Chlorophenyl phenylether	EPA 8270C	10185805	Extractable Organics	4/25/2023
5825	4-Chlorophenyl phenylether	EPA 8270D	10186035	Extractable Organics	4/25/2023
5825	4-Chlorophenyl phenylether	EPA 8270E	10242543	Extractable Organics	4/25/2023
4540	4-Chlorotoluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4540	4-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4995	4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4995	4-Methyl-2-pentanone (MIBK)	EPA 8260D	10307127	Volatile Organics	4/25/2023
6410	4-Methylphenol (p-Cresol)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6410	4-Methylphenol (p-Cresol)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6410	4-Methylphenol (p-Cresol)	EPA 8270E	10242543	Extractable Organics	4/25/2023
6470	4-Nitroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
6470	4-Nitroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
6470	4-Nitroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
6500	4-Nitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6500	4-Nitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6500	4-Nitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
5500	Acenaphthene	EPA 8270C	10185805	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5500	Acenaphthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5500	Acenaphthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5505	Acenaphthylene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5505	Acenaphthylene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5505	Acenaphthylene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4315	Acetone	EPA 8260B	10184802	Volatile Organics	4/25/2023
4315	Acetone	EPA 8260D	10307127	Volatile Organics	4/25/2023
5510	Acetophenone	EPA 8270C	10185805	Extractable Organics	4/25/2023
5510	Acetophenone	EPA 8270D	10186035	Extractable Organics	4/25/2023
5510	Acetophenone	EPA 8270E	10242543	Extractable Organics	4/25/2023
1000	Aluminum	EPA 6010C	10155905	Metals	4/25/2023
1000	Aluminum	EPA 6010B	10155609	Metals	4/25/2023
5545	Aniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
5545	Aniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
5545	Aniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
5555	Anthracene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5555	Anthracene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5555	Anthracene	EPA 8270E	10242543	Extractable Organics	4/25/2023
1005	Antimony	EPA 6010C	10155905	Metals	4/25/2023
1005	Antimony	EPA 6010B	10155609	Metals	4/25/2023
8880	Aroclor-1016 (PCB-1016)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8885	Aroclor-1221 (PCB-1221)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8890	Aroclor-1232 (PCB-1232)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8895	Aroclor-1242 (PCB-1242)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8900	Aroclor-1248 (PCB-1248)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8905	Aroclor-1254 (PCB-1254)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8910	Aroclor-1260 (PCB-1260)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
1010	Arsenic	EPA 6010C	10155905	Metals	4/25/2023
1010	Arsenic	EPA 6010B	10155609	Metals	4/25/2023
1015	Barium	EPA 6010C	10155905	Metals	4/25/2023
1015	Barium	EPA 6010B	10155609	Metals	4/25/2023
4375	Benzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4375	Benzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5595	Benzidine	EPA 8270C	10185805	Extractable Organics	4/25/2023
5595	Benzidine	EPA 8270D	10186035	Extractable Organics	4/25/2023
5595	Benzidine	EPA 8270E	10242543	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5575	Benzo(a)anthracene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5575	Benzo(a)anthracene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5575	Benzo(a)anthracene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5580	Benzo(a)pyrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5580	Benzo(a)pyrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5580	Benzo(a)pyrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5585	Benzo(b)fluoranthene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5585	Benzo(b)fluoranthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5585	Benzo(b)fluoranthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5590	Benzo(g,h,i)perylene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5590	Benzo(g,h,i)perylene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5590	Benzo(g,h,i)perylene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5600	Benzo(k)fluoranthene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5600	Benzo(k)fluoranthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5600	Benzo(k)fluoranthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5610	Benzoic acid	EPA 8270C	10185805	Extractable Organics	4/25/2023
5610	Benzoic acid	EPA 8270D	10186035	Extractable Organics	4/25/2023
5610	Benzoic acid	EPA 8270E	10242543	Extractable Organics	4/25/2023
5630	Benzyl alcohol	EPA 8270C	10185805	Extractable Organics	4/25/2023
5630	Benzyl alcohol	EPA 8270D	10186035	Extractable Organics	4/25/2023
5630	Benzyl alcohol	EPA 8270E	10242543	Extractable Organics	4/25/2023
1020	Beryllium	EPA 6010C	10155905	Metals	4/25/2023
1020	Beryllium	EPA 6010B	10155609	Metals	4/25/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270C	10185805	Extractable Organics	4/25/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270D	10186035	Extractable Organics	4/25/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270E	10242543	Extractable Organics	4/25/2023
5765	bis(2-Chloroethyl) ether	EPA 8270C	10185805	Extractable Organics	4/25/2023
5765	bis(2-Chloroethyl) ether	EPA 8270D	10186035	Extractable Organics	4/25/2023
5765	bis(2-Chloroethyl) ether	EPA 8270E	10242543	Extractable Organics	4/25/2023
1025	Boron	EPA 6010C	10155905	Metals	4/25/2023
1025	Boron	EPA 6010B	10155609	Metals	4/25/2023
1540	Bromide	EPA 300.0	10053200	General Chemistry	2/1/2002
1540	Bromide	EPA 9056A	10199607	General Chemistry	4/25/2023
4385	Bromobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4385	Bromobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4390	Bromochloromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4390	Bromochloromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4395	Bromodichloromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4395	Bromodichloromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4400	Bromoform	EPA 8260B	10184802	Volatile Organics	4/25/2023
4400	Bromoform	EPA 8260D	10307127	Volatile Organics	4/25/2023
5670	Butyl benzyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
5670	Butyl benzyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
5670	Butyl benzyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
1030	Cadmium	EPA 6010C	10155905	Metals	4/25/2023
1030	Cadmium	EPA 6010B	10155609	Metals	4/25/2023
1035	Calcium	EPA 6010C	10155905	Metals	4/25/2023
1035	Calcium	EPA 6010B	10155609	Metals	4/25/2023
5680	Carbazole	EPA 8270C	10185805	Extractable Organics	4/25/2023
5680	Carbazole	EPA 8270D	10186035	Extractable Organics	4/25/2023
5680	Carbazole	EPA 8270E	10242543	Extractable Organics	4/25/2023
4450	Carbon disulfide	EPA 8260B	10184802	Volatile Organics	4/25/2023
4450	Carbon disulfide	EPA 8260D	10307127	Volatile Organics	4/25/2023
4455	Carbon tetrachloride	EPA 8260B	10184802	Volatile Organics	4/25/2023
4455	Carbon tetrachloride	EPA 8260D	10307127	Volatile Organics	4/25/2023
1575	Chloride	EPA 300.0	10053200	General Chemistry	2/1/2002
1575	Chloride	EPA 9056A	10199607	General Chemistry	4/25/2023
4475	Chlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4475	Chlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4485	Chloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4485	Chloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4505	Chloroform	EPA 8260B	10184802	Volatile Organics	4/25/2023
4505	Chloroform	EPA 8260D	10307127	Volatile Organics	4/25/2023
1040	Chromium	EPA 6010C	10155905	Metals	4/25/2023
1040	Chromium	EPA 6010B	10155609	Metals	4/25/2023
5855	Chrysene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5855	Chrysene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5855	Chrysene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4645	cis-1,2-Dichloroethylene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4645	cis-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4680	cis-1,3-Dichloropropene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4680	cis-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	4/25/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1050	Cobalt	EPA 6010C	10155905	Metals	4/25/2023
1050	Cobalt	EPA 6010B	10155609	Metals	4/25/2023
1055	Copper	EPA 6010C	10155905	Metals	4/25/2023
1055	Copper	EPA 6010B	10155609	Metals	4/25/2023
9105	Decachlorobiphenyl (BZ 209)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9105	Decachlorobiphenyl (BZ 209)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270E	10242543	Extractable Organics	4/25/2023
5895	Dibenz(a,h)anthracene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5895	Dibenz(a,h)anthracene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5895	Dibenz(a,h)anthracene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5905	Dibenzofuran	EPA 8270C	10185805	Extractable Organics	4/25/2023
5905	Dibenzofuran	EPA 8270D	10186035	Extractable Organics	4/25/2023
5905	Dibenzofuran	EPA 8270E	10242543	Extractable Organics	4/25/2023
4575	Dibromochloromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4575	Dibromochloromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4595	Dibromomethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4595	Dibromomethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4625	Dichlorodifluoromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4625	Dichlorodifluoromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
6070	Diethyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
6070	Diethyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
6070	Diethyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
6135	Dimethyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
6135	Dimethyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
6135	Dimethyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
5925	Di-n-butyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
5925	Di-n-butyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
5925	Di-n-butyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
6200	Di-n-octyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
6200	Di-n-octyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
6200	Di-n-octyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
4765	Ethylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4765	Ethylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
6265	Fluoranthene	EPA 8270C	10185805	Extractable Organics	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6265	Fluoranthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6265	Fluoranthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6270	Fluorene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6270	Fluorene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6270	Fluorene	EPA 8270E	10242543	Extractable Organics	4/25/2023
1730	Fluoride	EPA 300.0	10053200	General Chemistry	2/1/2002
1730	Fluoride	EPA 9056A	10199607	General Chemistry	4/25/2023
6275	Hexachlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6275	Hexachlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6275	Hexachlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6285	Hexachlorocyclopentadiene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6285	Hexachlorocyclopentadiene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6285	Hexachlorocyclopentadiene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4840	Hexachloroethane	EPA 8270C	10185805	Extractable Organics	4/25/2023
4840	Hexachloroethane	EPA 8270D	10186035	Extractable Organics	4/25/2023
4840	Hexachloroethane	EPA 8270E	10242543	Extractable Organics	4/25/2023
9438	Hpcdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9438	Hpcdd, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9444	Hpcdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9444	Hpcdf, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9468	Hxcdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9468	Hxcdd, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9483	Hxcdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9483	Hxcdf, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
6315	Indeno(1,2,3-cd)pyrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6315	Indeno(1,2,3-cd)pyrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6315	Indeno(1,2,3-cd)pyrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
1070	Iron	EPA 6010C	10155905	Metals	4/25/2023
1070	Iron	EPA 6010B	10155609	Metals	4/25/2023
6320	Isophorone	EPA 8270C	10185805	Extractable Organics	4/25/2023
6320	Isophorone	EPA 8270D	10186035	Extractable Organics	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6320	Isophorone	EPA 8270E	10242543	Extractable Organics	4/25/2023
4900	Isopropylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4900	Isopropylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1075	Lead	EPA 6010C	10155905	Metals	4/25/2023
1075	Lead	EPA 6010B	10155609	Metals	4/25/2023
1080	Lithium	EPA 6010C	10155905	Metals	4/25/2023
1080	Lithium	EPA 6010B	10155609	Metals	4/25/2023
1085	Magnesium	EPA 6010C	10155905	Metals	4/25/2023
1085	Magnesium	EPA 6010B	10155609	Metals	4/25/2023
1090	Manganese	EPA 6010C	10155905	Metals	4/25/2023
1090	Manganese	EPA 6010B	10155609	Metals	4/25/2023
1095	Mercury	EPA 7470A	10165807	Metals	4/25/2023
4950	Methyl bromide (Bromomethane)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4950	Methyl bromide (Bromomethane)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4960	Methyl chloride (Chloromethane)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4960	Methyl chloride (Chloromethane)	EPA 8260D	10307127	Volatile Organics	4/25/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4975	Methylene chloride	EPA 8260B	10184802	Volatile Organics	4/25/2023
4975	Methylene chloride	EPA 8260D	10307127	Volatile Organics	4/25/2023
1100	Molybdenum	EPA 6010C	10155905	Metals	4/25/2023
1100	Molybdenum	EPA 6010B	10155609	Metals	4/25/2023
5005	Naphthalene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5005	Naphthalene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5005	Naphthalene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5005	Naphthalene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5005	Naphthalene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4435	n-Butylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4435	n-Butylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1105	Nickel	EPA 6010C	10155905	Metals	4/25/2023
1105	Nickel	EPA 6010B	10155609	Metals	4/25/2023
1805	Nitrate	EPA 9056A	10199607	General Chemistry	4/25/2023
1810	Nitrate as N	EPA 300.0	10053200	General Chemistry	2/1/2002
1835	Nitrite	EPA 9056A	10199607	General Chemistry	4/25/2023
1840	Nitrite as N	EPA 300.0	10053200	General Chemistry	2/1/2002
5015	Nitrobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5015	Nitrobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5015	Nitrobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6530	n-Nitrosodimethylamine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6530	n-Nitrosodimethylamine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6530	n-Nitrosodimethylamine	EPA 8270E	10242543	Extractable Organics	4/25/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270E	10242543	Extractable Organics	4/25/2023
6535	n-Nitrosodiphenylamine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6535	n-Nitrosodiphenylamine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6535	n-Nitrosodiphenylamine	EPA 8270E	10242543	Extractable Organics	4/25/2023
5090	n-Propylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5090	n-Propylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1870	Orthophosphate as P	EPA 300.0	10053200	General Chemistry	2/1/2002
1870	Orthophosphate as P	EPA 9056A	10199607	General Chemistry	4/25/2023
9555	Pecdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9555	Pecdd, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9552	Pecdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9552	Pecdf, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
6605	Pentachlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6605	Pentachlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6605	Pentachlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6615	Phenanthrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6615	Phenanthrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6615	Phenanthrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6625	Phenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6625	Phenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6625	Phenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
4910	p-Isopropyltoluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4910	p-Isopropyltoluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1125	Potassium	EPA 6010C	10155905	Metals	4/25/2023
1125	Potassium	EPA 6010B	10155609	Metals	4/25/2023
6665	Pyrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6665	Pyrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6665	Pyrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5095	Pyridine	EPA 8270C	10185805	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5095	Pyridine	EPA 8270D	10186035	Extractable Organics	4/25/2023
5095	Pyridine	EPA 8270E	10242543	Extractable Organics	4/25/2023
4440	sec-Butylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4440	sec-Butylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1140	Selenium	EPA 6010C	10155905	Metals	4/25/2023
1140	Selenium	EPA 6010B	10155609	Metals	4/25/2023
1145	Silicon	EPA 6010C	10155905	Metals	4/25/2023
1145	Silicon	EPA 6010B	10155609	Metals	4/25/2023
1150	Silver	EPA 6010C	10155905	Metals	4/25/2023
1150	Silver	EPA 6010B	10155609	Metals	4/25/2023
1155	Sodium	EPA 6010C	10155905	Metals	4/25/2023
1155	Sodium	EPA 6010B	10155609	Metals	4/25/2023
1160	Strontium	EPA 6010C	10155905	Metals	4/25/2023
1160	Strontium	EPA 6010B	10155609	Metals	4/25/2023
5100	Styrene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5100	Styrene	EPA 8260D	10307127	Volatile Organics	4/25/2023
2000	Sulfate	EPA 300.0	10053200	General Chemistry	2/1/2002
2000	Sulfate	EPA 9056A	10199607	General Chemistry	4/25/2023
9609	TCDD, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9609	TCDD, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
9615	TCDF, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9615	TCDF, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	4/25/2023
4445	tert-Butylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4445	tert-Butylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5115	Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5115	Tetrachloroethylene (Perchloroethylene)	EPA 8260D	10307127	Volatile Organics	4/25/2023
1165	Thallium	EPA 6010C	10155905	Metals	4/25/2023
1165	Thallium	EPA 6010B	10155609	Metals	4/25/2023
1175	Tin	EPA 6010C	10155905	Metals	4/25/2023
1175	Tin	EPA 6010B	10155609	Metals	4/25/2023
5140	Toluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5140	Toluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4700	trans-1,2-Dichloroethylene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4700	trans-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4685	trans-1,3-Dichloropropene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4685	trans-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Non-Potable Water

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5170	Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5170	Trichloroethene (Trichloroethylene)	EPA 8260D	10307127	Volatile Organics	4/25/2023
5175	Trichlorofluoromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5175	Trichlorofluoromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
1185	Vanadium	EPA 6010C	10155905	Metals	4/25/2023
1185	Vanadium	EPA 6010B	10155609	Metals	4/25/2023
5235	Vinyl chloride	EPA 8260B	10184802	Volatile Organics	4/25/2023
5235	Vinyl chloride	EPA 8260D	10307127	Volatile Organics	4/25/2023
5260	Xylene (total)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5260	Xylene (total)	EPA 8260D	10307127	Volatile Organics	4/25/2023
1190	Zinc	EPA 6010C	10155905	Metals	4/25/2023
1190	Zinc	EPA 6010B	10155609	Metals	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5105	1,1,1,2-Tetrachloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5105	1,1,1,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5160	1,1,1-Trichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5160	1,1,1-Trichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5110	1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5110	1,1,2,2-Tetrachloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5165	1,1,2-Trichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5165	1,1,2-Trichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4630	1,1-Dichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4630	1,1-Dichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4640	1,1-Dichloroethylene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4640	1,1-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4670	1,1-Dichloropropene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4670	1,1-Dichloropropene	EPA 8260D	10307127	Volatile Organics	4/25/2023
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A	10187403	Extractable Organics	4/25/2023
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A	10187403	Extractable Organics	4/25/2023
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A	10187403	Extractable Organics	4/25/2023
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A	10187403	Extractable Organics	4/25/2023
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A	10187403	Extractable Organics	4/25/2023
9453	1,2,3,4,7,8-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9453	1,2,3,4,7,8-Hxcdd	EPA 8290A	10187403	Extractable Organics	4/25/2023
9471	1,2,3,4,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9471	1,2,3,4,7,8-Hxcdf	EPA 8290A	10187403	Extractable Organics	4/25/2023
9456	1,2,3,6,7,8-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9456	1,2,3,6,7,8-Hxcdd	EPA 8290A	10187403	Extractable Organics	4/25/2023
9474	1,2,3,6,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9474	1,2,3,6,7,8-Hxcdf	EPA 8290A	10187403	Extractable Organics	4/25/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9459	1,2,3,7,8,9-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9459	1,2,3,7,8,9-Hxcdd	EPA 8290A	10187403	Extractable Organics	4/25/2023
9477	1,2,3,7,8,9-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9477	1,2,3,7,8,9-Hxcdf	EPA 8290A	10187403	Extractable Organics	4/25/2023
9540	1,2,3,7,8-Pecdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9540	1,2,3,7,8-Pecdd	EPA 8290A	10187403	Extractable Organics	4/25/2023
9543	1,2,3,7,8-Pecdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9543	1,2,3,7,8-Pecdf	EPA 8290A	10187403	Extractable Organics	4/25/2023
5150	1,2,3-Trichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5150	1,2,3-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5180	1,2,3-Trichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5180	1,2,3-Trichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5155	1,2,4-Trichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5210	1,2,4-Trimethylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5210	1,2,4-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4570	1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4610	1,2-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4635	1,2-Dichloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4635	1,2-Dichloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4655	1,2-Dichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4655	1,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
6220	1,2-Diphenylhydrazine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6220	1,2-Diphenylhydrazine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6220	1,2-Diphenylhydrazine	EPA 8270E	10242543	Extractable Organics	4/25/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5215	1,3,5-Trimethylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5215	1,3,5-Trimethylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4615	1,3-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4660	1,3-Dichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4660	1,3-Dichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4620	1,4-Dichlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
8952	2,2',3,3' + 2,2',3,4 + 2,3',4',6 - Tetrachlorobiphenyls (BZ 40 + 41 + 71)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8952	2,2',3,3' + 2,2',3,4 + 2,3',4',6 - Tetrachlorobiphenyls (BZ 40 + 41 + 71)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8919	2,2',3,3',4,4' + 2,3,4,4',5,6 - Hexachlorobiphenyls (BZ 128 + 166)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8919	2,2',3,3',4,4' + 2,3,4,4',5,6 - Hexachlorobiphenyls (BZ 128 + 166)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9095	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9095	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9101	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9101	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9102	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9102	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8916	2,2',3,3',4,4',6 + 2,2',3,3',4,5,6 - Heptachlorobiphenyls (BZ 171 + 173)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8916	2,2',3,3',4,4',6 + 2,2',3,3',4,5,6 - Heptachlorobiphenyls (BZ 171 + 173)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9104	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9104	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8934	2,2',3,3',4,5,5',6 + 2,2',3,3',4,5,5',6' - Octachlorobiphenyls (BZ 198 + 199)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8934	2,2',3,3',4,5,5',6 + 2,2',3,3',4,5,5',6' - Octachlorobiphenyls (BZ 198 + 199)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9107	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9107	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9110	2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9110	2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9111	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9111	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9115	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9115	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8921	2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4,5,6+2,3,3',4',5,6 - Hexachlorobiphenyls (BZ 129+138+160+163)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8921	2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4,5,6+2,3,3',4',5,6 - Hexachlorobiphenyls (BZ 129+138+160+163)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9117	2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9117	2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9119	2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9119	2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9121	2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9121	2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9122	2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9122	2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8939	2,2',3,3',5 + 2,2',4,4',5 - Pentachlorobiphenyls (BZ 83 + 99)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8939	2,2',3,3',5 + 2,2',4,4',5 - Pentachlorobiphenyls (BZ 83 + 99)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9123	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9123	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9124	2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9124	2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9125	2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9125	2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8924	2,2',3,3',5,6 + 2,2',3,4,5,6' - Hexachlorobiphenyls (BZ 134 + 143)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8924	2,2',3,3',5,6 + 2,2',3,4,5,6' - Hexachlorobiphenyls (BZ 134 + 143)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8927	2,2',3,3',5,6' + 2,2',3,5,5',6 - Hexachlorobiphenyls (BZ 135 + 151)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8927	2,2',3,3',5,6' + 2,2',3,5,5',6 - Hexachlorobiphenyls (BZ 135 + 151)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9126	2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9126	2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9130	2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9130	2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9131	2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9131	2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8941	2,2',3,4,4' + 2,3,4,5,6 + 2,3,4',5,6 - Pentachlorobiphenyls (BZ 85 + 116 + 117)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8941	2,2',3,4,4' + 2,3,4,5,6 + 2,3,4',5,6 - Pentachlorobiphenyls (BZ 85 + 116 + 117)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8917	2,2',3,4,4',5,5' + 2,3,3',4',5,5',6 - Heptachlorobiphenyls (BZ 180 + 193)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8917	2,2',3,4,4',5,5' + 2,3,3',4',5,5',6 - Heptachlorobiphenyls (BZ 180 + 193)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8918	2,2',3,4,4',5',6 + 2,2',3,4,5,5',6 - Heptachlorobiphenyls (BZ 183 + 185)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8918	2,2',3,4,4',5',6 + 2,2',3,4,5,5',6 - Heptachlorobiphenyls (BZ 183 + 185)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9135	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9135	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9137	2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9137	2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9136	2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9136	2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9138	2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9138	2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8928	2,2',3,4,4',6 + 2,2',3,4,4',6' - Hexachlorobiphenyls (BZ 139 + 140)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8928	2,2',3,4,4',6 + 2,2',3,4,4',6' - Hexachlorobiphenyls (BZ 139 + 140)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9139	2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9139	2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8948	2,2',3,4',5 + 2,2',4,5,5' + 2,3,3',5',6 - Pentachlorobiphenyls (BZ 90 + 101 + 113)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8948	2,2',3,4',5 + 2,2',4,5,5' + 2,3,3',5',6 - Pentachlorobiphenyls (BZ 90 + 101 + 113)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9144	2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9144	2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8929	2,2',3,4',5,6 + 2,2',3,4',5',6 - Hexachlorobiphenyls (BZ 147 + 149)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8929	2,2',3,4',5,6 + 2,2',3,4',5',6 - Hexachlorobiphenyls (BZ 147 + 149)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9145	2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9145	2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9146	2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9146	2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9148	2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9148	2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9150	2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9150	2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9147	2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9147	2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8901	2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,6+2,3',4,4',6+2,3',4',5',6-PeCB(BZ86+87+97+109+119+125)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8901	2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,6+2,3',4,4',6+2,3',4',5',6-PeCB(BZ86+87+97+109+119+125)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8947	2,2',3,4,6 + 2,2',3,4',6 - Pentachlorobiphenyls (BZ 88 + 91)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8947	2,2',3,4,6 + 2,2',3,4',6 - Pentachlorobiphenyls (BZ 88 + 91)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8951	2,2',3,4',6' + 2,2',4,5,6' - Pentachlorobiphenyls (BZ 98 + 102)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8951	2,2',3,4',6' + 2,2',4,5,6' - Pentachlorobiphenyls (BZ 98 + 102)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9156	2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9156	2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9157	2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9157	2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9161	2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9161	2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9162	2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9162	2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8957	2,2',3,5' + 2,2',4,4' + 2,3,5,6 - Tetrachlorobiphenyls (BZ 44 + 47 + 65)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8957	2,2',3,5' + 2,2',4,4' + 2,3,5,6 - Tetrachlorobiphenyls (BZ 44 + 47 + 65)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8956	2,2',3,5 + 2,3',5',6 - Tetrachlorobiphenyls (BZ 43 + 73)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8956	2,2',3,5 + 2,3',5',6 - Tetrachlorobiphenyls (BZ 43 + 73)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9164	2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9164	2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8949	2,2',3,5,6 + 2,2',4,4',6 - Pentachlorobiphenyls (BZ 93 + 100)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8949	2,2',3,5,6 + 2,2',4,4',6 - Pentachlorobiphenyls (BZ 93 + 100)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9165	2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9165	2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9167	2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9167	2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8958	2,2',3,6 + 2,2',4,6' - Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8958	2,2',3,6 + 2,2',4,6' - Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9170	2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9170	2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9171	2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9171	2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9173	2,2',3-Trichlorobiphenyl (BZ 16)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9173	2,2',3-Trichlorobiphenyl (BZ 16)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8931	2,2',4,4',5,5' + 2,3',4,4',5',6 - Hexachlorobiphenyls (BZ 153 + 168)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8931	2,2',4,4',5,5' + 2,3',4,4',5',6 - Hexachlorobiphenyls (BZ 153 + 168)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9176	2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9176	2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8959	2,2',4,5' + 2,3',4,6 - Tetrachlorobiphenyls (BZ 49 + 69)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8959	2,2',4,5' + 2,3',4,6 - Tetrachlorobiphenyls (BZ 49 + 69)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9179	2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9179	2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9181	2,2',4,5-Tetrachlorobiphenyl (BZ 48)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9181	2,2',4,5-Tetrachlorobiphenyl (BZ 48)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8961	2,2',4,6 + 2,2',5,6' - Tetrachlorobiphenyls (BZ 50 + 53)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8961	2,2',4,6 + 2,2',5,6' - Tetrachlorobiphenyls (BZ 50 + 53)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9182	2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9182	2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9185	2,2',4-Trichlorobiphenyl (BZ 17)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9185	2,2',4-Trichlorobiphenyl (BZ 17)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8966	2,2',5 + 2,4,6 - Trichlorobiphenyls (BZ 18 + 30)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8966	2,2',5 + 2,4,6 - Trichlorobiphenyls (BZ 18 + 30)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9187	2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9187	2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9188	2,2',6-Trichlorobiphenyl (BZ 19)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9188	2,2',6-Trichlorobiphenyl (BZ 19)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9189	2,2'-Dichlorobiphenyl (BZ 4)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9189	2,2'-Dichlorobiphenyl (BZ 4)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
4665	2,2-Dichloropropane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4665	2,2-Dichloropropane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270C	10185805	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270D	10186035	Extractable Organics	4/25/2023
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	EPA 8270E	10242543	Extractable Organics	4/25/2023
8967	2,3,3' + 2,4,4' - Trichlorobiphenyls (BZ 20 + 28)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8967	2,3,3' + 2,4,4' - Trichlorobiphenyls (BZ 20 + 28)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8932	2,3,3',4,4',5 + 2,3,3',4,4',5' - Hexachlorobiphenyls (BZ 156 + 157)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8932	2,3,3',4,4',5 + 2,3,3',4,4',5' - Hexachlorobiphenyls (BZ 156 + 157)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9190	2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9190	2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9191	2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9191	2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9192	2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9192	2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8937	2,3,3',4,5' + 2,3',4',5,5' - Pentachlorobiphenyls (BZ 108 + 124)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8937	2,3,3',4,5' + 2,3',4',5,5' - Pentachlorobiphenyls (BZ 108 + 124)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9194	2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9194	2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9196	2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9196	2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9197	2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9197	2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9200	2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9200	2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9201	2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9201	2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9204	2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9204	2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9205	2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9205	2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9202	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9202	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8938	2,3,3',4',6 + 2,3,4,4',6 - Pentachlorobiphenyls (BZ 110 + 115)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8938	2,3,3',4',6 + 2,3,4,4',6 - Pentachlorobiphenyls (BZ 110 + 115)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9208	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9208	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9209	2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9209	2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9210	2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9210	2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9211	2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9211	2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9214	2,3,3',5-Tetrachlorobiphenyl (BZ 57)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9214	2,3,3',5-Tetrachlorobiphenyl (BZ 57)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9213	2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9213	2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8962	2,3,3',6 + 2,3,4,6 + 2,4,4',6 - Tetrachlorobiphenyls (BZ 59 + 62 + 75)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8962	2,3,3',6 + 2,3,4,6 + 2,4,4',6 - Tetrachlorobiphenyls (BZ 59 + 62 + 75)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8968	2,3,4 + 2,3',4' - Trichlorobiphenyls (BZ 21 + 33)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8968	2,3,4 + 2,3',4' - Trichlorobiphenyls (BZ 21 + 33)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9055	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9055	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9005	2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9005	2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9000	2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9000	2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

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Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8963	2,3,4,5 + 2,3',4',5 + 2,4,4',5 + 2,3',4',5' - Tetrachlorobiphenyls (BZ 61 + 70 + 74 + 76)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8963	2,3,4,5 + 2,3',4',5 + 2,4,4',5 + 2,3',4',5' - Tetrachlorobiphenyls (BZ 61 + 70 + 74 + 76)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9223	2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9223	2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9226	2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9226	2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9233	2,3,4',5-Tetrachlorobiphenyl (BZ 63)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9233	2,3,4',5-Tetrachlorobiphenyl (BZ 63)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9232	2,3',4,5-Tetrachlorobiphenyl (BZ 67)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9232	2,3',4,5-Tetrachlorobiphenyl (BZ 67)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9231	2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9231	2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9480	2,3,4,6,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9480	2,3,4,6,7,8-Hxcdf	EPA 8290A	10187403	Extractable Organics	4/25/2023
9236	2,3,4',6-Tetrachlorobiphenyl (BZ 64)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9236	2,3,4',6-Tetrachlorobiphenyl (BZ 64)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9549	2,3,4,7,8-Pecdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9549	2,3,4,7,8-Pecdf	EPA 8290A	10187403	Extractable Organics	4/25/2023
9240	2,3',4-Trichlorobihenyl (BZ 25)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9240	2,3',4-Trichlorobihenyl (BZ 25)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9241	2,3,4'-Trichlorobiphenyl (BZ 22)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9241	2,3,4'-Trichlorobiphenyl (BZ 22)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8969	2,3',5 + 2,4,5 - Trichlorobiphenyls (BZ 26 + 29)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8969	2,3',5 + 2,4,5 - Trichlorobiphenyls (BZ 26 + 29)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9242	2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9242	2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9245	2,3,5-Trichlorobihenyl (BZ 23)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9245	2,3,5-Trichlorobihenyl (BZ 23)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9246	2,3',5'-Trichlorobihenyl (BZ 34)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9246	2,3',5'-Trichlorobihenyl (BZ 34)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9248	2,3',6-Trichlorobihenyl (BZ 27)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9248	2,3',6-Trichlorobihenyl (BZ 27)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9247	2,3,6-Trichlorobiphenyl (BZ 24)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9247	2,3,6-Trichlorobiphenyl (BZ 24)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 8290A	10187403	Extractable Organics	4/25/2023
9612	2,3,7,8-TCDF	EPA 1613B	10120602	Extractable Organics	11/7/2023
9612	2,3,7,8-TCDF	EPA 8290A	10187403	Extractable Organics	4/25/2023
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9249	2,3'-Dichlorobiphenyl (BZ 6)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9249	2,3'-Dichlorobiphenyl (BZ 6)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6835	2,4,5-Trichlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6835	2,4,5-Trichlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6835	2,4,5-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
9255	2,4',6-Trichlorobihenyl (BZ 32)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9255	2,4',6-Trichlorobihenyl (BZ 32)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6840	2,4,6-Trichlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6840	2,4,6-Trichlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6840	2,4,6-Trichlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
9257	2,4-Dichlorobiphenyl (BZ 7)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9257	2,4-Dichlorobiphenyl (BZ 7)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9256	2,4'-Dichlorobiphenyl (BZ 8)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9256	2,4'-Dichlorobiphenyl (BZ 8)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6000	2,4-Dichlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6000	2,4-Dichlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6000	2,4-Dichlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6130	2,4-Dimethylphenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6130	2,4-Dimethylphenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6130	2,4-Dimethylphenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6175	2,4-Dinitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6175	2,4-Dinitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6175	2,4-Dinitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	Extractable Organics	4/25/2023

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Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6185	2,4-Dinitrotoluene (2,4-DNT)	EPA 8270E	10242543	Extractable Organics	4/25/2023
9258	2,5-Dichlorobiphenyl (BZ 9)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9258	2,5-Dichlorobiphenyl (BZ 9)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9259	2,6-Dichlorophenyl (BZ 10)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9259	2,6-Dichlorophenyl (BZ 10)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6190	2,6-Dinitrotoluene (2,6-DNT)	EPA 8270E	10242543	Extractable Organics	4/25/2023
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260D	10307127	Volatile Organics	4/25/2023
8915	2-Chlorobiphenyl (BZ 1)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8915	2-Chlorobiphenyl (BZ 1)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5795	2-Chloronaphthalene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5795	2-Chloronaphthalene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5795	2-Chloronaphthalene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5800	2-Chlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
5800	2-Chlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
5800	2-Chlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
4535	2-Chlorotoluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4535	2-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4860	2-Hexanone	EPA 8260B	10184802	Volatile Organics	4/25/2023
4860	2-Hexanone	EPA 8260D	10307127	Volatile Organics	4/25/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6360	2-Methyl-4,6-dinitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6385	2-Methylnaphthalene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6385	2-Methylnaphthalene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6385	2-Methylnaphthalene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6400	2-Methylphenol (o-Cresol)	EPA 8270E	10242543	Extractable Organics	4/25/2023
6460	2-Nitroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
6460	2-Nitroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
6460	2-Nitroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
6490	2-Nitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023

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6490	2-Nitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6490	2-Nitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
9060	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9060	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9015	3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9015	3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8965	3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8965	3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9260	3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9260	3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9262	3,3',4,5-Tetrachlorobiphenyl (BZ 78)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9262	3,3',4,5-Tetrachlorobiphenyl (BZ 78)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9261	3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9261	3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9263	3,3',4-Trichlorobihenyl (BZ 35)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9263	3,3',4-Trichlorobihenyl (BZ 35)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9264	3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9264	3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9265	3,3',5-Trichlorobihenyl (BZ 36)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9265	3,3',5-Trichlorobihenyl (BZ 36)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5945	3,3'-Dichlorobenzidine	EPA 8270C	10185805	Extractable Organics	4/25/2023
5945	3,3'-Dichlorobenzidine	EPA 8270D	10186035	Extractable Organics	4/25/2023
5945	3,3'-Dichlorobenzidine	EPA 8270E	10242543	Extractable Organics	4/25/2023
8925	3,3'-Dichlorobiphenyl (BZ 11)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8925	3,3'-Dichlorobiphenyl (BZ 11)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8914	3,4 + 3,4' - Dichlorobiphenyls (BZ 12 + 13)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8914	3,4 + 3,4' - Dichlorobiphenyls (BZ 12 + 13)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8970	3,4,4',5-Tetrachlorobiphenyl (BZ 81)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8970	3,4,4',5-Tetrachlorobiphenyl (BZ 81)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9266	3,4,4'-Trichlorobiphenyl (BZ 37)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9266	3,4,4'-Trichlorobiphenyl (BZ 37)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9267	3,4,5-Trichlorobihenyl (BZ 38)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9267	3,4,5-Trichlorobihenyl (BZ 38)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9268	3,4',5-Trichlorobihenyl (BZ 39)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9268	3,4',5-Trichlorobihenyl (BZ 39)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9271	3,5-Dichlorobiphenyl (BZ 14)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9271	3,5-Dichlorobiphenyl (BZ 14)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9272	3-Chlorobiphenyl (BZ 2)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9272	3-Chlorobiphenyl (BZ 2)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6465	3-Nitroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
6465	3-Nitroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
6465	3-Nitroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
9273	4,4'-Dichlorobiphenyl (BZ 15)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9273	4,4'-Dichlorobiphenyl (BZ 15)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5660	4-Bromophenyl phenyl ether	EPA 8270C	10185805	Extractable Organics	4/25/2023
5660	4-Bromophenyl phenyl ether	EPA 8270D	10186035	Extractable Organics	4/25/2023
5660	4-Bromophenyl phenyl ether	EPA 8270E	10242543	Extractable Organics	4/25/2023
5700	4-Chloro-3-methylphenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
5700	4-Chloro-3-methylphenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
5700	4-Chloro-3-methylphenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
5745	4-Chloroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
5745	4-Chloroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
5745	4-Chloroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
9274	4-Chlorobiphenyl (BZ 3)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9274	4-Chlorobiphenyl (BZ 3)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
5825	4-Chlorophenyl phenylether	EPA 8270C	10185805	Extractable Organics	4/25/2023
5825	4-Chlorophenyl phenylether	EPA 8270D	10186035	Extractable Organics	4/25/2023
5825	4-Chlorophenyl phenylether	EPA 8270E	10242543	Extractable Organics	4/25/2023
4540	4-Chlorotoluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4540	4-Chlorotoluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4995	4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4995	4-Methyl-2-pentanone (MIBK)	EPA 8260D	10307127	Volatile Organics	4/25/2023
6410	4-Methylphenol (p-Cresol)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6410	4-Methylphenol (p-Cresol)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6410	4-Methylphenol (p-Cresol)	EPA 8270E	10242543	Extractable Organics	4/25/2023
6470	4-Nitroaniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
6470	4-Nitroaniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
6470	4-Nitroaniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
6500	4-Nitrophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6500	4-Nitrophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6500	4-Nitrophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
5500	Acenaphthene	EPA 8270C	10185805	Extractable Organics	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5500	Acenaphthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5500	Acenaphthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5505	Acenaphthylene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5505	Acenaphthylene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5505	Acenaphthylene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4315	Acetone	EPA 8260B	10184802	Volatile Organics	4/25/2023
4315	Acetone	EPA 8260D	10307127	Volatile Organics	4/25/2023
5510	Acetophenone	EPA 8270C	10185805	Extractable Organics	4/25/2023
5510	Acetophenone	EPA 8270D	10186035	Extractable Organics	4/25/2023
5510	Acetophenone	EPA 8270E	10242543	Extractable Organics	4/25/2023
1000	Aluminum	EPA 6010C	10155905	Metals	4/25/2023
1000	Aluminum	EPA 6010B	10155609	Metals	4/25/2023
5545	Aniline	EPA 8270C	10185805	Extractable Organics	4/25/2023
5545	Aniline	EPA 8270D	10186035	Extractable Organics	4/25/2023
5545	Aniline	EPA 8270E	10242543	Extractable Organics	4/25/2023
5555	Anthracene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5555	Anthracene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5555	Anthracene	EPA 8270E	10242543	Extractable Organics	4/25/2023
1005	Antimony	EPA 6010C	10155905	Metals	4/25/2023
1005	Antimony	EPA 6010B	10155609	Metals	4/25/2023
8880	Aroclor-1016 (PCB-1016)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8885	Aroclor-1221 (PCB-1221)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8890	Aroclor-1232 (PCB-1232)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8895	Aroclor-1242 (PCB-1242)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8900	Aroclor-1248 (PCB-1248)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8905	Aroclor-1254 (PCB-1254)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
8910	Aroclor-1260 (PCB-1260)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	4/25/2023
1010	Arsenic	EPA 6010C	10155905	Metals	4/25/2023
1010	Arsenic	EPA 6010B	10155609	Metals	4/25/2023
1015	Barium	EPA 6010C	10155905	Metals	4/25/2023
1015	Barium	EPA 6010B	10155609	Metals	4/25/2023
4375	Benzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4375	Benzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5595	Benzidine	EPA 8270C	10185805	Extractable Organics	4/25/2023
5595	Benzidine	EPA 8270D	10186035	Extractable Organics	4/25/2023
5595	Benzidine	EPA 8270E	10242543	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5575	Benzo(a)anthracene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5575	Benzo(a)anthracene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5575	Benzo(a)anthracene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5580	Benzo(a)pyrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5580	Benzo(a)pyrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5580	Benzo(a)pyrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5585	Benzo(b)fluoranthene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5585	Benzo(b)fluoranthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5585	Benzo(b)fluoranthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5590	Benzo(g,h,i)perylene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5590	Benzo(g,h,i)perylene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5590	Benzo(g,h,i)perylene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5600	Benzo(k)fluoranthene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5600	Benzo(k)fluoranthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5600	Benzo(k)fluoranthene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5610	Benzoic acid	EPA 8270C	10185805	Extractable Organics	4/25/2023
5610	Benzoic acid	EPA 8270D	10186035	Extractable Organics	4/25/2023
5610	Benzoic acid	EPA 8270E	10242543	Extractable Organics	4/25/2023
5630	Benzyl alcohol	EPA 8270C	10185805	Extractable Organics	4/25/2023
5630	Benzyl alcohol	EPA 8270D	10186035	Extractable Organics	4/25/2023
5630	Benzyl alcohol	EPA 8270E	10242543	Extractable Organics	4/25/2023
1020	Beryllium	EPA 6010C	10155905	Metals	4/25/2023
1020	Beryllium	EPA 6010B	10155609	Metals	4/25/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270C	10185805	Extractable Organics	4/25/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270D	10186035	Extractable Organics	4/25/2023
5760	bis(2-Chloroethoxy)methane	EPA 8270E	10242543	Extractable Organics	4/25/2023
5765	bis(2-Chloroethyl) ether	EPA 8270C	10185805	Extractable Organics	4/25/2023
5765	bis(2-Chloroethyl) ether	EPA 8270D	10186035	Extractable Organics	4/25/2023
5765	bis(2-Chloroethyl) ether	EPA 8270E	10242543	Extractable Organics	4/25/2023
1025	Boron	EPA 6010C	10155905	Metals	4/25/2023
1025	Boron	EPA 6010B	10155609	Metals	4/25/2023
1540	Bromide	EPA 9056A	10199607	General Chemistry	4/25/2023
4385	Bromobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4385	Bromobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4390	Bromochloromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4390	Bromochloromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4395	Bromodichloromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4395	Bromodichloromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4400	Bromoform	EPA 8260B	10184802	Volatile Organics	4/25/2023
4400	Bromoform	EPA 8260D	10307127	Volatile Organics	4/25/2023
5670	Butyl benzyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
5670	Butyl benzyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
5670	Butyl benzyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
1030	Cadmium	EPA 6010C	10155905	Metals	4/25/2023
1030	Cadmium	EPA 6010B	10155609	Metals	4/25/2023
1035	Calcium	EPA 6010C	10155905	Metals	4/25/2023
1035	Calcium	EPA 6010B	10155609	Metals	4/25/2023
5680	Carbazole	EPA 8270C	10185805	Extractable Organics	4/25/2023
5680	Carbazole	EPA 8270D	10186035	Extractable Organics	4/25/2023
5680	Carbazole	EPA 8270E	10242543	Extractable Organics	4/25/2023
4450	Carbon disulfide	EPA 8260B	10184802	Volatile Organics	4/25/2023
4450	Carbon disulfide	EPA 8260D	10307127	Volatile Organics	4/25/2023
4455	Carbon tetrachloride	EPA 8260B	10184802	Volatile Organics	4/25/2023
4455	Carbon tetrachloride	EPA 8260D	10307127	Volatile Organics	4/25/2023
1575	Chloride	EPA 9056A	10199607	General Chemistry	4/25/2023
4475	Chlorobenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4475	Chlorobenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4485	Chloroethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4485	Chloroethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4505	Chloroform	EPA 8260B	10184802	Volatile Organics	4/25/2023
4505	Chloroform	EPA 8260D	10307127	Volatile Organics	4/25/2023
1040	Chromium	EPA 6010C	10155905	Metals	4/25/2023
1040	Chromium	EPA 6010B	10155609	Metals	4/25/2023
5855	Chrysene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5855	Chrysene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5855	Chrysene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4645	cis-1,2-Dichloroethylene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4645	cis-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4680	cis-1,3-Dichloropropene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4680	cis-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1050	Cobalt	EPA 6010C	10155905	Metals	4/25/2023
1050	Cobalt	EPA 6010B	10155609	Metals	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1055	Copper	EPA 6010C	10155905	Metals	4/25/2023
1055	Copper	EPA 6010B	10155609	Metals	4/25/2023
9105	Decachlorobiphenyl (BZ 209)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9105	Decachlorobiphenyl (BZ 209)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270C	10185805	Extractable Organics	4/25/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270D	10186035	Extractable Organics	4/25/2023
6065	Di(2-ethylhexyl) phthalate (DEHP)	EPA 8270E	10242543	Extractable Organics	4/25/2023
5895	Dibenz(a,h)anthracene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5895	Dibenz(a,h)anthracene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5895	Dibenz(a,h)anthracene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5905	Dibenzofuran	EPA 8270C	10185805	Extractable Organics	4/25/2023
5905	Dibenzofuran	EPA 8270D	10186035	Extractable Organics	4/25/2023
5905	Dibenzofuran	EPA 8270E	10242543	Extractable Organics	4/25/2023
4575	Dibromochloromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4575	Dibromochloromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4595	Dibromomethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4595	Dibromomethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
4625	Dichlorodifluoromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
4625	Dichlorodifluoromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
6070	Diethyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
6070	Diethyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
6070	Diethyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
6135	Dimethyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
6135	Dimethyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
6135	Dimethyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
5925	Di-n-butyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
5925	Di-n-butyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
5925	Di-n-butyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
6200	Di-n-octyl phthalate	EPA 8270C	10185805	Extractable Organics	4/25/2023
6200	Di-n-octyl phthalate	EPA 8270D	10186035	Extractable Organics	4/25/2023
6200	Di-n-octyl phthalate	EPA 8270E	10242543	Extractable Organics	4/25/2023
4765	Ethylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4765	Ethylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
6265	Fluoranthene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6265	Fluoranthene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6265	Fluoranthene	EPA 8270E	10242543	Extractable Organics	4/25/2023

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Eurofins Knoxville
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Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6270	Fluorene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6270	Fluorene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6270	Fluorene	EPA 8270E	10242543	Extractable Organics	4/25/2023
1730	Fluoride	EPA 9056A	10199607	General Chemistry	4/25/2023
6275	Hexachlorobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6275	Hexachlorobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6275	Hexachlorobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8270C	10185805	Extractable Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8270D	10186035	Extractable Organics	4/25/2023
4835	Hexachlorobutadiene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6285	Hexachlorocyclopentadiene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6285	Hexachlorocyclopentadiene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6285	Hexachlorocyclopentadiene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4840	Hexachloroethane	EPA 8270C	10185805	Extractable Organics	4/25/2023
4840	Hexachloroethane	EPA 8270D	10186035	Extractable Organics	4/25/2023
4840	Hexachloroethane	EPA 8270E	10242543	Extractable Organics	4/25/2023
9438	Hpcdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9438	Hpcdd, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
9444	Hpcdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9444	Hpcdf, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
9468	Hxcdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9468	Hxcdd, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
9483	Hxcdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9483	Hxcdf, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
6315	Indeno(1,2,3-cd)pyrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6315	Indeno(1,2,3-cd)pyrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6315	Indeno(1,2,3-cd)pyrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
1070	Iron	EPA 6010C	10155905	Metals	4/25/2023
1070	Iron	EPA 6010B	10155609	Metals	4/25/2023
6320	Isophorone	EPA 8270C	10185805	Extractable Organics	4/25/2023
6320	Isophorone	EPA 8270D	10186035	Extractable Organics	4/25/2023
6320	Isophorone	EPA 8270E	10242543	Extractable Organics	4/25/2023
4900	Isopropylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4900	Isopropylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1075	Lead	EPA 6010C	10155905	Metals	4/25/2023
1075	Lead	EPA 6010B	10155609	Metals	4/25/2023
1080	Lithium	EPA 6010C	10155905	Metals	4/25/2023
1080	Lithium	EPA 6010B	10155609	Metals	4/25/2023
1085	Magnesium	EPA 6010C	10155905	Metals	4/25/2023
1085	Magnesium	EPA 6010B	10155609	Metals	4/25/2023
1090	Manganese	EPA 6010C	10155905	Metals	4/25/2023
1090	Manganese	EPA 6010B	10155609	Metals	4/25/2023
1095	Mercury	EPA 7470A	10165807	Metals	4/25/2023
1095	Mercury	EPA 7471B	10166457	Metals	4/25/2023
4950	Methyl bromide (Bromomethane)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4950	Methyl bromide (Bromomethane)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4960	Methyl chloride (Chloromethane)	EPA 8260B	10184802	Volatile Organics	4/25/2023
4960	Methyl chloride (Chloromethane)	EPA 8260D	10307127	Volatile Organics	4/25/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5000	Methyl tert-butyl ether (MTBE)	EPA 8260D	10307127	Volatile Organics	4/25/2023
4975	Methylene chloride	EPA 8260B	10184802	Volatile Organics	4/25/2023
4975	Methylene chloride	EPA 8260D	10307127	Volatile Organics	4/25/2023
1100	Molybdenum	EPA 6010C	10155905	Metals	4/25/2023
1100	Molybdenum	EPA 6010B	10155609	Metals	4/25/2023
5005	Naphthalene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5005	Naphthalene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5005	Naphthalene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5005	Naphthalene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5005	Naphthalene	EPA 8270E	10242543	Extractable Organics	4/25/2023
4435	n-Butylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4435	n-Butylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1105	Nickel	EPA 6010C	10155905	Metals	4/25/2023
1105	Nickel	EPA 6010B	10155609	Metals	4/25/2023
1805	Nitrate	EPA 9056A	10199607	General Chemistry	4/25/2023
1835	Nitrite	EPA 9056A	10199607	General Chemistry	4/25/2023
5015	Nitrobenzene	EPA 8270C	10185805	Extractable Organics	4/25/2023
5015	Nitrobenzene	EPA 8270D	10186035	Extractable Organics	4/25/2023
5015	Nitrobenzene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6530	n-Nitrosodimethylamine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6530	n-Nitrosodimethylamine	EPA 8270D	10186035	Extractable Organics	4/25/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6530	n-Nitrosodimethylamine	EPA 8270E	10242543	Extractable Organics	4/25/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6545	n-Nitrosodi-n-propylamine	EPA 8270E	10242543	Extractable Organics	4/25/2023
6535	n-Nitrosodiphenylamine	EPA 8270C	10185805	Extractable Organics	4/25/2023
6535	n-Nitrosodiphenylamine	EPA 8270D	10186035	Extractable Organics	4/25/2023
6535	n-Nitrosodiphenylamine	EPA 8270E	10242543	Extractable Organics	4/25/2023
5090	n-Propylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5090	n-Propylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
9555	Pecdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9555	Pecdd, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
9552	Pecdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9552	Pecdf, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
6605	Pentachlorophenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6605	Pentachlorophenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6605	Pentachlorophenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
6615	Phenanthrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6615	Phenanthrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6615	Phenanthrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
6625	Phenol	EPA 8270C	10185805	Extractable Organics	4/25/2023
6625	Phenol	EPA 8270D	10186035	Extractable Organics	4/25/2023
6625	Phenol	EPA 8270E	10242543	Extractable Organics	4/25/2023
4910	p-Isopropyltoluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4910	p-Isopropyltoluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1125	Potassium	EPA 6010C	10155905	Metals	4/25/2023
1125	Potassium	EPA 6010B	10155609	Metals	4/25/2023
6665	Pyrene	EPA 8270C	10185805	Extractable Organics	4/25/2023
6665	Pyrene	EPA 8270D	10186035	Extractable Organics	4/25/2023
6665	Pyrene	EPA 8270E	10242543	Extractable Organics	4/25/2023
5095	Pyridine	EPA 8270C	10185805	Extractable Organics	4/25/2023
5095	Pyridine	EPA 8270D	10186035	Extractable Organics	4/25/2023
5095	Pyridine	EPA 8270E	10242543	Extractable Organics	4/25/2023
4440	sec-Butylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4440	sec-Butylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
1140	Selenium	EPA 6010C	10155905	Metals	4/25/2023
1140	Selenium	EPA 6010B	10155609	Metals	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
1150	Silver	EPA 6010C	10155905	Metals	4/25/2023
1150	Silver	EPA 6010B	10155609	Metals	4/25/2023
1155	Sodium	EPA 6010C	10155905	Metals	4/25/2023
1155	Sodium	EPA 6010B	10155609	Metals	4/25/2023
1160	Strontium	EPA 6010C	10155905	Metals	4/25/2023
1160	Strontium	EPA 6010B	10155609	Metals	4/25/2023
5100	Styrene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5100	Styrene	EPA 8260D	10307127	Volatile Organics	4/25/2023
2000	Sulfate	EPA 9056A	10199607	General Chemistry	4/25/2023
9609	TCDD, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9609	TCDD, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
9615	TCDF, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9615	TCDF, total	EPA 8290A	10187403	Extractable Organics	4/25/2023
4445	tert-Butylbenzene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4445	tert-Butylbenzene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5115	Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5115	Tetrachloroethylene (Perchloroethylene)	EPA 8260D	10307127	Volatile Organics	4/25/2023
1165	Thallium	EPA 6010C	10155905	Metals	4/25/2023
1165	Thallium	EPA 6010B	10155609	Metals	4/25/2023
1175	Tin	EPA 6010C	10155905	Metals	4/25/2023
1175	Tin	EPA 6010B	10155609	Metals	4/25/2023
5140	Toluene	EPA 8260B	10184802	Volatile Organics	4/25/2023
5140	Toluene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4700	trans-1,2-Dichloroethylene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4700	trans-1,2-Dichloroethylene	EPA 8260D	10307127	Volatile Organics	4/25/2023
4685	trans-1,3-Dichloropropene	EPA 8260B	10184802	Volatile Organics	4/25/2023
4685	trans-1,3-Dichloropropene	EPA 8260D	10307127	Volatile Organics	4/25/2023
5170	Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	Volatile Organics	4/25/2023
5170	Trichloroethene (Trichloroethylene)	EPA 8260D	10307127	Volatile Organics	4/25/2023
5175	Trichlorofluoromethane	EPA 8260B	10184802	Volatile Organics	4/25/2023
5175	Trichlorofluoromethane	EPA 8260D	10307127	Volatile Organics	4/25/2023
1185	Vanadium	EPA 6010C	10155905	Metals	4/25/2023
1185	Vanadium	EPA 6010B	10155609	Metals	4/25/2023
5235	Vinyl chloride	EPA 8260B	10184802	Volatile Organics	4/25/2023
5235	Vinyl chloride	EPA 8260D	10307127	Volatile Organics	4/25/2023
5260	Xylene (total)	EPA 8260B	10184802	Volatile Organics	4/25/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Solid and Chemical Materials

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5260	Xylene (total)	EPA 8260D	10307127	Volatile Organics	4/25/2023
1190	Zinc	EPA 6010C	10155905	Metals	4/25/2023
1190	Zinc	EPA 6010B	10155609	Metals	4/25/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9453	1,2,3,4,7,8-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9453	1,2,3,4,7,8-Hxcdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9471	1,2,3,4,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9471	1,2,3,4,7,8-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9456	1,2,3,6,7,8-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9456	1,2,3,6,7,8-Hxcdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9474	1,2,3,6,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9474	1,2,3,6,7,8-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9459	1,2,3,7,8,9-Hxcdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9459	1,2,3,7,8,9-Hxcdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9477	1,2,3,7,8,9-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9477	1,2,3,7,8,9-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9540	1,2,3,7,8-Pecdd	EPA 1613B	10120602	Extractable Organics	11/7/2023
9540	1,2,3,7,8-Pecdd	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9543	1,2,3,7,8-Pecdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9543	1,2,3,7,8-Pecdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
8952	2,2',3,3' + 2,2',3,4 + 2,3',4',6 - Tetrachlorobiphenyls (BZ 40 + 41 + 71)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8952	2,2',3,3' + 2,2',3,4 + 2,3',4',6 - Tetrachlorobiphenyls (BZ 40 + 41 + 71)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8919	2,2',3,3',4,4' + 2,3,4,4',5,6 - Hexachlorobiphenyls (BZ 128 + 166)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8919	2,2',3,3',4,4' + 2,3,4,4',5,6 - Hexachlorobiphenyls (BZ 128 + 166)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9095	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9095	2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ 206)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9090	2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ 194)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9101	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9101	2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ 207)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9103	2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ 195)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9102	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9102	2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ 196)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9065	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ 170)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8916	2,2',3,3',4,4',6 + 2,2',3,3',4,5,6 - Heptachlorobiphenyls (BZ 171 + 173)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8916	2,2',3,3',4,4',6 + 2,2',3,3',4,5,6 - Heptachlorobiphenyls (BZ 171 + 173)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9104	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9104	2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ 197)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8934	2,2',3,3',4,5,5',6 + 2,2',3,3',4,5,5',6' - Octachlorobiphenyls (BZ 198 + 199)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8934	2,2',3,3',4,5,5',6 + 2,2',3,3',4,5,5',6' - Octachlorobiphenyls (BZ 198 + 199)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9107	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9107	2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ 208)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9110	2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9110	2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ 172)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9111	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9111	2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ 200)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9112	2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ 201)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9116	2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ 174)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9115	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9115	2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ 175)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9114	2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ 177)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8921	2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4,5,6+2,3,3',4',5,6 - Hexachlorobiphenyls (BZ 129+138+160+163)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8921	2,2',3,3',4,5+2,2',3,4,4',5'+2,3,3',4,5,6+2,3,3',4',5,6 - Hexachlorobiphenyls (BZ 129+138+160+163)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9117	2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9117	2,2',3,3',4,5'-Hexachlorobiphenyl (BZ 130)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9119	2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9119	2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ 176)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9121	2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9121	2,2',3,3',4,6-Hexachlorobiphenyl (BZ 131)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9120	2,2',3,3',4,6'-Hexachlorobiphenyl (BZ 132)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9122	2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9122	2,2',3,3',4-Pentachlorobiphenyl (BZ 82)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8939	2,2',3,3',5 + 2,2',4,4',5 - Pentachlorobiphenyls (BZ 83 + 99)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8939	2,2',3,3',5 + 2,2',4,4',5 - Pentachlorobiphenyls (BZ 83 + 99)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9123	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9123	2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ 202)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9124	2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9124	2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ 178)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9125	2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9125	2,2',3,3',5,5'-Hexachlorobiphenyl (BZ 133)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8924	2,2',3,3',5,6 + 2,2',3,4,5,6' - Hexachlorobiphenyls (BZ 134 + 143)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8924	2,2',3,3',5,6 + 2,2',3,4,5,6' - Hexachlorobiphenyls (BZ 134 + 143)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8927	2,2',3,3',5,6' + 2,2',3,5,5',6 - Hexachlorobiphenyls (BZ 135 + 151)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8927	2,2',3,3',5,6' + 2,2',3,5,5',6 - Hexachlorobiphenyls (BZ 135 + 151)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9126	2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9126	2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ 179)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9130	2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9130	2,2',3,3',6,6'-Hexachlorobiphenyl (BZ 136)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9131	2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9131	2,2',3,3',6-Pentachlorobiphenyl (BZ 84)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8941	2,2',3,4,4' + 2,3,4,5,6 + 2,3,4',5,6 - Pentachlorobiphenyls (BZ 85 + 116 + 117)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8941	2,2',3,4,4' + 2,3,4,5,6 + 2,3,4',5,6 - Pentachlorobiphenyls (BZ 85 + 116 + 117)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8917	2,2',3,4,4',5,5' + 2,3,3',4',5,5',6 - Heptachlorobiphenyls (BZ 180 + 193)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8917	2,2',3,4,4',5,5' + 2,3,3',4',5,5',6 - Heptachlorobiphenyls (BZ 180 + 193)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9133	2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ 203)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8918	2,2',3,4,4',5',6 + 2,2',3,4,5,5',6 - Heptachlorobiphenyls (BZ 183 + 185)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8918	2,2',3,4,4',5',6 + 2,2',3,4,5,5',6 - Heptachlorobiphenyls (BZ 183 + 185)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9135	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9135	2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ 204)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9137	2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9137	2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ 181)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9136	2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9136	2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ 182)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9138	2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9138	2,2',3,4,4',5-Hexachlorobiphenyl (BZ 137)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8928	2,2',3,4,4',6 + 2,2',3,4,4',6' - Hexachlorobiphenyls (BZ 139 + 140)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8928	2,2',3,4,4',6 + 2,2',3,4,4',6' - Hexachlorobiphenyls (BZ 139 + 140)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9139	2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9139	2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ 184)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8948	2,2',3,4',5 + 2,2',4,5,5' + 2,3,3',5',6 - Pentachlorobiphenyls (BZ 90 + 101 + 113)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8948	2,2',3,4',5 + 2,2',4,5,5' + 2,3,3',5',6 - Pentachlorobiphenyls (BZ 90 + 101 + 113)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9080	2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ 187)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9030	2,2',3,4,5,5'-Hexachlorobiphenyl (BZ 141)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9144	2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9144	2,2',3,4',5,5'-Hexachlorobiphenyl (BZ 146)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8929	2,2',3,4',5,6 + 2,2',3,4',5',6 - Hexachlorobiphenyls (BZ 147 + 149)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8929	2,2',3,4',5,6 + 2,2',3,4',5',6 - Hexachlorobiphenyls (BZ 147 + 149)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9145	2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9145	2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ 186)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9146	2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9146	2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ 188)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9148	2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9148	2,2',3,4,5,6-Hexachlorobiphenyl (BZ 142)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9150	2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9150	2,2',3,4,5',6-Hexachlorobiphenyl (BZ 144)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9147	2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9147	2,2',3,4',5,6'-Hexachlorobiphenyl (BZ 148)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8901	2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,6+2,3',4,4',6+2,3',4',5',6-PeCB(BZ86+87+97+109+119+125)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8901	2,2',3,4,5+2,2',3,4,5'+2,2',3,4',5'+2,3,3',4,6+2,3',4,4',6+2,3',4',5',6-PeCB(BZ86+87+97+109+119+125)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8947	2,2',3,4,6 + 2,2',3,4',6 - Pentachlorobiphenyls (BZ 88 + 91)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8947	2,2',3,4,6 + 2,2',3,4',6 - Pentachlorobiphenyls (BZ 88 + 91)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8951	2,2',3,4',6' + 2,2',4,5,6' - Pentachlorobiphenyls (BZ 98 + 102)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8951	2,2',3,4',6' + 2,2',4,5,6' - Pentachlorobiphenyls (BZ 98 + 102)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9156	2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9156	2,2',3,4,6,6'-Hexachlorobiphenyl (BZ 145)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9157	2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9157	2,2',3,4',6,6'-Hexachlorobiphenyl (BZ 150)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9161	2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9161	2,2',3,4,6'-Pentachlorobiphenyl (BZ 89)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9162	2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9162	2,2',3,4'-Tetrachlorobiphenyl (BZ 42)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8957	2,2',3,5' + 2,2',4,4' + 2,3,5,6 - Tetrachlorobiphenyls (BZ 44 + 47 + 65)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8957	2,2',3,5' + 2,2',4,4' + 2,3,5,6 - Tetrachlorobiphenyls (BZ 44 + 47 + 65)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8956	2,2',3,5 + 2,3',5',6 - Tetrachlorobiphenyls (BZ 43 + 73)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8956	2,2',3,5 + 2,3',5',6 - Tetrachlorobiphenyls (BZ 43 + 73)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9164	2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9164	2,2',3,5,5'-Pentachlorobiphenyl (BZ 92)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8949	2,2',3,5,6 + 2,2',4,4',6 - Pentachlorobiphenyls (BZ 93 + 100)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8949	2,2',3,5,6 + 2,2',4,4',6 - Pentachlorobiphenyls (BZ 93 + 100)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9165	2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9165	2,2',3,5,6,6'-Hexachlorobiphenyl (BZ 152)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9167	2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9167	2,2',3,5,6'-Pentachlorobiphenyl (BZ 94)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9166	2,2',3,5',6-Pentachlorobiphenyl (BZ 95)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8958	2,2',3,6 + 2,2',4,6' - Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8958	2,2',3,6 + 2,2',4,6' - Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9170	2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9170	2,2',3,6,6'-Pentachlorobiphenyl (BZ 96)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9171	2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9171	2,2',3,6'-Tetrachlorobiphenyl (BZ 46)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9173	2,2',3-Trichlorobiphenyl (BZ 16)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9173	2,2',3-Trichlorobiphenyl (BZ 16)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8931	2,2',4,4',5,5' + 2,3',4,4',5',6 - Hexachlorobiphenyls (BZ 153 + 168)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8931	2,2',4,4',5,5' + 2,3',4,4',5',6 - Hexachlorobiphenyls (BZ 153 + 168)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9174	2,2',4,4',5,6'-Hexachlorobiphenyl (BZ 154)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9176	2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9176	2,2',4,4',6,6'-Hexachlorobiphenyl (BZ 155)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8959	2,2',4,5' + 2,3',4,6 - Tetrachlorobiphenyls (BZ 49 + 69)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8959	2,2',4,5' + 2,3',4,6 - Tetrachlorobiphenyls (BZ 49 + 69)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9179	2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9179	2,2',4,5',6-Pentachlorobiphenyl (BZ 103)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9181	2,2',4,5-Tetrachlorobiphenyl (BZ 48)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9181	2,2',4,5-Tetrachlorobiphenyl (BZ 48)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8961	2,2',4,6 + 2,2',5,6' - Tetrachlorobiphenyls (BZ 50 + 53)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8961	2,2',4,6 + 2,2',5,6' - Tetrachlorobiphenyls (BZ 50 + 53)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9182	2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9182	2,2',4,6,6'-Pentachlorobiphenyl (BZ 104)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9185	2,2',4-Trichlorobiphenyl (BZ 17)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9185	2,2',4-Trichlorobiphenyl (BZ 17)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8966	2,2',5 + 2,4,6 - Trichlorobiphenyls (BZ 18 + 30)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8966	2,2',5 + 2,4,6 - Trichlorobiphenyls (BZ 18 + 30)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8955	2,2',5,5'-Tetrachlorobiphenyl (BZ 52)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9187	2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9187	2,2',6,6'-Tetrachlorobiphenyl (BZ 54)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9188	2,2',6-Trichlorobiphenyl (BZ 19)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9188	2,2',6-Trichlorobiphenyl (BZ 19)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9189	2,2'-Dichlorobiphenyl (BZ 4)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9189	2,2'-Dichlorobiphenyl (BZ 4)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8967	2,3,3' + 2,4,4' - Trichlorobiphenyls (BZ 20 + 28)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8967	2,3,3' + 2,4,4' - Trichlorobiphenyls (BZ 20 + 28)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8932	2,3,3',4,4',5 + 2,3,3',4,4',5' - Hexachlorobiphenyls (BZ 156 + 157)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8932	2,3,3',4,4',5 + 2,3,3',4,4',5' - Hexachlorobiphenyls (BZ 156 + 157)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9190	2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9190	2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ 205)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9085	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ 189)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9191	2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9191	2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ 190)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9192	2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9192	2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ 191)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9193	2,3,3',4,4',6-Hexachlorobiphenyl (BZ 158)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8985	2,3,3',4,4'-Pentachlorobiphenyl (BZ 105)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8937	2,3,3',4,5' + 2,3',4',5,5' - Pentachlorobiphenyls (BZ 108 + 124)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8937	2,3,3',4,5' + 2,3',4',5,5' - Pentachlorobiphenyls (BZ 108 + 124)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9194	2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9194	2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ 192)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9196	2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9196	2,3,3',4,5,5'-Hexachlorobiphenyl (BZ 159)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9197	2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9197	2,3,3',4',5,5'-Hexachlorobiphenyl (BZ 162)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9200	2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9200	2,3,3',4,5',6-Hexachlorobiphenyl (BZ 161)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9201	2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9201	2,3,3',4',5',6-Hexachlorobiphenyl (BZ 164)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9204	2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9204	2,3,3',4,5-Pentachlorobiphenyl (BZ 106)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9205	2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9205	2,3,3',4',5-Pentachlorobiphenyl (BZ 107)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9202	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9202	2,3,3',4',5'-Pentachlorobiphenyl (BZ 122)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8938	2,3,3',4',6 + 2,3,4,4',6 - Pentachlorobiphenyls (BZ 110 + 115)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8938	2,3,3',4',6 + 2,3,4,4',6 - Pentachlorobiphenyls (BZ 110 + 115)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9208	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9208	2,3,3',4-Tetrachlorobiphenyl (BZ 55)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9207	2,3,3',4'-Tetrachlorobiphenyl (BZ 56)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9209	2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9209	2,3,3',5,5',6-Hexachlorobiphenyl (BZ 165)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9210	2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9210	2,3,3',5,5'-Pentachlorobiphenyl (BZ 111)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9211	2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9211	2,3,3',5,6-Pentachlorobiphenyl (BZ 112)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9214	2,3,3',5-Tetrachlorobiphenyl (BZ 57)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9214	2,3,3',5-Tetrachlorobiphenyl (BZ 57)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9213	2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9213	2,3,3',5'-Tetrachlorobiphenyl (BZ 58)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8962	2,3,3',6 + 2,3,4,6 + 2,4,4',6 - Tetrachlorobiphenyls (BZ 59 + 62 + 75)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8962	2,3,3',6 + 2,3,4,6 + 2,4,4',6 - Tetrachlorobiphenyls (BZ 59 + 62 + 75)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8968	2,3,4 + 2,3',4' - Trichlorobiphenyls (BZ 21 + 33)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8968	2,3,4 + 2,3',4' - Trichlorobiphenyls (BZ 21 + 33)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9055	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9055	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ 167)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9005	2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9005	2,3,4,4',5-Pentachlorobiphenyl (BZ 114)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8995	2,3',4,4',5-Pentachlorobiphenyl (BZ 118)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9000	2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9000	2,3',4,4',5'-Pentachlorobiphenyl (BZ 123)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9221	2,3,4,4'-Tetrachlorobiphenyl (BZ 60)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8960	2,3',4,4'-Tetrachlorobiphenyl (BZ 66)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8963	2,3,4,5 + 2,3',4',5 + 2,4,4',5 + 2,3',4',5' - Tetrachlorobiphenyls (BZ 61 + 70 + 74 + 76)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8963	2,3,4,5 + 2,3',4',5 + 2,4,4',5 + 2,3',4',5' - Tetrachlorobiphenyls (BZ 61 + 70 + 74 + 76)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9223	2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9223	2,3',4,5,5'-Pentachlorobiphenyl (BZ 120)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9226	2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9226	2,3',4,5',6-Pentachlorobiphenyl (BZ 121)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9233	2,3,4',5-Tetrachlorobiphenyl (BZ 63)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9233	2,3,4',5-Tetrachlorobiphenyl (BZ 63)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9232	2,3',4,5-Tetrachlorobiphenyl (BZ 67)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9232	2,3',4,5-Tetrachlorobiphenyl (BZ 67)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9231	2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9231	2,3',4,5'-Tetrachlorobiphenyl (BZ 68)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9480	2,3,4,6,7,8-Hxcdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9480	2,3,4,6,7,8-Hxcdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9236	2,3,4',6-Tetrachlorobiphenyl (BZ 64)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9236	2,3,4',6-Tetrachlorobiphenyl (BZ 64)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9549	2,3,4,7,8-Pecdf	EPA 1613B	10120602	Extractable Organics	11/7/2023
9549	2,3,4,7,8-Pecdf	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9240	2,3',4-Trichlorobihenyl (BZ 25)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9240	2,3',4-Trichlorobihenyl (BZ 25)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9241	2,3,4'-Trichlorobiphenyl (BZ 22)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9241	2,3,4'-Trichlorobiphenyl (BZ 22)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8969	2,3',5 + 2,4,5 - Trichlorobiphenyls (BZ 26 + 29)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8969	2,3',5 + 2,4,5 - Trichlorobiphenyls (BZ 26 + 29)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9242	2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9242	2,3',5,5'-Tetrachlorobiphenyl (BZ 72)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9245	2,3,5-Trichlorobihenyl (BZ 23)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9245	2,3,5-Trichlorobihenyl (BZ 23)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9246	2,3',5'-Trichlorobihenyl (BZ 34)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9246	2,3',5'-Trichlorobihenyl (BZ 34)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9248	2,3',6-Trichlorobihenyl (BZ 27)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9248	2,3',6-Trichlorobihenyl (BZ 27)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9247	2,3,6-Trichlorobiphenyl (BZ 24)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9247	2,3,6-Trichlorobiphenyl (BZ 24)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 1613B	10120602	Extractable Organics	11/7/2023
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9612	2,3,7,8-TCDF	EPA 1613B	10120602	Extractable Organics	11/7/2023
9612	2,3,7,8-TCDF	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8920	2,3-Dichlorobiphenyl (BZ 5)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9249	2,3'-Dichlorobiphenyl (BZ 6)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9249	2,3'-Dichlorobiphenyl (BZ 6)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8940	2,4',5-Trichlorobiphenyl (BZ 31)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9255	2,4',6-Trichlorobihenyl (BZ 32)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9255	2,4',6-Trichlorobihenyl (BZ 32)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9257	2,4-Dichlorobiphenyl (BZ 7)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9257	2,4-Dichlorobiphenyl (BZ 7)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9256	2,4'-Dichlorobiphenyl (BZ 8)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9256	2,4'-Dichlorobiphenyl (BZ 8)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9258	2,5-Dichlorobiphenyl (BZ 9)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9258	2,5-Dichlorobiphenyl (BZ 9)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9259	2,6-Dichlorophenyl (BZ 10)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9259	2,6-Dichlorophenyl (BZ 10)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8915	2-Chlorobiphenyl (BZ 1)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8915	2-Chlorobiphenyl (BZ 1)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9060	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9060	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ 169)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9015	3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
9015	3,3',4,4',5-Pentachlorobiphenyl (BZ 126)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8965	3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8965	3,3',4,4'-Tetrachlorobiphenyl (BZ 77)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9260	3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9260	3,3',4,5,5'-Pentachlorobiphenyl (BZ 127)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9262	3,3',4,5-Tetrachlorobiphenyl (BZ 78)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9262	3,3',4,5-Tetrachlorobiphenyl (BZ 78)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9261	3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9261	3,3',4,5'-Tetrachlorobiphenyl (BZ 79)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9263	3,3',4-Trichlorobihenyl (BZ 35)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9263	3,3',4-Trichlorobihenyl (BZ 35)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9264	3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9264	3,3',5,5'-Tetrachlorobiphenyl (BZ 80)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9265	3,3',5-Trichlorobihenyl (BZ 36)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9265	3,3',5-Trichlorobihenyl (BZ 36)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8925	3,3'-Dichlorobiphenyl (BZ 11)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8925	3,3'-Dichlorobiphenyl (BZ 11)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8914	3,4 + 3,4' - Dichlorobiphenyls (BZ 12 + 13)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8914	3,4 + 3,4' - Dichlorobiphenyls (BZ 12 + 13)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8970	3,4,4',5-Tetrachlorobiphenyl (BZ 81)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
8970	3,4,4',5-Tetrachlorobiphenyl (BZ 81)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9266	3,4,4'-Trichlorobiphenyl (BZ 37)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9266	3,4,4'-Trichlorobiphenyl (BZ 37)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9267	3,4,5-Trichlorobihenyl (BZ 38)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9267	3,4,5-Trichlorobihenyl (BZ 38)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9268	3,4',5-Trichlorobihenyl (BZ 39)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9268	3,4',5-Trichlorobihenyl (BZ 39)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9271	3,5-Dichlorobiphenyl (BZ 14)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9271	3,5-Dichlorobiphenyl (BZ 14)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9272	3-Chlorobiphenyl (BZ 2)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9272	3-Chlorobiphenyl (BZ 2)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9273	4,4'-Dichlorobiphenyl (BZ 15)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9273	4,4'-Dichlorobiphenyl (BZ 15)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9274	4-Chlorobiphenyl (BZ 3)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9274	4-Chlorobiphenyl (BZ 3)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
8880	Aroclor-1016 (PCB-1016)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/7/2023

Laboratory Scope of Accreditation

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Biological Tissue

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
8910	Aroclor-1260 (PCB-1260)	EPA 8082A	10179358	Pesticides-Herbicides-PCB's	11/7/2023
9105	Decachlorobiphenyl (BZ 209)	EPA 1668A	10262007	Pesticides-Herbicides-PCB's	11/7/2023
9105	Decachlorobiphenyl (BZ 209)	EPA 1668C	10262109	Pesticides-Herbicides-PCB's	11/7/2023
9438	Hpcdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9438	Hpcdd, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9444	Hpcdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9444	Hpcdf, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9468	Hxcdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9468	Hxcdd, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9483	Hxcdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9483	Hxcdf, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9555	Pecdd, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9555	Pecdd, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9552	Pecdf, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9552	Pecdf, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9609	TCDD, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9609	TCDD, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023
9615	TCDF, total	EPA 1613B	10120602	Extractable Organics	11/7/2023
9615	TCDF, total	EPA 8290A	10187403	Pesticides-Herbicides-PCB's	11/7/2023

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E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5160	1,1,1-Trichloroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5160	1,1,1-Trichloroethane	EPA TO-15	10248803	Volatile Organics	9/30/2002
5110	1,1,2,2-Tetrachloroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5110	1,1,2,2-Tetrachloroethane	EPA TO-15	10248803	Volatile Organics	9/30/2002
5185	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5165	1,1,2-Trichloroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5165	1,1,2-Trichloroethane	EPA TO-15	10248803	Volatile Organics	2/20/2006
4630	1,1-Dichloroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4630	1,1-Dichloroethane	EPA TO-15	10248803	Volatile Organics	9/30/2002
4640	1,1-Dichloroethylene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4640	1,1-Dichloroethylene	EPA TO-15	10248803	Volatile Organics	9/30/2002
9516	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9519	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9420	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9426	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9423	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9453	1,2,3,4,7,8-Hxcdd	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9471	1,2,3,4,7,8-Hxcdf	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9456	1,2,3,6,7,8-Hxcdd	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9474	1,2,3,6,7,8-Hxcdf	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9459	1,2,3,7,8,9-Hxcdd	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9477	1,2,3,7,8,9-Hxcdf	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9540	1,2,3,7,8-Pecdd	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9543	1,2,3,7,8-Pecdf	EPA TO-9A	10249408	Extractable Organics	10/1/2002
5150	1,2,3-Trichlorobenzene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5180	1,2,3-Trichloropropane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5155	1,2,4-Trichlorobenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5155	1,2,4-Trichlorobenzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
5155	1,2,4-Trichlorobenzene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5210	1,2,4-Trimethylbenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-14A	10312002	Volatile Organics	2/20/2006
4585	1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15	10248803	Volatile Organics	9/30/2002
4695	1,2-Dichloro-1,1,2,2-tetrafluoroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4610	1,2-Dichlorobenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4610	1,2-Dichlorobenzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4610	1,2-Dichlorobenzene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4635	1,2-Dichloroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4635	1,2-Dichloroethane	EPA TO-15	10248803	Volatile Organics	9/30/2002
4655	1,2-Dichloropropane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4655	1,2-Dichloropropane	EPA TO-15	10248803	Volatile Organics	9/30/2002
5215	1,3,5-Trimethylbenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
9318	1,3-Butadiene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4615	1,3-Dichlorobenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4615	1,3-Dichlorobenzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4615	1,3-Dichlorobenzene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4620	1,4-Dichlorobenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4620	1,4-Dichlorobenzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4620	1,4-Dichlorobenzene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4735	1,4-Dioxane (1,4-Diethyleneoxide)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5220	2,2,4-Trimethylpentane	EPA TO-15	10248803	Volatile Organics	2/20/2006
4659	2,2'-Oxybis(1-chloropropane),bis(2-Chloro-1-methylethyl)ether (fka bis(2-Chloroisopropyl) ether	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
9480	2,3,4,6,7,8-Hxcdf	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9549	2,3,4,7,8-Pecdf	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9618	2,3,7,8-TCDD (Dioxin, 2,3,7,8-Tetrachlorodibenzo-p-dioxin)	EPA TO-9A	10249408	Extractable Organics	10/1/2002
9612	2,3,7,8-TCDF	EPA TO-9A	10249408	Extractable Organics	10/1/2002
6835	2,4,5-Trichlorophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6840	2,4,6-Trichlorophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6000	2,4-Dichlorophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6130	2,4-Dimethylphenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6175	2,4-Dinitrophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6185	2,4-Dinitrotoluene (2,4-DNT)	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6190	2,6-Dinitrotoluene (2,6-DNT)	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4410	2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15	10248803	Volatile Organics	9/30/2002
5795	2-Chloronaphthalene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5800	2-Chlorophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4535	2-Chlorotoluene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4860	2-Hexanone	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6360	2-Methyl-4,6-dinitrophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013

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State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
6385	2-Methylnaphthalene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6400	2-Methylphenol (o-Cresol)	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6460	2-Nitroaniline	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6490	2-Nitrophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5945	3,3'-Dichlorobenzidine	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6465	3-Nitroaniline	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5660	4-Bromophenyl phenyl ether	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5700	4-Chloro-3-methylphenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5745	4-Chloroaniline	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5825	4-Chlorophenyl phenylether	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4542	4-Ethyltoluene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4995	4-Methyl-2-pentanone (MIBK)	EPA TO-15	10248803	Volatile Organics	9/30/2002
6410	4-Methylphenol (p-Cresol)	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6470	4-Nitroaniline	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6500	4-Nitrophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5500	Acenaphthene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5505	Acenaphthylene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
4315	Acetone	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4320	Acetonitrile	EPA TO-15	10248803	Volatile Organics	9/30/2002
4325	Acrolein (Propenal)	EPA TO-15	10248803	Volatile Organics	9/30/2002
4340	Acrylonitrile	EPA TO-15	10248803	Volatile Organics	9/30/2002
4355	Allyl chloride (3-Chloropropene)	EPA TO-15	10248803	Volatile Organics	2/20/2006
4357	a-Methylstyrene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5545	Aniline	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5555	Anthracene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
8880	Aroclor-1016 (PCB-1016)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
8885	Aroclor-1221 (PCB-1221)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
8890	Aroclor-1232 (PCB-1232)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
8895	Aroclor-1242 (PCB-1242)	EPA TO-10A	10247504	Pesticides-Herbicides-PCB's	10/28/2010
8895	Aroclor-1242 (PCB-1242)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
8900	Aroclor-1248 (PCB-1248)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
8905	Aroclor-1254 (PCB-1254)	EPA TO-10A	10247504	Pesticides-Herbicides-PCB's	10/28/2010
8905	Aroclor-1254 (PCB-1254)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
8910	Aroclor-1260 (PCB-1260)	EPA TO-10A	10247504	Pesticides-Herbicides-PCB's	10/28/2010
8910	Aroclor-1260 (PCB-1260)	EPA TO-4A	10249204	Pesticides-Herbicides-PCB's	9/30/2002
4375	Benzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4375	Benzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
5575	Benzo(a)anthracene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5580	Benzo(a)pyrene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5585	Benzo(b)fluoranthene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5590	Benzo(g,h,i)perylene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5600	Benzo(k)fluoranthene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5610	Benzoic acid	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5630	Benzyl alcohol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5635	Benzyl chloride	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5635	Benzyl chloride	EPA TO-15	10248803	Volatile Organics	9/30/2002
5760	bis(2-Chloroethoxy)methane	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5765	bis(2-Chloroethyl) ether	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4395	Bromodichloromethane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4400	Bromoform	EPA TO-15	10248803	Volatile Organics	9/30/2002
5670	Butyl benzyl phthalate	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5680	Carbazole	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4450	Carbon disulfide	EPA TO-15	10248803	Volatile Organics	9/30/2002
4455	Carbon tetrachloride	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4455	Carbon tetrachloride	EPA TO-15	10248803	Volatile Organics	9/30/2002
4475	Chlorobenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4475	Chlorobenzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4577	Chlorodifluoromethane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4485	Chloroethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4485	Chloroethane	EPA TO-15	10248803	Volatile Organics	9/30/2002
4505	Chloroform	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4505	Chloroform	EPA TO-15	10248803	Volatile Organics	9/30/2002
5855	Chrysene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
4705	cis & trans-1,2-Dichloroethylene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4645	cis-1,2-Dichloroethylene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4645	cis-1,2-Dichloroethylene	EPA TO-15	10248803	Volatile Organics	2/20/2006
4680	cis-1,3-Dichloropropene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4680	cis-1,3-Dichloropropene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4555	Cyclohexane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6065	Di(2-ethylhexyl) phthalate (DEHP)	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5895	Dibenz(a,h)anthracene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5905	Dibenzofuran	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
4575	Dibromochloromethane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4595	Dibromomethane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4625	Dichlorodifluoromethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4725	Diethyl ether	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6070	Diethyl phthalate	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6135	Dimethyl phthalate	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5925	Di-n-butyl phthalate	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6200	Di-n-octyl phthalate	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4755	Ethyl acetate	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4765	Ethylbenzene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4765	Ethylbenzene	EPA TO-15	10248803	Volatile Organics	9/30/2002
6265	Fluoranthene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
6270	Fluorene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
6275	Hexachlorobenzene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4835	Hexachlorobutadiene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4835	Hexachlorobutadiene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4835	Hexachlorobutadiene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6285	Hexachlorocyclopentadiene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4840	Hexachloroethane	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6315	Indeno(1,2,3-cd)pyrene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
4938	Isopentane (2-Methylbutane)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6320	Isophorone	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4895	Isopropyl alcohol (2-Propanol)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4900	Isopropylbenzene	EPA TO-15	10248803	Volatile Organics	2/20/2006
5240	m+p-Xylenes	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4950	Methyl bromide (Bromomethane)	EPA TO-14A	10312002	Volatile Organics	2/20/2006
4950	Methyl bromide (Bromomethane)	EPA TO-15	10248803	Volatile Organics	9/30/2002
4950	Methyl bromide (Bromomethane)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4960	Methyl chloride (Chloromethane)	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4960	Methyl chloride (Chloromethane)	EPA TO-15	10248803	Volatile Organics	9/30/2002
4990	Methyl methacrylate	EPA TO-15	10248803	Volatile Organics	10/15/2008
5000	Methyl tert-butyl ether (MTBE)	EPA TO-15	10248803	Volatile Organics	9/30/2002
4975	Methylene chloride	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4975	Methylene chloride	EPA TO-15	10248803	Volatile Organics	9/30/2002
5005	Naphthalene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5005	Naphthalene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5007	n-Butane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4425	n-Butyl alcohol	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4435	n-Butylbenzene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5875	n-Decane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6235	n-Dodecane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4825	n-Heptane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4855	n-Hexane	EPA TO-15	10248803	Volatile Organics	9/30/2002
5015	Nitrobenzene	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6545	n-Nitrosodi-n-propylamine	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6535	n-Nitrosodiphenylamine	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
5027	n-Octane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5026	Nonane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5028	n-Pentane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5090	n-Propylbenzene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6747	n-Undecane	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5250	o-Xylene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
6605	Pentachlorophenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
6615	Phenanthrene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
6625	Phenol	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4910	p-Isopropyltoluene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4836	Propylene (Propene)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
6665	Pyrene	EPA TO-13A	10248405	Extractable Organics	4/14/2004
5095	Pyridine	KNOX-MS-0017/GC-MS	60005370	Extractable Organics	9/13/2013
4440	sec-Butylbenzene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5100	Styrene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5100	Styrene	EPA TO-15	10248803	Volatile Organics	9/30/2002
4420	tert-Butyl alcohol (2-Methyl-2-propanol)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
4445	tert-Butylbenzene	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5115	Tetrachloroethylene (Perchloroethylene)	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5115	Tetrachloroethylene (Perchloroethylene)	EPA TO-15	10248803	Volatile Organics	2/20/2006
5120	Tetrahydrofuran (THF)	KNOX-MS-0001/GC-MS	60005358	Volatile Organics	9/13/2013
5140	Toluene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5140	Toluene	EPA TO-15	10248803	Volatile Organics	2/20/2006
4700	trans-1,2-Dichloroethylene	EPA TO-15	10248803	Volatile Organics	2/20/2006
4685	trans-1,3-Dichloropropene	EPA TO-14A	10312002	Volatile Organics	2/1/2002
4685	trans-1,3-Dichloropropene	EPA TO-15	10248803	Volatile Organics	9/30/2002

Laboratory Scope of Accreditation

Attachment to Certificate #: E87177-40, expiration date June 30, 2025. This listing of accredited analytes should be used only when associated with a valid certificate.

State Laboratory ID: E87177 EPA Lab Code: TN00009 (865) 291-3000

E87177
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921

Matrix: Air and Emissions

Analyte#	Analyte	Method/Tech	Method Code	Category	Effective Date
5170	Trichloroethene (Trichloroethylene)	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5170	Trichloroethene (Trichloroethylene)	EPA TO-15	10248803	Volatile Organics	9/30/2002
5175	Trichlorofluoromethane	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5225	Vinyl acetate	EPA TO-15	10248803	Volatile Organics	9/30/2002
5230	Vinyl bromide	EPA TO-15	10248803	Volatile Organics	2/20/2006
5235	Vinyl chloride	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5235	Vinyl chloride	EPA TO-15	10248803	Volatile Organics	9/30/2002
5260	Xylene (total)	EPA TO-14A	10312002	Volatile Organics	2/1/2002
5260	Xylene (total)	EPA TO-15	10248803	Volatile Organics	9/30/2002

EUROFINS LOUISIANA CERTIFICATION

JEFF LANDRY
GOVERNOR

STATE OF LOUISIANA

DEPARTMENT OF ENVIRONMENTAL QUALITY
OFFICE OF ENVIRONMENTAL SERVICES

AURELIA S. GIACOMETTO
SECRETARY

AI No. 83979
Activity No. ACC20230001
LELAP Lab ID No. 03079
Renewal Due June 30, 2026

Ms. Anna Barlozhetskaya
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Re: Annual Environmental Laboratory Accreditation

Dear Ms. Barlozhetskaya:

The Louisiana Department of Environmental Quality's laboratory accreditation program, in accordance with Louisiana Administrative Code Title 33, Part I, Subpart 3, Laboratory Accreditation, accredits this laboratory July 1, 2024 to June 30, 2025. This accreditation does not constitute an endorsement of the suitability of the listed methods for any specific purpose. Accreditation of the environmental laboratory does not imply that a product, process, system, or person is approved by the Louisiana Environmental Laboratory Accreditation Program (LELAP).

LELAP grants accreditation for those methods/analytes as indicated by the accreditation type on the attached scope of accreditation.[1] Accreditation is dependent on the laboratory's successful ongoing compliance with regulations as outlined in the Louisiana Administrative Code, Title 33, Part I, Subpart 3, Laboratory Accreditation and with the policy, rules, or standard of any other accreditation body (AB) listed on the scope of accreditation, as applicable.

LAC 33:I.5313.A requires that the laboratory report include all relevant information. Therefore, the certificate number shall be placed in the upper right corner of all laboratory reports. If the test report includes results of any test for which the laboratory is not accredited, the unaccredited results must be clearly identified as such.

[1]If the methods were partially identified on the LELAP application for secondary accreditation, the laboratory is accredited for the versions listed on the current application or referenced in the laboratory standard operating procedure.

Form_7568_r02
5-17-24

Post Office Box 4313 • Baton Rouge, Louisiana 70821-4313 • Phone 225-219-3181 • Fax 225-219-3309
www.deq.louisiana.gov

The accreditation certificate is the property of the State of Louisiana. Should your accreditation be suspended or revoked, your laboratory must return the certificate of accreditation to LELAP and delete any electronic copies until your accreditation status is restored.

We request that you examine the attached certificate and scope of accreditation for accuracy and completeness. If you note any errors, please notify us immediately.

If you have any questions, please contact your assigned assessor, Teman Roberts, at (225) 219-3284 or teman.roberts@la.gov.

Sincerely,

Tonya Landry

Tonya Landry
Administrator
Public Participation and Permit Support Division

6/28/2024
Date

TL:TR:tr

Attachments

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Is hereby granting a Louisiana Environmental Laboratory Accreditation to

Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, Tennessee 37921-5947

Agency Interest No. 83979
Activity No. ACC20230001

According to the Louisiana Administrative Code, Title 33, Part I, Subpart 3, LABORATORY ACCREDITATION, the State of Louisiana formally recognizes that this laboratory is technically competent to perform the environmental analyses listed on the scope of accreditation detailed in the attachment.

The laboratory agrees to perform all analyses listed on this scope of accreditation according to the Part I, Subpart 3 requirements and acknowledges that continued accreditation is dependent on successful ongoing compliance with the applicable requirements of Part I and the TNI Standard by which the laboratory was assessed. Please contact the Department of Environmental Quality, Louisiana Environmental Laboratory Accreditation Program (LELAP) to verify the laboratory's scope of accreditation and accreditation status.

Accreditation by the State of Louisiana is not an endorsement or a guarantee of validity of the data generated by the laboratory. Accreditation of the environmental laboratory does not imply that a product, process, system, or person is approved by LELAP. To be accredited initially and maintain accreditation, the laboratory agrees to participate in two single-blind, single-concentration PT studies, where available, per year for each field of testing for which it seeks accreditation or maintains accreditation as required in LAC 33:I.4711.

Tonya Landry
Administrator
Public Participation and Permit Support Division

Issued Date: 6/28/2024

Effective Date: **July 1, 2024**
Expiration Date: **June 30, 2025**
Certificate Number: 03079

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

Effective Date: July 1, 2024

5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
100068 - Desorption of Sorbent Cartridges	SOP KNOX-MS-0011	2027	NELAP	LA
100069 - Total Organic Emissions	SOP KNOX-GC-0010	2031	NELAP	LA
1580 - Chlorine	SOP KNOX WC-0005	2041	NELAP	LA
1770 - Hydrochloric acid (Hydrogen chloride (gas only))	SOP KNOX WC-0005	2041	NELAP	LA
6380 - 1-Methylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
9501 - 1-Methylphenanthrene	SOP KNOX-ID-0016	2042	NELAP	LA
6852 - 2,3,5-Trimethylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6188 - 2,6-Dimethylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6385 - 2-Methylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
5500 - Acenaphthene	SOP KNOX-ID-0016	2042	NELAP	LA
5505 - Acenaphthylene	SOP KNOX-ID-0016	2042	NELAP	LA
5555 - Anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
5575 - Benzo(a)anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
5580 - Benzo(a)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5585 - Benzo(b)fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
5605 - Benzo(e)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5590 - Benzo(g,h,i)perylene	SOP KNOX-ID-0016	2042	NELAP	LA
5600 - Benzo(k)fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
5640 - Biphenyl (1,1'-Biphenyl)	SOP KNOX-ID-0016	2042	NELAP	LA
5855 - Chrysene	SOP KNOX-ID-0016	2042	NELAP	LA
5895 - Dibenz(a,h)anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
6265 - Fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
6270 - Fluorene	SOP KNOX-ID-0016	2042	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5005 - Naphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6608 - Perylene	SOP KNOX-ID-0016	2042	NELAP	LA
6615 - Phenanthrene	SOP KNOX-ID-0016	2042	NELAP	LA
6665 - Pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	SOP KNOX-ID-0013	2061	NELAP	LA
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	SOP KNOX-ID-0013	2061	NELAP	LA
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	SOP KNOX-ID-0013	2061	NELAP	LA
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	SOP KNOX-ID-0013	2061	NELAP	LA
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	SOP KNOX-ID-0013	2061	NELAP	LA
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	SOP KNOX-ID-0013	2061	NELAP	LA
9134 - 2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)	SOP KNOX-ID-0013	2061	NELAP	LA
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	SOP KNOX-ID-0013	2061	NELAP	LA
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	SOP KNOX-ID-0013	2061	NELAP	LA
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	SOP KNOX-ID-0013	2061	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	SOP KNOX-ID-0013	2061	NELAP	LA
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	SOP KNOX-ID-0013	2061	NELAP	LA
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	SOP KNOX-ID-0013	2061	NELAP	LA
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	SOP KNOX-ID-0013	2061	NELAP	LA
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	SOP KNOX-ID-0013	2061	NELAP	LA
9045 - 2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-157)	SOP KNOX-ID-0013	2061	NELAP	LA
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	SOP KNOX-ID-0013	2061	NELAP	LA
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	SOP KNOX-ID-0013	2061	NELAP	LA
9050 - 2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)	SOP KNOX-ID-0013	2061	NELAP	LA
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	SOP KNOX-ID-0013	2061	NELAP	LA
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	SOP KNOX-ID-0013	2061	NELAP	LA
8915 - 2-Chlorobiphenyl (BZ-1)	SOP KNOX-ID-0013	2061	NELAP	LA
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	SOP KNOX-ID-0013	2061	NELAP	LA
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	SOP KNOX-ID-0013	2061	NELAP	LA
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	SOP KNOX-ID-0013	2061	NELAP	LA
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	SOP KNOX-ID-0013	2061	NELAP	LA
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	SOP KNOX-ID-0013	2061	NELAP	LA
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	SOP KNOX-ID-0013	2061	NELAP	LA
100071 - 4-monochlorobiphenyl	SOP KNOX-ID-0013	2061	NELAP	LA
100072 - Total Decachlorobiphenyl	SOP KNOX-ID-0013	2061	NELAP	LA
8876 - Total Dichlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8877 - Total Heptachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8888 - Total Hexachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8889 - Total Monochlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8891 - Total Nonachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8892 - Total Octachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8896 - Total Pentachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8893 - Total Tetrachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8894 - Total Trichlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
4610 - 1,2-Dichlorobenzene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
4615 - 1,3-Dichlorobenzene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
4620 - 1,4-Dichlorobenzene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6835 - 2,4,5-Trichlorophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6840 - 2,4,6-Trichlorophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6000 - 2,4-Dichlorophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6130 - 2,4-Dimethylphenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6175 - 2,4-Dinitrophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Effective Date: July 1, 2024

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
6185 - 2,4-Dinitrotoluene (2,4-DNT)	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6190 - 2,6-Dinitrotoluene (2,6-DNT)	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5795 - 2-Chloronaphthalene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5800 - 2-Chlorophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6385 - 2-Methylnaphthalene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6400 - 2-Methylphenol (o-Cresol)	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6460 - 2-Nitroaniline	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6490 - 2-Nitrophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5945 - 3,3'-Dichlorobenzidine	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6465 - 3-Nitroaniline	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5660 - 4-Bromophenyl phenyl ether	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5700 - 4-Chloro-3-methylphenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5745 - 4-Chloroaniline	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5825 - 4-Chlorophenyl phenylether	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6410 - 4-Methylphenol (p-Cresol)	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6470 - 4-Nitroaniline	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6500 - 4-Nitrophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5545 - Aniline	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5610 - Benzoic acid	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5630 - Benzyl alcohol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5780 - Bis(2-Chloroisopropyl) ether (2,2-oxybis(1-chloropropane))	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5670 - Butyl benzyl phthalate	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5680 - Carbazole	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5925 - Di-n-butyl phthalate	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6200 - Di-n-octyl phthalate	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5905 - Dibenzofuran	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6070 - Diethyl phthalate	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6135 - Dimethyl phthalate	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6275 - Hexachlorobenzene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
4835 - Hexachlorobutadiene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6285 - Hexachlorocyclopentadiene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
4840 - Hexachloroethane	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6320 - Isophorone	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5015 - Nitrobenzene	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6605 - Pentachlorophenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6625 - Phenol	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5095 - Pyridine	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5760 - bis(2-Chloroethoxy)methane	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
5765 - bis(2-Chloroethyl) ether	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6545 - n-Nitrosodi-n-propylamine	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
6535 - n-Nitrosodiphenylamine	SOP KNOX-MS-0017GC/MS	3012	NELAP	FL
9490 - 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11-Cl-PF3OUdS)	SOP KNOX-OP-0026	9394	NELAP	LA
6948 - 1H, 1H, 2H, 2H-Perfluorodecanesulfonic acid (8:2 FTS)	SOP KNOX-OP-0026	9394	NELAP	LA

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

STATE OF LOUISIANA
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Eurofins Knoxville
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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
6946 - 1H, 1H, 2H, 2H-Perfluorohexanesulfonic acid (4:2 FTS)	SOP KNOX-OP-0026	9394	NELAP	LA
6947 - 1H, 1H, 2H, 2H-Perfluorooctanesulfonic acid (6:2 FTS)	SOP KNOX-OP-0026	9394	NELAP	LA
9616 - 1H, 1H, 2H, 2H-perfluorododecane sulfonic acid (10:2 FTS)	SOP KNOX-OP-0026	9394	NELAP	LA
100864 - 2-(N-methyl perfluorooctanesulfonamido) ethanol (NMeFOSE)	SOP KNOX-OP-0026	9394	NELAP	LA
6951 - 4,8-Dioxa-3H-perfluorononanoic acid (DONA)	SOP KNOX-OP-0026	9394	NELAP	LA
6952 - 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9-Cl-PF3ONS)	SOP KNOX-OP-0026	9394	NELAP	LA
9460 - Hexafluoropropyleneoxide dimer acid (HFPO-DA) (GenX)	SOP KNOX-OP-0026	9394	NELAP	LA
9395 - N-Ethylperfluorooctane sulfonamide (EtFOSAm)	SOP KNOX-OP-0026	9394	NELAP	LA
4846 - N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	SOP KNOX-OP-0026	9394	NELAP	LA
9431 - N-Ethylperfluorooctane sulfonamido ethanol (EtFOSE)	SOP KNOX-OP-0026	9394	NELAP	LA
9433 - N-Methylperfluorooctane sulfonamide (MeFOSA)	SOP KNOX-OP-0026	9394	NELAP	LA
6955 - N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	SOP KNOX-OP-0026	9394	NELAP	LA
6918 - Perfluorobutanesulfonic acid (PFBS)	SOP KNOX-OP-0026	9394	NELAP	LA
6915 - Perfluorobutyric acid (PFBA)	SOP KNOX-OP-0026	9394	NELAP	LA
6920 - Perfluorodecane sulfonic acid (PFDS)	SOP KNOX-OP-0026	9394	NELAP	LA
6905 - Perfluorodecanoic acid (PFDA)	SOP KNOX-OP-0026	9394	NELAP	LA
6923 - Perfluorododecane sulfonic acid (PFDoS)	SOP KNOX-OP-0026	9394	NELAP	LA
6903 - Perfluorododecanoic acid (PFDOA)	SOP KNOX-OP-0026	9394	NELAP	LA
9470 - Perfluoroheptane sulfonic acid (PFHpS)	SOP KNOX-OP-0026	9394	NELAP	LA
6908 - Perfluoroheptanoic acid (PFHpA)	SOP KNOX-OP-0026	9394	NELAP	LA
6901 - Perfluorohexadecanoic acid (PFHXDA)	SOP KNOX-OP-0026	9394	NELAP	LA
6927 - Perfluorohexanesulfonic acid (PFHxS)	SOP KNOX-OP-0026	9394	NELAP	LA
6913 - Perfluorohexanoic acid (PFHXA)	SOP KNOX-OP-0026	9394	NELAP	LA
6929 - Perfluorononane sulfonic acid (PFNS)	SOP KNOX-OP-0026	9394	NELAP	LA
6906 - Perfluorononanoic acid (PFNA)	SOP KNOX-OP-0026	9394	NELAP	LA
6916 - Perfluorooctadecanoic acid (PFODA)	SOP KNOX-OP-0026	9394	NELAP	LA
6917 - Perfluorooctane sulfonamide (PFOSAm)	SOP KNOX-OP-0026	9394	NELAP	LA
6931 - Perfluorooctane sulfonic acid (PFOS)	SOP KNOX-OP-0026	9394	NELAP	LA
6912 - Perfluorooctanoic acid (PFOA)	SOP KNOX-OP-0026	9394	NELAP	LA

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Air Emissions

Analyte	Method Name	Method Code	Type	AB
6934 - Perfluoropentanesulfonic acid (PFPeS)	SOP KNOX-OP-0026	9394	NELAP	LA
6914 - Perfluoropentanoic acid (PFPEA)	SOP KNOX-OP-0026	9394	NELAP	LA
6902 - Perfluorotetradecanoic acid (PFTDA)	SOP KNOX-OP-0026	9394	NELAP	LA
9563 - Perfluorotridecanoic acid (PFTrDA)	SOP KNOX-OP-0026	9394	NELAP	LA
6904 - Perfluoroundecanoic acid (PFUnDA)	SOP KNOX-OP-0026	9394	NELAP	LA
9490 - 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11-Cl-PF3OUdS)	KNOXLC0007	9405	NELAP	LA
6948 - 1H, 1H, 2H, 2H-Perfluorodecanesulfonic acid (8:2 FTS)	KNOXLC0007	9405	NELAP	LA
6946 - 1H, 1H, 2H, 2H-Perfluorohexanesulfonic acid (4:2 FTS)	KNOXLC0007	9405	NELAP	LA
6947 - 1H, 1H, 2H, 2H-Perfluorooctanesulfonic acid (6:2 FTS)	KNOXLC0007	9405	NELAP	LA
9616 - 1H, 1H, 2H, 2H-perfluorododecane sulfonic acid (10:2 FTS)	KNOXLC0007	9405	NELAP	LA
100864 - 2-(N-methyl perfluorooctanesulfonamido) ethanol (NMeFOSE)	KNOXLC0007	9405	NELAP	LA
6951 - 4,8-Dioxa-3H-perfluorononanoic acid (DONA)	KNOXLC0007	9405	NELAP	LA
6952 - 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9-Cl-PF3ONS)	KNOXLC0007	9405	NELAP	LA
9460 - Hexafluoropropyleneoxide dimer acid (HFPO-DA) (GenX)	KNOXLC0007	9405	NELAP	LA
9395 - N-Ethylperfluorooctane sulfonamide (EtFOSAm)	KNOXLC0007	9405	NELAP	LA
4846 - N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	KNOXLC0007	9405	NELAP	LA
9431 - N-Ethylperfluorooctane sulfonamido ethanol (EtFOSE)	KNOXLC0007	9405	NELAP	LA
9433 - N-Methylperfluorooctane sulfonamide (MeFOSA)	KNOXLC0007	9405	NELAP	LA
6955 - N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	KNOXLC0007	9405	NELAP	LA
6918 - Perfluorobutanesulfonic acid (PFBS)	KNOXLC0007	9405	NELAP	LA
6915 - Perfluorobutyric acid (PFBA)	KNOXLC0007	9405	NELAP	LA
6920 - Perfluorodecane sulfonic acid (PFDS)	KNOXLC0007	9405	NELAP	LA
6905 - Perfluorodecanoic acid (PFDA)	KNOXLC0007	9405	NELAP	LA
6923 - Perfluorododecane sulfonic acid (PFDoS)	KNOXLC0007	9405	NELAP	LA
6903 - Perfluorododecanoic acid (PFDOA)	KNOXLC0007	9405	NELAP	LA
9470 - Perfluoroheptane sulfonic acid (PFHpS)	KNOXLC0007	9405	NELAP	LA
6908 - Perfluoroheptanoic acid (PFHpA)	KNOXLC0007	9405	NELAP	LA
6901 - Perfluorohexadecanoic acid (PFHXDA)	KNOXLC0007	9405	NELAP	LA
6927 - Perfluorohexanesulfonic acid	KNOXLC0007	9405	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
(PFHxS)				
6913 - Perfluorohexanoic acid (PFHXA)	KNOXLC0007	9405	NELAP	LA
6929 - Perfluorononane sulfonic acid (PFNS)	KNOXLC0007	9405	NELAP	LA
6906 - Perfluorononanoic acid (PFNA)	KNOXLC0007	9405	NELAP	LA
6916 - Perfluorooctadecanoic acid (PFODA)	KNOXLC0007	9405	NELAP	LA
6917 - Perfluorooctane sulfonamide (PFOSAm)	KNOXLC0007	9405	NELAP	LA
6931 - Perfluorooctane sulfonic acid (PFOS)	KNOXLC0007	9405	NELAP	LA
6912 - Perfluorooctanoic acid (PFOA)	KNOXLC0007	9405	NELAP	LA
6934 - Perfluoropentanesulfonic acid (PFPeS)	KNOXLC0007	9405	NELAP	LA
6914 - Perfluoropentanoic acid (PFPEA)	KNOXLC0007	9405	NELAP	LA
6902 - Perfluorotetradecanoic acid (PFTDA)	KNOXLC0007	9405	NELAP	LA
9563 - Perfluorotridecanoic acid (PFTrDA)	KNOXLC0007	9405	NELAP	LA
6904 - Perfluoroundecanoic acid (PFUnDA)	KNOXLC0007	9405	NELAP	LA
3973 - Total Suspended Particulate (TSP)	40 CFR Part 50 Appendix B	10000304	NELAP	TX
3950 - Particulates <10 um	40 CFR Part 50 Appendix J	10000507	NELAP	TX
100061 - Volatile Organic Sampling Train (VOST)	EPA 0030	10002401	NELAP	LA
1441 - Sampling	EPA 0031	10002605	NELAP	LA
4026 - Sampling of Principal Organic Hazardous Constituents from Combustion Sources Using Tedlar® Bags	EPA 0040	10002809	NELAP	LA
100516 - Metals Sampling Train	EPA 0060	10003404	NELAP	LA
1045 - Chromium VI	EPA 0061	10003608	NELAP	LA
1441 - Sampling	EPA 0061	10003608	NELAP	LA
1415 - Extraction of Semivolatile Analytes Collected Using Method 0010 (Modified Method 5 Sampling Train)	EPA 3542	10140600	NELAP	LA
1406 - Purge and trap for aqueous phase samples	EPA 5030B	10153409	NELAP	LA
5160 - 1,1,1-Trichloroethane	EPA 5041A	10154800	NELAP	LA
5110 - 1,1,2,2-Tetrachloroethane	EPA 5041A	10154800	NELAP	LA
5165 - 1,1,2-Trichloroethane	EPA 5041A	10154800	NELAP	LA
4630 - 1,1-Dichloroethane	EPA 5041A	10154800	NELAP	LA
5180 - 1,2,3-Trichloropropane	EPA 5041A	10154800	NELAP	LA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 5041A	10154800	NELAP	LA
4655 - 1,2-Dichloropropane	EPA 5041A	10154800	NELAP	LA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 5041A	10154800	NELAP	LA
4860 - 2-Hexanone	EPA 5041A	10154800	NELAP	LA
4315 - Acetone	EPA 5041A	10154800	NELAP	LA
4375 - Benzene	EPA 5041A	10154800	NELAP	LA
4395 - Bromodichloromethane	EPA 5041A	10154800	NELAP	LA
4400 - Bromoform	EPA 5041A	10154800	NELAP	LA
4450 - Carbon disulfide	EPA 5041A	10154800	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
4455 - Carbon tetrachloride	EPA 5041A	10154800	NELAP	LA
4475 - Chlorobenzene	EPA 5041A	10154800	NELAP	LA
4575 - Chlorodibromomethane (dibromochloromethane)	EPA 5041A	10154800	NELAP	LA
4485 - Chloroethane (Ethyl chloride)	EPA 5041A	10154800	NELAP	LA
4505 - Chloroform	EPA 5041A	10154800	NELAP	LA
4595 - Dibromomethane (Methylene bromide)	EPA 5041A	10154800	NELAP	LA
4765 - Ethylbenzene	EPA 5041A	10154800	NELAP	LA
4950 - Methyl bromide (Bromomethane)	EPA 5041A	10154800	NELAP	LA
4960 - Methyl chloride (Chloromethane)	EPA 5041A	10154800	NELAP	LA
4975 - Methylene chloride (Dichloromethane)	EPA 5041A	10154800	NELAP	LA
5100 - Styrene	EPA 5041A	10154800	NELAP	LA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 5041A	10154800	NELAP	LA
5140 - Toluene	EPA 5041A	10154800	NELAP	LA
5170 - Trichloroethene (Trichloroethylene)	EPA 5041A	10154800	NELAP	LA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 5041A	10154800	NELAP	LA
5235 - Vinyl chloride	EPA 5041A	10154800	NELAP	LA
100719 - Volatile Principle Organic Hazardous Constituents	EPA 5041A	10154800	NELAP	LA
4645 - cis-1,2-Dichloroethylene	EPA 5041A	10154800	NELAP	LA
4680 - cis-1,3-Dichloropropene	EPA 5041A	10154800	NELAP	LA
5240 - m+p-xylene	EPA 5041A	10154800	NELAP	LA
5250 - o-Xylene	EPA 5041A	10154800	NELAP	LA
4700 - trans-1,2-Dichloroethylene	EPA 5041A	10154800	NELAP	LA
4685 - trans-1,3-Dichloropropylene	EPA 5041A	10154800	NELAP	LA
1000 - Aluminum	EPA 6010C	10155803	NELAP	LA
1005 - Antimony	EPA 6010C	10155803	NELAP	LA
1010 - Arsenic	EPA 6010C	10155803	NELAP	LA
1015 - Barium	EPA 6010C	10155803	NELAP	LA
1020 - Beryllium	EPA 6010C	10155803	NELAP	LA
1030 - Cadmium	EPA 6010C	10155803	NELAP	LA
1035 - Calcium	EPA 6010C	10155803	NELAP	LA
1040 - Chromium	EPA 6010C	10155803	NELAP	LA
1050 - Cobalt	EPA 6010C	10155803	NELAP	LA
1055 - Copper	EPA 6010C	10155803	NELAP	LA
1070 - Iron	EPA 6010C	10155803	NELAP	LA
1075 - Lead	EPA 6010C	10155803	NELAP	LA
1080 - Lithium	EPA 6010C	10155803	NELAP	LA
1085 - Magnesium	EPA 6010C	10155803	NELAP	LA
1090 - Manganese	EPA 6010C	10155803	NELAP	LA
1100 - Molybdenum	EPA 6010C	10155803	NELAP	LA
1105 - Nickel	EPA 6010C	10155803	NELAP	LA
1125 - Potassium	EPA 6010C	10155803	NELAP	LA
1140 - Selenium	EPA 6010C	10155803	NELAP	LA
1150 - Silver	EPA 6010C	10155803	NELAP	LA
1155 - Sodium	EPA 6010C	10155803	NELAP	LA
1160 - Strontium	EPA 6010C	10155803	NELAP	LA

STATE OF LOUISIANA
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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
1165 - Thallium	EPA 6010C	10155803	NELAP	LA
1175 - Tin	EPA 6010C	10155803	NELAP	LA
1180 - Titanium	EPA 6010C	10155803	NELAP	LA
1910 - Total Phosphorus	EPA 6010C	10155803	NELAP	LA
1185 - Vanadium	EPA 6010C	10155803	NELAP	LA
1190 - Zinc	EPA 6010C	10155803	NELAP	LA
1045 - Chromium VI	EPA 7199	10163005	NELAP	LA
1095 - Mercury	EPA 7470A	10165807	NELAP	LA
5105 - 1,1,1,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	LA
5160 - 1,1,1-Trichloroethane	EPA 8260B	10184802	NELAP	LA
5110 - 1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	LA
5185 - 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260B	10184802	NELAP	LA
5165 - 1,1,2-Trichloroethane	EPA 8260B	10184802	NELAP	LA
4630 - 1,1-Dichloroethane	EPA 8260B	10184802	NELAP	LA
4640 - 1,1-Dichloroethylene	EPA 8260B	10184802	NELAP	LA
4670 - 1,1-Dichloropropene	EPA 8260B	10184802	NELAP	LA
5150 - 1,2,3-Trichlorobenzene	EPA 8260B	10184802	NELAP	LA
5180 - 1,2,3-Trichloropropane	EPA 8260B	10184802	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	EPA 8260B	10184802	NELAP	LA
5210 - 1,2,4-Trimethylbenzene	EPA 8260B	10184802	NELAP	LA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	NELAP	LA
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	NELAP	LA
4610 - 1,2-Dichlorobenzene	EPA 8260B	10184802	NELAP	LA
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 8260B	10184802	NELAP	LA
4655 - 1,2-Dichloropropane	EPA 8260B	10184802	NELAP	LA
5215 - 1,3,5-Trimethylbenzene	EPA 8260B	10184802	NELAP	LA
9318 - 1,3-Butadiene	EPA 8260B	10184802	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA 8260B	10184802	NELAP	LA
4660 - 1,3-Dichloropropane	EPA 8260B	10184802	NELAP	LA
4620 - 1,4-Dichlorobenzene	EPA 8260B	10184802	NELAP	LA
4665 - 2,2-Dichloropropane	EPA 8260B	10184802	NELAP	LA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	NELAP	LA
5812 - 2-Chloropropane	EPA 8260B	10184802	NELAP	LA
4535 - 2-Chlorotoluene	EPA 8260B	10184802	NELAP	LA
4860 - 2-Hexanone	EPA 8260B	10184802	NELAP	LA
4540 - 4-Chlorotoluene	EPA 8260B	10184802	NELAP	LA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 8260B	10184802	NELAP	LA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	NELAP	LA
4315 - Acetone	EPA 8260B	10184802	NELAP	LA
4320 - Acetonitrile	EPA 8260B	10184802	NELAP	LA
4340 - Acrylonitrile	EPA 8260B	10184802	NELAP	LA
4375 - Benzene	EPA 8260B	10184802	NELAP	LA
4385 - Bromobenzene	EPA 8260B	10184802	NELAP	LA
4390 - Bromochloromethane	EPA 8260B	10184802	NELAP	LA
4395 - Bromodichloromethane	EPA 8260B	10184802	NELAP	LA
4400 - Bromoform	EPA 8260B	10184802	NELAP	LA

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

Effective Date: July 1, 2024

5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
4450 - Carbon disulfide	EPA 8260B	10184802	NELAP	LA
4455 - Carbon tetrachloride	EPA 8260B	10184802	NELAP	LA
4475 - Chlorobenzene	EPA 8260B	10184802	NELAP	LA
4575 - Chlorodibromomethane (dibromochloromethane)	EPA 8260B	10184802	NELAP	LA
4485 - Chloroethane (Ethyl chloride)	EPA 8260B	10184802	NELAP	LA
4505 - Chloroform	EPA 8260B	10184802	NELAP	LA
4595 - Dibromomethane (Methylene bromide)	EPA 8260B	10184802	NELAP	LA
4625 - Dichlorodifluoromethane (Freon-12)	EPA 8260B	10184802	NELAP	LA
4765 - Ethylbenzene	EPA 8260B	10184802	NELAP	LA
4835 - Hexachlorobutadiene	EPA 8260B	10184802	NELAP	LA
4870 - Iodomethane (Methyl iodide)	EPA 8260B	10184802	NELAP	LA
4900 - Isopropylbenzene (Cumene)	EPA 8260B	10184802	NELAP	LA
4950 - Methyl bromide (Bromomethane)	EPA 8260B	10184802	NELAP	LA
4960 - Methyl chloride (Chloromethane)	EPA 8260B	10184802	NELAP	LA
5000 - Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	NELAP	LA
4975 - Methylene chloride (Dichloromethane)	EPA 8260B	10184802	NELAP	LA
5005 - Naphthalene	EPA 8260B	10184802	NELAP	LA
5100 - Styrene	EPA 8260B	10184802	NELAP	LA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	NELAP	LA
5140 - Toluene	EPA 8260B	10184802	NELAP	LA
5170 - Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	NELAP	LA
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 8260B	10184802	NELAP	LA
5230 - Vinyl bromide (Bromoethane)	EPA 8260B	10184802	NELAP	LA
5235 - Vinyl chloride	EPA 8260B	10184802	NELAP	LA
5260 - Xylene (total)	EPA 8260B	10184802	NELAP	LA
4705 - cis & trans-1,2-Dichloroethene	EPA 8260B	10184802	NELAP	LA
4645 - cis-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	LA
4680 - cis-1,3-Dichloropropene	EPA 8260B	10184802	NELAP	LA
4600 - cis-1,4-Dichloro-2-butene	EPA 8260B	10184802	NELAP	LA
5240 - m+p-xylene	EPA 8260B	10184802	NELAP	LA
4435 - n-Butylbenzene	EPA 8260B	10184802	NELAP	LA
4855 - n-Hexane	EPA 8260B	10184802	NELAP	LA
5090 - n-Propylbenzene	EPA 8260B	10184802	NELAP	LA
5250 - o-Xylene	EPA 8260B	10184802	NELAP	LA
4440 - sec-Butylbenzene	EPA 8260B	10184802	NELAP	LA
4445 - tert-Butylbenzene	EPA 8260B	10184802	NELAP	LA
4700 - trans-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	LA
4685 - trans-1,3-Dichloropropylene	EPA 8260B	10184802	NELAP	LA
4605 - trans-1,4-Dichloro-2-butene	EPA 8260B	10184802	NELAP	LA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	EPA 8270C	10185805	NELAP	LA
4610 - 1,2-Dichlorobenzene	EPA 8270C	10185805	NELAP	LA
6220 - 1,2-Diphenylhydrazine	EPA 8270C	10185805	NELAP	LA
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270C	10185805	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA 8270C	10185805	NELAP	LA
4620 - 1,4-Dichlorobenzene	EPA 8270C	10185805	NELAP	LA

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Effective Date: July 1, 2024

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
5790 - 1-Chloronaphthalene	EPA 8270C	10185805	NELAP	LA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 8270C	10185805	NELAP	LA
6835 - 2,4,5-Trichlorophenol	EPA 8270C	10185805	NELAP	LA
6840 - 2,4,6-Trichlorophenol	EPA 8270C	10185805	NELAP	LA
6000 - 2,4-Dichlorophenol	EPA 8270C	10185805	NELAP	LA
6130 - 2,4-Dimethylphenol	EPA 8270C	10185805	NELAP	LA
6175 - 2,4-Dinitrophenol	EPA 8270C	10185805	NELAP	LA
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	NELAP	LA
6005 - 2,6-Dichlorophenol	EPA 8270C	10185805	NELAP	LA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	NELAP	LA
5515 - 2-Acetylaminofluorene	EPA 8270C	10185805	NELAP	LA
5795 - 2-Chloronaphthalene	EPA 8270C	10185805	NELAP	LA
5800 - 2-Chlorophenol	EPA 8270C	10185805	NELAP	LA
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270C	10185805	NELAP	LA
5145 - 2-Methylaniline (o-Toluidine)	EPA 8270C	10185805	NELAP	LA
6385 - 2-Methylnaphthalene	EPA 8270C	10185805	NELAP	LA
6400 - 2-Methylphenol (o-Cresol)	EPA 8270C	10185805	NELAP	LA
6460 - 2-Nitroaniline	EPA 8270C	10185805	NELAP	LA
6490 - 2-Nitrophenol	EPA 8270C	10185805	NELAP	LA
6690 - 2-Sec-butyl-4,6-dinitrophenol (DNBP, Dinoseb)	EPA 8270C	10185805	NELAP	LA
6412 - 3+4 Methylphenol	EPA 8270C	10185805	NELAP	LA
5945 - 3,3'-Dichlorobenzidine	EPA 8270C	10185805	NELAP	LA
6355 - 3-Methylcholanthrene	EPA 8270C	10185805	NELAP	LA
6465 - 3-Nitroaniline	EPA 8270C	10185805	NELAP	LA
5660 - 4-Bromophenyl phenyl ether	EPA 8270C	10185805	NELAP	LA
5700 - 4-Chloro-3-methylphenol	EPA 8270C	10185805	NELAP	LA
5745 - 4-Chloroaniline	EPA 8270C	10185805	NELAP	LA
5825 - 4-Chlorophenyl phenylether	EPA 8270C	10185805	NELAP	LA
6105 - 4-Dimethyl aminoazobenzene	EPA 8270C	10185805	NELAP	LA
6470 - 4-Nitroaniline	EPA 8270C	10185805	NELAP	LA
6500 - 4-Nitrophenol	EPA 8270C	10185805	NELAP	LA
6115 - 7,12-Dimethylbenz(a) anthracene	EPA 8270C	10185805	NELAP	LA
5500 - Acenaphthene	EPA 8270C	10185805	NELAP	LA
5505 - Acenaphthylene	EPA 8270C	10185805	NELAP	LA
5510 - Acetophenone	EPA 8270C	10185805	NELAP	LA
5545 - Aniline	EPA 8270C	10185805	NELAP	LA
5555 - Anthracene	EPA 8270C	10185805	NELAP	LA
5595 - Benzidine	EPA 8270C	10185805	NELAP	LA
5575 - Benzo(a)anthracene	EPA 8270C	10185805	NELAP	LA
5580 - Benzo(a)pyrene	EPA 8270C	10185805	NELAP	LA
5585 - Benzo(b)fluoranthene	EPA 8270C	10185805	NELAP	LA
5590 - Benzo(g,h,i)perylene	EPA 8270C	10185805	NELAP	LA
5600 - Benzo(k)fluoranthene	EPA 8270C	10185805	NELAP	LA
5610 - Benzoic acid	EPA 8270C	10185805	NELAP	LA
5630 - Benzyl alcohol	EPA 8270C	10185805	NELAP	LA
5780 - Bis(2-Chloroisopropyl) ether (2,2-oxybis(1-chloropropane))	EPA 8270C	10185805	NELAP	LA
5670 - Butyl benzyl phthalate	EPA 8270C	10185805	NELAP	LA
5680 - Carbazole	EPA 8270C	10185805	NELAP	LA

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Air Emissions

Analyte	Method Name	Method Code	Type	AB
5855 - Chrysene	EPA 8270C	10185805	NELAP	LA
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270C	10185805	NELAP	LA
5925 - Di-n-butyl phthalate	EPA 8270C	10185805	NELAP	LA
6200 - Di-n-octyl phthalate	EPA 8270C	10185805	NELAP	LA
5895 - Dibenz(a,h)anthracene	EPA 8270C	10185805	NELAP	LA
5905 - Dibenzofuran	EPA 8270C	10185805	NELAP	LA
6070 - Diethyl phthalate	EPA 8270C	10185805	NELAP	LA
6135 - Dimethyl phthalate	EPA 8270C	10185805	NELAP	LA
6205 - Diphenylamine	EPA 8270C	10185805	NELAP	LA
6260 - Ethyl methanesulfonate	EPA 8270C	10185805	NELAP	LA
6265 - Fluoranthene	EPA 8270C	10185805	NELAP	LA
6270 - Fluorene	EPA 8270C	10185805	NELAP	LA
6275 - Hexachlorobenzene	EPA 8270C	10185805	NELAP	LA
4835 - Hexachlorobutadiene	EPA 8270C	10185805	NELAP	LA
6285 - Hexachlorocyclopentadiene	EPA 8270C	10185805	NELAP	LA
4840 - Hexachloroethane	EPA 8270C	10185805	NELAP	LA
6295 - Hexachloropropene	EPA 8270C	10185805	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	EPA 8270C	10185805	NELAP	LA
6320 - Isophorone	EPA 8270C	10185805	NELAP	LA
6325 - Isosafrole	EPA 8270C	10185805	NELAP	LA
6375 - Methyl methanesulfonate	EPA 8270C	10185805	NELAP	LA
5005 - Naphthalene	EPA 8270C	10185805	NELAP	LA
5015 - Nitrobenzene	EPA 8270C	10185805	NELAP	LA
6590 - Pentachlorobenzene	EPA 8270C	10185805	NELAP	LA
5035 - Pentachloroethane	EPA 8270C	10185805	NELAP	LA
6600 - Pentachloronitrobenzene	EPA 8270C	10185805	NELAP	LA
6605 - Pentachlorophenol	EPA 8270C	10185805	NELAP	LA
6610 - Phenacetin	EPA 8270C	10185805	NELAP	LA
6615 - Phenanthrene	EPA 8270C	10185805	NELAP	LA
6625 - Phenol	EPA 8270C	10185805	NELAP	LA
6665 - Pyrene	EPA 8270C	10185805	NELAP	LA
5095 - Pyridine	EPA 8270C	10185805	NELAP	LA
6685 - Safrole	EPA 8270C	10185805	NELAP	LA
5760 - bis(2-Chloroethoxy)methane	EPA 8270C	10185805	NELAP	LA
5765 - bis(2-Chloroethyl) ether	EPA 8270C	10185805	NELAP	LA
5025 - n-Nitroso-di-n-butylamine	EPA 8270C	10185805	NELAP	LA
6545 - n-Nitrosodi-n-propylamine	EPA 8270C	10185805	NELAP	LA
6525 - n-Nitrosodiethylamine	EPA 8270C	10185805	NELAP	LA
6530 - n-Nitrosodimethylamine	EPA 8270C	10185805	NELAP	LA
6535 - n-Nitrosodiphenylamine	EPA 8270C	10185805	NELAP	LA
6550 - n-Nitrosomethylethylamine	EPA 8270C	10185805	NELAP	LA
6555 - n-Nitrosomorpholine	EPA 8270C	10185805	NELAP	LA
6560 - n-Nitrosopiperidine	EPA 8270C	10185805	NELAP	LA
6565 - n-Nitrosopyrrolidine	EPA 8270C	10185805	NELAP	LA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A, Rev.2007	10187403	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	LA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	LA
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 8290A, Rev.2007	10187403	NELAP	LA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	LA
100489 - Dibenzo-p-dioxins & dibenzofurans	EPA 8290A, Rev.2007	10187403	NELAP	LA
9438 - Total Hpcdd	EPA 8290A, Rev.2007	10187403	NELAP	LA
9444 - Total Hpcdf	EPA 8290A, Rev.2007	10187403	NELAP	LA
9468 - Total Hxcdd	EPA 8290A, Rev.2007	10187403	NELAP	LA
9483 - Total Hxcdf	EPA 8290A, Rev.2007	10187403	NELAP	LA
9555 - Total Pecdd	EPA 8290A, Rev.2007	10187403	NELAP	LA
9552 - Total Pecdf	EPA 8290A, Rev.2007	10187403	NELAP	LA
9609 - Total TCDD	EPA 8290A, Rev.2007	10187403	NELAP	LA
9615 - Total TCDF	EPA 8290A, Rev.2007	10187403	NELAP	LA
9318 - 1,3-Butadiene	EPA Method 18	10246636	NELAP	LA
4917 - 1-Butene	EPA Method 18	10246636	NELAP	LA
4833 - 1-Pentene	EPA Method 18	10246636	NELAP	LA
4836 - 1-Propene	EPA Method 18	10246636	NELAP	LA
4938 - 2-Methylbutane (Isopentane)	EPA Method 18	10246636	NELAP	LA
4942 - 2-methylpropane (Isobutane)	EPA Method 18	10246636	NELAP	LA
4375 - Benzene	EPA Method 18	10246636	NELAP	LA
3780 - Carbon monoxide	EPA Method 18	10246636	NELAP	LA
4747 - Ethane	EPA Method 18	10246636	NELAP	LA
4752 - Ethene	EPA Method 18	10246636	NELAP	LA
4765 - Ethylbenzene	EPA Method 18	10246636	NELAP	LA
1772 - Hydrogen	EPA Method 18	10246636	NELAP	LA
4926 - Methane	EPA Method 18	10246636	NELAP	LA
5140 - Toluene	EPA Method 18	10246636	NELAP	LA

Air Emissions

Analyte	Method Name	Method Code	Type	AB
5260 - Xylene (total)	EPA Method 18	10246636	NELAP	LA
4602 - cis-2-Butene	EPA Method 18	10246636	NELAP	LA
5007 - n-Butane	EPA Method 18	10246636	NELAP	LA
4855 - n-Hexane	EPA Method 18	10246636	NELAP	LA
5028 - n-Pentane	EPA Method 18	10246636	NELAP	LA
5029 - n-Propane	EPA Method 18	10246636	NELAP	LA
4607 - trans-2-Butene	EPA Method 18	10246636	NELAP	LA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA Method 23	10246705	NELAP	LA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA Method 23	10246705	NELAP	LA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA Method 23	10246705	NELAP	LA
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA Method 23	10246705	NELAP	LA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA Method 23	10246705	NELAP	LA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA Method 23	10246705	NELAP	LA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA Method 23	10246705	NELAP	LA
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA Method 23	10246705	NELAP	LA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA Method 23	10246705	NELAP	LA
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA Method 23	10246705	NELAP	LA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA Method 23	10246705	NELAP	LA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA Method 23	10246705	NELAP	LA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA Method 23	10246705	NELAP	LA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA Method 23	10246705	NELAP	LA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA Method 23	10246705	NELAP	LA
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA Method 23	10246705	NELAP	LA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA Method 23	10246705	NELAP	LA
5500 - Acenaphthene	EPA TO-13A	10248405	NELAP	FL
5505 - Acenaphthylene	EPA TO-13A	10248405	NELAP	FL
5555 - Anthracene	EPA TO-13A	10248405	NELAP	FL
5575 - Benzo(a)anthracene	EPA TO-13A	10248405	NELAP	FL
5580 - Benzo(a)pyrene	EPA TO-13A	10248405	NELAP	FL
5585 - Benzo(b)fluoranthene	EPA TO-13A	10248405	NELAP	FL
5590 - Benzo(g,h,i)perylene	EPA TO-13A	10248405	NELAP	FL
5600 - Benzo(k)fluoranthene	EPA TO-13A	10248405	NELAP	FL
5855 - Chrysene	EPA TO-13A	10248405	NELAP	FL
5895 - Dibenz(a,h)anthracene	EPA TO-13A	10248405	NELAP	FL
6265 - Fluoranthene	EPA TO-13A	10248405	NELAP	FL

Air Emissions

Analyte	Method Name	Method Code	Type	AB
6270 - Fluorene	EPA TO-13A	10248405	NELAP	FL
6315 - Indeno(1,2,3-cd)pyrene	EPA TO-13A	10248405	NELAP	FL
5005 - Naphthalene	EPA TO-13A	10248405	NELAP	FL
6615 - Phenanthrene	EPA TO-13A	10248405	NELAP	FL
6665 - Pyrene	EPA TO-13A	10248405	NELAP	FL
5160 - 1,1,1-Trichloroethane	EPA TO-14A	10248609	NELAP	FL
5110 - 1,1,2,2-Tetrachloroethane	EPA TO-14A	10248609	NELAP	FL
5195 - 1,1,2-Trichloro-2,2,2-trifluoroethane (Freon 113a)	EPA TO-14A	10248609	NELAP	FL
5165 - 1,1,2-Trichloroethane	EPA TO-14A	10248609	NELAP	FL
4630 - 1,1-Dichloroethane	EPA TO-14A	10248609	NELAP	FL
4640 - 1,1-Dichloroethylene	EPA TO-14A	10248609	NELAP	FL
5155 - 1,2,4-Trichlorobenzene	EPA TO-14A	10248609	NELAP	FL
5210 - 1,2,4-Trimethylbenzene	EPA TO-14A	10248609	NELAP	FL
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-14A	10248609	NELAP	FL
4695 - 1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon-114)	EPA TO-14A	10248609	NELAP	FL
4610 - 1,2-Dichlorobenzene	EPA TO-14A	10248609	NELAP	FL
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA TO-14A	10248609	NELAP	FL
4655 - 1,2-Dichloropropane	EPA TO-14A	10248609	NELAP	FL
5215 - 1,3,5-Trimethylbenzene	EPA TO-14A	10248609	NELAP	FL
4615 - 1,3-Dichlorobenzene	EPA TO-14A	10248609	NELAP	FL
4620 - 1,4-Dichlorobenzene	EPA TO-14A	10248609	NELAP	FL
4375 - Benzene	EPA TO-14A	10248609	NELAP	FL
5635 - Benzyl chloride	EPA TO-14A	10248609	NELAP	FL
4455 - Carbon tetrachloride	EPA TO-14A	10248609	NELAP	FL
4475 - Chlorobenzene	EPA TO-14A	10248609	NELAP	FL
4485 - Chloroethane (Ethyl chloride)	EPA TO-14A	10248609	NELAP	FL
4505 - Chloroform	EPA TO-14A	10248609	NELAP	FL
4625 - Dichlorodifluoromethane (Freon-12)	EPA TO-14A	10248609	NELAP	FL
4765 - Ethylbenzene	EPA TO-14A	10248609	NELAP	FL
4835 - Hexachlorobutadiene	EPA TO-14A	10248609	NELAP	FL
4950 - Methyl bromide (Bromomethane)	EPA TO-14A	10248609	NELAP	FL
4960 - Methyl chloride (Chloromethane)	EPA TO-14A	10248609	NELAP	FL
4975 - Methylene chloride (Dichloromethane)	EPA TO-14A	10248609	NELAP	FL
5100 - Styrene	EPA TO-14A	10248609	NELAP	FL
5115 - Tetrachloroethylene (Perchloroethylene)	EPA TO-14A	10248609	NELAP	FL
5140 - Toluene	EPA TO-14A	10248609	NELAP	FL
5170 - Trichloroethene (Trichloroethylene)	EPA TO-14A	10248609	NELAP	FL
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA TO-14A	10248609	NELAP	FL
5235 - Vinyl chloride	EPA TO-14A	10248609	NELAP	FL
5260 - Xylene (total)	EPA TO-14A	10248609	NELAP	FL
4645 - cis-1,2-Dichloroethylene	EPA TO-14A	10248609	NELAP	FL
4680 - cis-1,3-Dichloropropene	EPA TO-14A	10248609	NELAP	FL
5250 - o-Xylene	EPA TO-14A	10248609	NELAP	FL
4685 - trans-1,3-Dichloropropylene	EPA TO-14A	10248609	NELAP	FL

STATE OF LOUISIANA
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Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Air Emissions

Analyte	Method Name	Method Code	Type	AB
5160 - 1,1,1-Trichloroethane	EPA TO-15	10248803	NELAP	FL
5110 - 1,1,2,2-Tetrachloroethane	EPA TO-15	10248803	NELAP	FL
5165 - 1,1,2-Trichloroethane	EPA TO-15	10248803	NELAP	FL
4630 - 1,1-Dichloroethane	EPA TO-15	10248803	NELAP	FL
4640 - 1,1-Dichloroethylene	EPA TO-15	10248803	NELAP	FL
6708 - 1,2,3,4-Tetramethylbenzene	EPA TO-15	10248803	NELAP	FL
6712 - 1,2,3,5-Tetramethylbenzene	EPA TO-15	10248803	NELAP	LA
5150 - 1,2,3-Trichlorobenzene	EPA TO-15	10248803	NELAP	LA
5180 - 1,2,3-Trichloropropane	EPA TO-15	10248803	NELAP	LA
5182 - 1,2,3-Trimethylbenzene	EPA TO-15	10248803	NELAP	LA
6717 - 1,2,4,5-tetramethylbenzene	EPA TO-15	10248803	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	EPA TO-15	10248803	NELAP	LA
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA TO-15	10248803	NELAP	FL
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA TO-15	10248803	NELAP	LA
4610 - 1,2-Dichlorobenzene	EPA TO-15	10248803	NELAP	FL
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA TO-15	10248803	NELAP	FL
4655 - 1,2-Dichloropropane	EPA TO-15	10248803	NELAP	FL
4658 - 1,2-dimethyl-4-ethylbenzene	EPA TO-15	10248803	NELAP	FL
9318 - 1,3-Butadiene	EPA TO-15	10248803	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA TO-15	10248803	NELAP	FL
4620 - 1,4-Dichlorobenzene	EPA TO-15	10248803	NELAP	FL
4735 - 1,4-Dioxane (1,4- Diethyleneoxide)	EPA TO-15	10248803	NELAP	FL
6380 - 1-Methylnaphthalene	EPA TO-15	10248803	NELAP	LA
4836 - 1-Propene	EPA TO-15	10248803	NELAP	LA
5220 - 2,2,4-Trimethylpentane (Isooctane)	EPA TO-15	10248803	NELAP	LA
100712 - 2,3-Dihydroindene	EPA TO-15	10248803	NELAP	FL
4687 - 2,3-Dimethylheptane	EPA TO-15	10248803	NELAP	LA
4671 - 2,3-Dimethylpentane	EPA TO-15	10248803	NELAP	LA
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA TO-15	10248803	NELAP	LA
4535 - 2-Chlorotoluene	EPA TO-15	10248803	NELAP	FL
4544 - 2-Ethylthiophene	EPA TO-15	10248803	NELAP	LA
4860 - 2-Hexanone	EPA TO-15	10248803	NELAP	LA
4938 - 2-Methylbutane (Isopentane)	EPA TO-15	10248803	NELAP	LA
6385 - 2-Methylnaphthalene	EPA TO-15	10248803	NELAP	LA
4941 - 2-Methylpentane (Isohexane)	EPA TO-15	10248803	NELAP	LA
4954 - 2-Methylthiophene	EPA TO-15	10248803	NELAP	LA
5783 - 3-Methylthiophene	EPA TO-15	10248803	NELAP	LA
4542 - 4-Ethyltoluene	EPA TO-15	10248803	NELAP	LA
4910 - 4-Isopropyltoluene (p-Cymene)	EPA TO-15	10248803	NELAP	LA
4995 - 4-Methyl-2-pentanone (MIBK)	EPA TO-15	10248803	NELAP	LA
4300 - Acetaldehyde	EPA TO-15	10248803	NELAP	LA
4315 - Acetone	EPA TO-15	10248803	NELAP	FL
4320 - Acetonitrile	EPA TO-15	10248803	NELAP	LA
4325 - Acrolein (Propenal)	EPA TO-15	10248803	NELAP	LA
4340 - Acrylonitrile	EPA TO-15	10248803	NELAP	FL
4355 - Allyl chloride (3-Chloropropene)	EPA TO-15	10248803	NELAP	FL
4375 - Benzene	EPA TO-15	10248803	NELAP	FL
		10248803	NELAP	FL
		10248803	NELAP	FL

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Air Emissions

Analyte	Method Name	Method Code	Type	AB
100297 - Benzo(b)thiophene	EPA TO-15	10248803	NELAP	LA
5635 - Benzyl chloride	EPA TO-15	10248803	NELAP	FL
4395 - Bromodichloromethane	EPA TO-15	10248803	NELAP	LA
4400 - Bromoform	EPA TO-15	10248803	NELAP	FL
4450 - Carbon disulfide	EPA TO-15	10248803	NELAP	FL
4455 - Carbon tetrachloride	EPA TO-15	10248803	NELAP	FL
4475 - Chlorobenzene	EPA TO-15	10248803	NELAP	FL
4575 - Chlorodibromomethane (dibromochloromethane)	EPA TO-15	10248803	NELAP	LA
4577 - Chlorodifluoromethane (Freon-22)	EPA TO-15	10248803	NELAP	LA
4485 - Chloroethane (Ethyl chloride)	EPA TO-15	10248803	NELAP	FL
4505 - Chloroform	EPA TO-15	10248803	NELAP	FL
4555 - Cyclohexane	EPA TO-15	10248803	NELAP	LA
4595 - Dibromomethane (Methylene bromide)	EPA TO-15	10248803	NELAP	LA
4725 - Diethyl ether	EPA TO-15	10248803	NELAP	LA
4750 - Ethanol	EPA TO-15	10248803	NELAP	LA
4755 - Ethyl acetate	EPA TO-15	10248803	NELAP	LA
4770 - Ethyl-t-butyl ether (ETBE) (2-Ethoxy-2-methylpropane)	EPA TO-15	10248803	NELAP	LA
4765 - Ethylbenzene	EPA TO-15	10248803	NELAP	FL
4835 - Hexachlorobutadiene	EPA TO-15	10248803	NELAP	FL
6312 - Indene	EPA TO-15	10248803	NELAP	LA
100145 - Isopropyl Ether	EPA TO-15	10248803	NELAP	LA
4895 - Isopropyl alcohol (2-Propanol, Isopropanol)	EPA TO-15	10248803	NELAP	LA
4900 - Isopropylbenzene (Cumene)	EPA TO-15	10248803	NELAP	LA
4930 - Methanol	EPA TO-15	10248803	NELAP	FL
4950 - Methyl bromide (Bromomethane)	EPA TO-15	10248803	NELAP	FL
4950 - Methyl bromide (Bromomethane)	EPA TO-15	10248803	NELAP	LA
4960 - Methyl chloride (Chloromethane)	EPA TO-15	10248803	NELAP	FL
100201 - Methyl isobutyl ketone (Hexanone)	EPA TO-15	10248803	NELAP	FL
4990 - Methyl methacrylate	EPA TO-15	10248803	NELAP	FL
5000 - Methyl tert-butyl ether (MTBE)	EPA TO-15	10248803	NELAP	FL
4965 - Methylcyclohexane	EPA TO-15	10248803	NELAP	LA
4975 - Methylene chloride (Dichloromethane)	EPA TO-15	10248803	NELAP	FL
5005 - Naphthalene	EPA TO-15	10248803	NELAP	LA
5100 - Styrene	EPA TO-15	10248803	NELAP	FL
4370 - T-amylmethylether (TAME)	EPA TO-15	10248803	NELAP	LA
5115 - Tetrachloroethylene (Perchloroethylene)	EPA TO-15	10248803	NELAP	FL
5120 - Tetrahydrofuran (THF)	EPA TO-15	10248803	NELAP	LA
9578 - Thiophene	EPA TO-15	10248803	NELAP	LA
5140 - Toluene	EPA TO-15	10248803	NELAP	FL
5170 - Trichloroethene (Trichloroethylene)	EPA TO-15	10248803	NELAP	FL
5225 - Vinyl acetate	EPA TO-15	10248803	NELAP	FL
5230 - Vinyl bromide (Bromoethane)	EPA TO-15	10248803	NELAP	FL
5235 - Vinyl chloride	EPA TO-15	10248803	NELAP	FL
5260 - Xylene (total)	EPA TO-15	10248803	NELAP	FL

STATE OF LOUISIANA
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Air Emissions

Analyte	Method Name	Method Code	Type	AB
4357 - alpha-Methylstyrene	EPA TO-15	10248803	NELAP	LA
4705 - cis & trans-1,2-Dichloroethene	EPA TO-15	10248803	NELAP	FL
4645 - cis-1,2-Dichloroethylene	EPA TO-15	10248803	NELAP	FL
4680 - cis-1,3-Dichloropropene	EPA TO-15	10248803	NELAP	FL
5240 - m+p-xylene	EPA TO-15	10248803	NELAP	LA
5007 - n-Butane	EPA TO-15	10248803	NELAP	LA
4425 - n-Butyl alcohol (1-Butanol, n-Butanol)	EPA TO-15	10248803	NELAP	LA
4435 - n-Butylbenzene	EPA TO-15	10248803	NELAP	LA
5875 - n-Decane	EPA TO-15	10248803	NELAP	LA
6235 - n-Dodecane	EPA TO-15	10248803	NELAP	LA
4825 - n-Heptane	EPA TO-15	10248803	NELAP	LA
4855 - n-Hexane	EPA TO-15	10248803	NELAP	FL
5026 - n-Nonane	EPA TO-15	10248803	NELAP	LA
5027 - n-Octane	EPA TO-15	10248803	NELAP	LA
5028 - n-Pentane	EPA TO-15	10248803	NELAP	LA
5090 - n-Propylbenzene	EPA TO-15	10248803	NELAP	LA
6747 - n-Undecane	EPA TO-15	10248803	NELAP	LA
100713 - n-butylcyclohexane	EPA TO-15	10248803	NELAP	LA
4440 - sec-Butylbenzene	EPA TO-15	10248803	NELAP	LA
4420 - tert-Butyl alcohol	EPA TO-15	10248803	NELAP	LA
4445 - tert-Butylbenzene	EPA TO-15	10248803	NELAP	LA
4700 - trans-1,2-Dichloroethylene	EPA TO-15	10248803	NELAP	LA
4685 - trans-1,3-Dichloropropylene	EPA TO-15	10248803	NELAP	FL
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA TO-9A	10248803	NELAP	FL
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA TO-9A	10249408	NELAP	FL
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA TO-9A	10249408	NELAP	FL
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA TO-9A	10249408	NELAP	FL
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA TO-9A	10249408	NELAP	FL
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA TO-9A	10249408	NELAP	FL
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA TO-9A	10249408	NELAP	FL
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA TO-9A	10249408	NELAP	FL
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA TO-9A	10249408	NELAP	FL
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA TO-9A	10249408	NELAP	FL
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA TO-9A	10249408	NELAP	FL
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA TO-9A	10249408	NELAP	FL
9543 - 1,2,3,7,8-Pentachlorodibenzofuran	EPA TO-9A	10249408	NELAP	FL

Air Emissions

Analyte	Method Name	Method Code	Type	AB
(1,2,3,7,8-Pecdf)				
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA TO-9A	10249408	NELAP	FL
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA TO-9A	10249408	NELAP	FL
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA TO-9A	10249408	NELAP	FL
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA TO-9A	10249408	NELAP	FL
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 0023A	10250803	NELAP	LA
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 0023A	10250803	NELAP	LA
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 0023A	10250803	NELAP	LA
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 0023A	10250803	NELAP	LA
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 0023A	10250803	NELAP	LA
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 0023A	10250803	NELAP	LA
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 0023A	10250803	NELAP	LA
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 0023A	10250803	NELAP	LA
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 0023A	10250803	NELAP	LA
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 0023A	10250803	NELAP	LA
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 0023A	10250803	NELAP	LA
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 0023A	10250803	NELAP	LA
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 0023A	10250803	NELAP	LA
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 0023A	10250803	NELAP	LA
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 0023A	10250803	NELAP	LA
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 0023A	10250803	NELAP	LA
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 0023A	10250803	NELAP	LA
100073 - Total Hexachlorodibenzofuran	EPA 0023A	10250803	NELAP	LA
9438 - Total Hpcdd	EPA 0023A	10250803	NELAP	LA
9444 - Total Hpcdf	EPA 0023A	10250803	NELAP	LA
9468 - Total Hxcdd	EPA 0023A	10250803	NELAP	LA
9555 - Total Pecdd	EPA 0023A	10250803	NELAP	LA
100074 - Total Pentachlorodibenzofuran	EPA 0023A	10250803	NELAP	LA
9609 - Total TCDD	EPA 0023A	10250803	NELAP	LA
9615 - Total TCDF	EPA 0023A	10250803	NELAP	LA
100120 - Particulate and Methylene Chloride Extractable Matter (MCEM)	EPA 315	10277153	NELAP	LA
4467 - Condensible Particulate Matter	EPA 202	10403006	NELAP	TX
1095 - Mercury	EPA Method 29 (CVAA)	10403302	NELAP	LA

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Air Emissions

Analyte	Method Name	Method Code	Type	AB
1005 - Antimony	EPA Method 29 (ICP)	10403608	NELAP	LA
1010 - Arsenic	EPA Method 29 (ICP)	10403608	NELAP	LA
1015 - Barium	EPA Method 29 (ICP)	10403608	NELAP	LA
1020 - Beryllium	EPA Method 29 (ICP)	10403608	NELAP	LA
1030 - Cadmium	EPA Method 29 (ICP)	10403608	NELAP	LA
1040 - Chromium	EPA Method 29 (ICP)	10403608	NELAP	LA
1050 - Cobalt	EPA Method 29 (ICP)	10403608	NELAP	LA
1055 - Copper	EPA Method 29 (ICP)	10403608	NELAP	LA
1075 - Lead	EPA Method 29 (ICP)	10403608	NELAP	LA
1090 - Manganese	EPA Method 29 (ICP)	10403608	NELAP	LA
1105 - Nickel	EPA Method 29 (ICP)	10403608	NELAP	LA
1140 - Selenium	EPA Method 29 (ICP)	10403608	NELAP	LA
1150 - Silver	EPA Method 29 (ICP)	10403608	NELAP	LA
1165 - Thallium	EPA Method 29 (ICP)	10403608	NELAP	LA
1910 - Total Phosphorus	EPA Method 29 (ICP)	10403608	NELAP	LA
1190 - Zinc	EPA Method 29 (ICP)	10403608	NELAP	LA
3915 - Particulates	EPA 5	10404305	NELAP	LA
3755 - Carbon dioxide	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
3780 - Carbon monoxide	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
4747 - Ethane	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
4752 - Ethene	ASTM D1946-90	30024465	NELAP	LA
1767 - Helium	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
1772 - Hydrogen	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
4926 - Methane	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
1843 - Nitrogen	ASTM D1946-90, Rev.1990	30024465	NELAP	LA
3895 - Oxygen	ASTM D1946-90, Rev.1990	30024465	NELAP	LA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9490 - 11-Chloroeicosafluoro-3-oxaundecane-1-sulfonic acid (11-Cl-PF3OUdS)	KNOXLC0007	9405	NELAP	LA
6948 - 1H, 1H, 2H, 2H-Perfluorodecanesulfonic acid (8:2 FTS)	KNOXLC0007	9405	NELAP	LA
6946 - 1H, 1H, 2H, 2H-Perfluorohexanesulfonic acid (4:2 FTS)	KNOXLC0007	9405	NELAP	LA
6947 - 1H, 1H, 2H, 2H-Perfluorooctanesulfonic acid (6:2 FTS)	KNOXLC0007	9405	NELAP	LA
9616 - 1H, 1H, 2H, 2H-perfluorododecane sulfonic acid (10:2 FTS)	KNOXLC0007	9405	NELAP	LA
100864 - 2-(N-methyl perfluorooctanesulfonamido) ethanol (NMeFOSE)	KNOXLC0007	9405	NELAP	LA
6951 - 4,8-Dioxa-3H-perfluorononanoic acid (DONA)	KNOXLC0007	9405	NELAP	LA
6952 - 9-Chlorohexadecafluoro-3-oxanonane-1-sulfonic acid (9-Cl-PF3ONS)	KNOXLC0007	9405	NELAP	LA
9460 - Hexafluoropropyleneoxide dimer	KNOXLC0007	9405	NELAP	LA

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
acid (HFPO-DA) (GenX)				
9395 - N-Ethylperfluorooctane sulfonamide (EtFOSAm)	KNOXLC0007	9405	NELAP	LA
4846 - N-Ethylperfluorooctane sulfonamido acetic acid (NEtFOSAA)	KNOXLC0007	9405	NELAP	LA
9431 - N-Ethylperfluorooctane sulfonamido ethanol (EtFOS)	KNOXLC0007	9405	NELAP	LA
9433 - N-Methylperfluorooctane sulfonamide (MeFOSA)	KNOXLC0007	9405	NELAP	LA
6955 - N-Methylperfluorooctane sulfonamido acetic acid (NMeFOSAA)	KNOXLC0007	9405	NELAP	LA
6918 - Perfluorobutanesulfonic acid (PFBS)	KNOXLC0007	9405	NELAP	LA
6915 - Perfluorobutyric acid (PFBA)	KNOXLC0007	9405	NELAP	LA
6920 - Perfluorodecane sulfonic acid (PFDS)	KNOXLC0007	9405	NELAP	LA
6905 - Perfluorodecanoic acid (PFDA)	KNOXLC0007	9405	NELAP	LA
6923 - Perfluorododecane sulfonic acid (PFDoS)	KNOXLC0007	9405	NELAP	LA
6903 - Perfluorododecanoic acid (PFDOA)	KNOXLC0007	9405	NELAP	LA
9470 - Perfluoroheptane sulfonic acid (PFHpS)	KNOXLC0007	9405	NELAP	LA
6908 - Perfluoroheptanoic acid (PFHpA)	KNOXLC0007	9405	NELAP	LA
6901 - Perfluorohexadecanoic acid (PFHXDA)	KNOXLC0007	9405	NELAP	LA
6927 - Perfluorohexanesulfonic acid (PFHxS)	KNOXLC0007	9405	NELAP	LA
6913 - Perfluorohexanoic acid (PFHXA)	KNOXLC0007	9405	NELAP	LA
6929 - Perfluorononane sulfonic acid (PFNS)	KNOXLC0007	9405	NELAP	LA
6906 - Perfluorononanoic acid (PFNA)	KNOXLC0007	9405	NELAP	LA
6916 - Perfluorooctadecanoic acid (PFODA)	KNOXLC0007	9405	NELAP	LA
6917 - Perfluorooctane sulfonamide (PFOSAm)	KNOXLC0007	9405	NELAP	LA
6931 - Perfluorooctane sulfonic acid (PFOS)	KNOXLC0007	9405	NELAP	LA
6912 - Perfluorooctanoic acid (PFOA)	KNOXLC0007	9405	NELAP	LA
6934 - Perfluoropentanesulfonic acid (PFPeS)	KNOXLC0007	9405	NELAP	LA
6914 - Perfluoropentanoic acid (PFPEA)	KNOXLC0007	9405	NELAP	LA
6902 - Perfluorotetradecanoic acid (PFTDA)	KNOXLC0007	9405	NELAP	LA
9563 - Perfluorotridecanoic acid (PFTrDA)	KNOXLC0007	9405	NELAP	LA
6904 - Perfluoroundecanoic acid (PFUnDA)	KNOXLC0007	9405	NELAP	LA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	10120602	NELAP	FL
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	10120602	NELAP	FL
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 1613B	10120602	NELAP	FL
9420 - 1,2,3,4,6,7,8-	EPA 1613B	10120602	NELAP	FL

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)				
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 1613B	10120602	NELAP	FL
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 1613B	10120602	NELAP	FL
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 1613B	10120602	NELAP	FL
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 1613B	10120602	NELAP	FL
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 1613B	10120602	NELAP	FL
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 1613B	10120602	NELAP	FL
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 1613B	10120602	NELAP	FL
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 1613B	10120602	NELAP	FL
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 1613B	10120602	NELAP	FL
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 1613B	10120602	NELAP	FL
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 1613B	10120602	NELAP	FL
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 1613B	10120602	NELAP	FL
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 1613B	10120602	NELAP	FL
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668A	10129405	NELAP	FL
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668A	10129405	NELAP	FL
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668A	10129405	NELAP	FL
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668A	10129405	NELAP	FL
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668A	10129405	NELAP	FL
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668A	10129405	NELAP	FL
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668A	10129405	NELAP	FL
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668A	10129405	NELAP	FL
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668A	10129405	NELAP	FL
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668A	10129405	NELAP	FL
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668A	10129405	NELAP	FL
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668A	10129405	NELAP	FL
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl	EPA 1668A	10129405	NELAP	FL

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Effective Date: July 1, 2024

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
(BZ-175)				
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668A	10129405	NELAP	FL
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668A	10129405	NELAP	FL
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668A	10129405	NELAP	FL
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668A	10129405	NELAP	FL
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)	EPA 1668A	10129405	NELAP	FL
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668A	10129405	NELAP	FL
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668A	10129405	NELAP	FL
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668A	10129405	NELAP	FL
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668A	10129405	NELAP	FL
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668A	10129405	NELAP	FL
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668A	10129405	NELAP	FL
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668A	10129405	NELAP	FL
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668A	10129405	NELAP	FL
8927 - 2,2',3,3',5,6'+2,2',3,5,5',6-Hexachlorobiphenyls (BZ 135+151)	EPA 1668A	10129405	NELAP	FL
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668A	10129405	NELAP	FL
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668A	10129405	NELAP	FL
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668A	10129405	NELAP	FL
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668A	10129405	NELAP	FL
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668A	10129405	NELAP	FL
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl (BZ-146)	EPA 1668A	10129405	NELAP	FL
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668A	10129405	NELAP	FL
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668A	10129405	NELAP	FL
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668A	10129405	NELAP	FL
8951 - 2,2',3,4',6'+2,2',4,5,6'-Pentachlorobiphenyl (BZ-98+102)	EPA 1668A	10129405	NELAP	FL
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668A	10129405	NELAP	FL

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668A	10129405	NELAP	FL
8941 - 2,2',3,4,4'+2,3,4,5,6+2,3,4',5,6-Pentachlorobiphenyl (BZ-85+116+117)	EPA 1668A	10129405	NELAP	FL
8918 - 2,2',3,4,4',5',6+2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-183+185)	EPA 1668A	10129405	NELAP	FL
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668A	10129405	NELAP	FL
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)	EPA 1668A	10129405	NELAP	FL
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668A	10129405	NELAP	FL
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668A	10129405	NELAP	FL
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ-181)	EPA 1668A	10129405	NELAP	FL
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl (BZ-137)	EPA 1668A	10129405	NELAP	FL
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668A	10129405	NELAP	FL
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668A	10129405	NELAP	FL
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668A	10129405	NELAP	FL
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668A	10129405	NELAP	FL
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668A	10129405	NELAP	FL
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668A	10129405	NELAP	FL
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668A	10129405	NELAP	FL
8947 - 2,2',3,4,6+2,2',3,4',6-Pentachlorobiphenyl (BZ-88+91)	EPA 1668A	10129405	NELAP	FL
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668A	10129405	NELAP	FL
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668A	10129405	NELAP	FL
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668A	10129405	NELAP	FL
8956 - 2,2',3,5+2,3',5',6-Tetrachlorobiphenyl (BZ-43+73)	EPA 1668A	10129405	NELAP	FL
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668A	10129405	NELAP	FL
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668A	10129405	NELAP	FL
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668A	10129405	NELAP	FL
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668A	10129405	NELAP	FL
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-	EPA 1668A	10129405	NELAP	FL

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
46)				
8958 - 2,2',3,6+2,2',4,6'-Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10129405	NELAP	FL
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668A	10129405	NELAP	FL
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668A	10129405	NELAP	FL
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668A	10129405	NELAP	FL
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-154)	EPA 1668A	10129405	NELAP	FL
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668A	10129405	NELAP	FL
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668A	10129405	NELAP	FL
9179 - 2,2',4,5',6-Pentachlorobiphenyl (BZ-103)	EPA 1668A	10129405	NELAP	FL
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668A	10129405	NELAP	FL
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668A	10129405	NELAP	FL
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668A	10129405	NELAP	FL
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668A	10129405	NELAP	FL
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668A	10129405	NELAP	FL
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668A	10129405	NELAP	FL
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668A	10129405	NELAP	FL
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668A	10129405	NELAP	FL
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668A	10129405	NELAP	FL
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668A	10129405	NELAP	FL
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668A	10129405	NELAP	FL
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668A	10129405	NELAP	FL
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668A	10129405	NELAP	FL
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668A	10129405	NELAP	FL
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668A	10129405	NELAP	FL
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668A	10129405	NELAP	FL
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668A	10129405	NELAP	FL
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668A	10129405	NELAP	FL
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668A	10129405	NELAP	FL
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668A	10129405	NELAP	FL

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668A	10129405	NELAP	FL
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668A	10129405	NELAP	FL
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668A	10129405	NELAP	FL
8967 - 2,3,3'+2,4,4'-Trichlorobiphenyl (BZ-20+28)	EPA 1668A	10129405	NELAP	FL
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668A	10129405	NELAP	FL
9202 - 2,3,3',4',5'-Pentachlorobiphenyl (BZ-122)	EPA 1668A	10129405	NELAP	FL
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668A	10129405	NELAP	FL
9205 - 2,3,3',4',5-Pentachlorobiphenyl (BZ-107)	EPA 1668A	10129405	NELAP	FL
8938 - 2,3,3',4',6+2,3,4,4',6-Pentachlorobiphenyl (BZ-110+115)	EPA 1668A	10129405	NELAP	FL
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668A	10129405	NELAP	FL
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668A	10129405	NELAP	FL
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668A	10129405	NELAP	FL
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668A	10129405	NELAP	FL
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668A	10129405	NELAP	FL
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668A	10129405	NELAP	FL
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668A	10129405	NELAP	FL
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668A	10129405	NELAP	FL
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668A	10129405	NELAP	FL
9194 - 2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ-192)	EPA 1668A	10129405	NELAP	FL
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668A	10129405	NELAP	FL
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668A	10129405	NELAP	FL
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668A	10129405	NELAP	FL
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668A	10129405	NELAP	FL
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668A	10129405	NELAP	FL
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668A	10129405	NELAP	FL
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668A	10129405	NELAP	FL
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-	EPA 1668A	10129405	NELAP	FL

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Analyte	Method Name	Method Code	Type	AB
57)				
8962 - 2,3,3',6+2,3,4,6+2,4,4',6-Tetrachlorobiphenyl (BZ-59+62+75)	EPA 1668A	10129405	NELAP	FL
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668A	10129405	NELAP	FL
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-64)	EPA 1668A	10129405	NELAP	FL
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668A	10129405	NELAP	FL
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl (BZ-21+33)	EPA 1668A	10129405	NELAP	FL
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668A	10129405	NELAP	FL
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668A	10129405	NELAP	FL
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668A	10129405	NELAP	FL
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668A	10129405	NELAP	FL
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668A	10129405	NELAP	FL
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668A	10129405	NELAP	FL
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668A	10129405	NELAP	FL
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668A	10129405	NELAP	FL
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668A	10129405	NELAP	FL
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668A	10129405	NELAP	FL
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668A	10129405	NELAP	FL
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668A	10129405	NELAP	FL
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668A	10129405	NELAP	FL
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668A	10129405	NELAP	FL
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668A	10129405	NELAP	FL
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668A	10129405	NELAP	FL
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668A	10129405	NELAP	FL
9260 - 3,3',4,5,5'-Pentachlorobiphenyl (BZ-127)	EPA 1668A	10129405	NELAP	FL
9262 - 3,3',4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668A	10129405	NELAP	FL
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668A	10129405	NELAP	FL
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668A	10129405	NELAP	FL
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668A	10129405	NELAP	FL
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668A	10129405	NELAP	FL
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668A	10129405	NELAP	FL
8914 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668A	10129405	NELAP	FL
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668A	10129405	NELAP	FL
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668A	10129405	NELAP	FL
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668A	10129405	NELAP	FL
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668A	10129405	NELAP	FL

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Analyte	Method Name	Method Code	Type	AB
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668A	10129405	NELAP	FL
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668A	10129405	NELAP	FL
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668A	10129405	NELAP	FL
8921 - Coelution - Hexachlorobiphenyls (BZ-129 + BZ-138 + BZ-160 + BZ-163)	EPA 1668A	10129405	NELAP	FL
8924 - Coelution - Hexachlorobiphenyls (BZ-134 + BZ-143)	EPA 1668A	10129405	NELAP	FL
8937 - Coelution - Pentachlorobiphenyls (BZ-108 + BZ-124)	EPA 1668A	10129405	NELAP	FL
8939 - Coelution - Pentachlorobiphenyls (BZ-83 + BZ-99)	EPA 1668A	10129405	NELAP	FL
8952 - Coelution - Tetrachlorobiphenyls (BZ-40 + BZ-41 + BZ-71)	EPA 1668A	10129405	NELAP	FL
8901 - Sum - Pentachlorobiphenyls (BZ-86 + BZ-87 + BZ 97 + BZ-109 + BZ-119 + BZ-125)	EPA 1668A	10129405	NELAP	FL
8580 - 2,4'-DDD	EPA 1699	10133105	NELAP	LA
8585 - 2,4'-DDE	EPA 1699	10133105	NELAP	LA
8590 - 2,4'-DDT	EPA 1699	10133105	NELAP	LA
7355 - 4,4'-DDD	EPA 1699	10133105	NELAP	LA
7360 - 4,4'-DDE	EPA 1699	10133105	NELAP	LA
7365 - 4,4'-DDT	EPA 1699	10133105	NELAP	LA
7025 - Aldrin	EPA 1699	10133105	NELAP	LA
7470 - Dieldrin	EPA 1699	10133105	NELAP	LA
7510 - Endosulfan I	EPA 1699	10133105	NELAP	LA
7515 - Endosulfan II	EPA 1699	10133105	NELAP	LA
7540 - Endrin	EPA 1699	10133105	NELAP	LA
7530 - Endrin aldehyde	EPA 1699	10133105	NELAP	LA
7535 - Endrin ketone	EPA 1699	10133105	NELAP	LA
7685 - Heptachlor	EPA 1699	10133105	NELAP	LA
7690 - Heptachlor epoxide	EPA 1699	10133105	NELAP	LA
6275 - Hexachlorobenzene	EPA 1699	10133105	NELAP	LA
7810 - Methoxychlor	EPA 1699	10133105	NELAP	LA
7870 - Mirex	EPA 1699	10133105	NELAP	LA
3890 - Oxychlordane	EPA 1699	10133105	NELAP	LA
7240 - alpha-Chlordane	EPA 1699	10133105	NELAP	LA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7925 - cis-Nonachlor	EPA 1699	10133105	NELAP	LA
7120 - gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7245 - gamma-Chlordane	EPA 1699	10133105	NELAP	LA
7910 - trans-Nonachlor	EPA 1699	10133105	NELAP	LA
1401 - Acid Digestion of waters for Total Recoverable or Dissolved Metals	EPA 3005A	10133207	NELAP	FL
1401 - Acid Digestion of Aqueous samples and Extracts for Total Metals	EPA 3010A	10133605	NELAP	FL
1410 - Continuous Liquid-liquid extraction	EPA 3520C	10139001	NELAP	FL
1406 - Purge and trap for aqueous phase samples	EPA 5030B	10153409	NELAP	FL
1000 - Aluminum	EPA 6010C	10155803	NELAP	FL

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Analyte	Method Name	Method Code	Type	AB
1005 - Antimony	EPA 6010C	10155803	NELAP	FL
1010 - Arsenic	EPA 6010C	10155803	NELAP	FL
1015 - Barium	EPA 6010C	10155803	NELAP	FL
1020 - Beryllium	EPA 6010C	10155803	NELAP	FL
1025 - Boron	EPA 6010C	10155803	NELAP	FL
1030 - Cadmium	EPA 6010C	10155803	NELAP	FL
1035 - Calcium	EPA 6010C	10155803	NELAP	FL
1040 - Chromium	EPA 6010C	10155803	NELAP	FL
1050 - Cobalt	EPA 6010C	10155803	NELAP	FL
1055 - Copper	EPA 6010C	10155803	NELAP	FL
1070 - Iron	EPA 6010C	10155803	NELAP	FL
1075 - Lead	EPA 6010C	10155803	NELAP	FL
1080 - Lithium	EPA 6010C	10155803	NELAP	FL
1085 - Magnesium	EPA 6010C	10155803	NELAP	FL
1090 - Manganese	EPA 6010C	10155803	NELAP	FL
1100 - Molybdenum	EPA 6010C	10155803	NELAP	FL
1105 - Nickel	EPA 6010C	10155803	NELAP	FL
1125 - Potassium	EPA 6010C	10155803	NELAP	FL
1140 - Selenium	EPA 6010C	10155803	NELAP	FL
1145 - Silicon	EPA 6010C	10155803	NELAP	FL
1150 - Silver	EPA 6010C	10155803	NELAP	FL
1155 - Sodium	EPA 6010C	10155803	NELAP	FL
1160 - Strontium	EPA 6010C	10155803	NELAP	FL
1165 - Thallium	EPA 6010C	10155803	NELAP	FL
1175 - Tin	EPA 6010C	10155803	NELAP	FL
1185 - Vanadium	EPA 6010C	10155803	NELAP	FL
1190 - Zinc	EPA 6010C	10155803	NELAP	FL
1095 - Mercury	EPA 7470A	10165807	NELAP	FL
8880 - Aroclor-1016 (PCB-1016)	EPA 8082A	10179201	NELAP	FL
8885 - Aroclor-1221 (PCB-1221)	EPA 8082A	10179201	NELAP	FL
8890 - Aroclor-1232 (PCB-1232)	EPA 8082A	10179201	NELAP	FL
8895 - Aroclor-1242 (PCB-1242)	EPA 8082A	10179201	NELAP	FL
8900 - Aroclor-1248 (PCB-1248)	EPA 8082A	10179201	NELAP	FL
8905 - Aroclor-1254 (PCB-1254)	EPA 8082A	10179201	NELAP	FL
8910 - Aroclor-1260 (PCB-1260)	EPA 8082A	10179201	NELAP	FL
5105 - 1,1,1,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	FL
5160 - 1,1,1-Trichloroethane	EPA 8260B	10184802	NELAP	FL
5110 - 1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	FL
5165 - 1,1,2-Trichloroethane	EPA 8260B	10184802	NELAP	FL
4630 - 1,1-Dichloroethane	EPA 8260B	10184802	NELAP	FL
4640 - 1,1-Dichloroethylene	EPA 8260B	10184802	NELAP	FL
4670 - 1,1-Dichloropropene	EPA 8260B	10184802	NELAP	FL
5150 - 1,2,3-Trichlorobenzene	EPA 8260B	10184802	NELAP	FL
5180 - 1,2,3-Trichloropropane	EPA 8260B	10184802	NELAP	FL
5155 - 1,2,4-Trichlorobenzene	EPA 8260B	10184802	NELAP	FL
5210 - 1,2,4-Trimethylbenzene	EPA 8260B	10184802	NELAP	FL
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	NELAP	FL
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	NELAP	FL
4610 - 1,2-Dichlorobenzene	EPA 8260B	10184802	NELAP	FL

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Non Potable Water

Analyte	Method Name	Method Code	Type	AB
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 8260B	10184802	NELAP	FL
4655 - 1,2-Dichloropropane	EPA 8260B	10184802	NELAP	FL
5215 - 1,3,5-Trimethylbenzene	EPA 8260B	10184802	NELAP	FL
4615 - 1,3-Dichlorobenzene	EPA 8260B	10184802	NELAP	FL
4660 - 1,3-Dichloropropane	EPA 8260B	10184802	NELAP	FL
4620 - 1,4-Dichlorobenzene	EPA 8260B	10184802	NELAP	FL
4665 - 2,2-Dichloropropane	EPA 8260B	10184802	NELAP	FL
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	NELAP	FL
4535 - 2-Chlorotoluene	EPA 8260B	10184802	NELAP	FL
4860 - 2-Hexanone	EPA 8260B	10184802	NELAP	FL
4540 - 4-Chlorotoluene	EPA 8260B	10184802	NELAP	FL
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 8260B	10184802	NELAP	FL
4995 - 4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	NELAP	FL
4315 - Acetone	EPA 8260B	10184802	NELAP	FL
4375 - Benzene	EPA 8260B	10184802	NELAP	FL
4385 - Bromobenzene	EPA 8260B	10184802	NELAP	FL
4390 - Bromochloromethane	EPA 8260B	10184802	NELAP	FL
4395 - Bromodichloromethane	EPA 8260B	10184802	NELAP	FL
4400 - Bromoform	EPA 8260B	10184802	NELAP	FL
4450 - Carbon disulfide	EPA 8260B	10184802	NELAP	FL
4455 - Carbon tetrachloride	EPA 8260B	10184802	NELAP	FL
4475 - Chlorobenzene	EPA 8260B	10184802	NELAP	FL
4575 - Chlorodibromomethane (dibromochloromethane)	EPA 8260B	10184802	NELAP	FL
4485 - Chloroethane (Ethyl chloride)	EPA 8260B	10184802	NELAP	FL
4505 - Chloroform	EPA 8260B	10184802	NELAP	FL
4595 - Dibromomethane (Methylene bromide)	EPA 8260B	10184802	NELAP	FL
4625 - Dichlorodifluoromethane (Freon-12)	EPA 8260B	10184802	NELAP	FL
4765 - Ethylbenzene	EPA 8260B	10184802	NELAP	FL
4835 - Hexachlorobutadiene	EPA 8260B	10184802	NELAP	FL
4900 - Isopropylbenzene (Cumene)	EPA 8260B	10184802	NELAP	FL
4950 - Methyl bromide (Bromomethane)	EPA 8260B	10184802	NELAP	FL
4960 - Methyl chloride (Chloromethane)	EPA 8260B	10184802	NELAP	FL
5000 - Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	NELAP	FL
4975 - Methylene chloride (Dichloromethane)	EPA 8260B	10184802	NELAP	FL
5005 - Naphthalene	EPA 8260B	10184802	NELAP	FL
5100 - Styrene	EPA 8260B	10184802	NELAP	FL
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	NELAP	FL
5140 - Toluene	EPA 8260B	10184802	NELAP	FL
5170 - Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	NELAP	FL
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 8260B	10184802	NELAP	FL
5235 - Vinyl chloride	EPA 8260B	10184802	NELAP	FL
5260 - Xylene (total)	EPA 8260B	10184802	NELAP	FL
4645 - cis-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	FL
4680 - cis-1,3-Dichloropropene	EPA 8260B	10184802	NELAP	FL

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5240 - m+p-xylene	EPA 8260B	10184802	NELAP	LA
4435 - n-Butylbenzene	EPA 8260B	10184802	NELAP	FL
5090 - n-Propylbenzene	EPA 8260B	10184802	NELAP	FL
5250 - o-Xylene	EPA 8260B	10184802	NELAP	LA
4440 - sec-Butylbenzene	EPA 8260B	10184802	NELAP	FL
4445 - tert-Butylbenzene	EPA 8260B	10184802	NELAP	FL
4700 - trans-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	FL
4685 - trans-1,3-Dichloropropylene	EPA 8260B	10184802	NELAP	FL
5155 - 1,2,4-Trichlorobenzene	EPA 8270C	10185805	NELAP	FL
4610 - 1,2-Dichlorobenzene	EPA 8270C	10185805	NELAP	FL
6220 - 1,2-Diphenylhydrazine	EPA 8270C	10185805	NELAP	FL
4615 - 1,3-Dichlorobenzene	EPA 8270C	10185805	NELAP	FL
4620 - 1,4-Dichlorobenzene	EPA 8270C	10185805	NELAP	FL
6835 - 2,4,5-Trichlorophenol	EPA 8270C	10185805	NELAP	FL
6840 - 2,4,6-Trichlorophenol	EPA 8270C	10185805	NELAP	FL
6000 - 2,4-Dichlorophenol	EPA 8270C	10185805	NELAP	FL
6130 - 2,4-Dimethylphenol	EPA 8270C	10185805	NELAP	FL
6175 - 2,4-Dinitrophenol	EPA 8270C	10185805	NELAP	FL
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	NELAP	FL
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	NELAP	FL
5795 - 2-Chloronaphthalene	EPA 8270C	10185805	NELAP	FL
5800 - 2-Chlorophenol	EPA 8270C	10185805	NELAP	FL
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270C	10185805	NELAP	FL
6385 - 2-Methylnaphthalene	EPA 8270C	10185805	NELAP	FL
6400 - 2-Methylphenol (o-Cresol)	EPA 8270C	10185805	NELAP	FL
6460 - 2-Nitroaniline	EPA 8270C	10185805	NELAP	FL
6490 - 2-Nitrophenol	EPA 8270C	10185805	NELAP	FL
6412 - 3+4 Methylphenol	EPA 8270C	10185805	NELAP	LA
5945 - 3,3'-Dichlorobenzidine	EPA 8270C	10185805	NELAP	FL
6465 - 3-Nitroaniline	EPA 8270C	10185805	NELAP	FL
5660 - 4-Bromophenyl phenyl ether	EPA 8270C	10185805	NELAP	FL
5700 - 4-Chloro-3-methylphenol	EPA 8270C	10185805	NELAP	FL
5745 - 4-Chloroaniline	EPA 8270C	10185805	NELAP	FL
5825 - 4-Chlorophenyl phenylether	EPA 8270C	10185805	NELAP	FL
6410 - 4-Methylphenol (p-Cresol)	EPA 8270C	10185805	NELAP	FL
6470 - 4-Nitroaniline	EPA 8270C	10185805	NELAP	FL
6500 - 4-Nitrophenol	EPA 8270C	10185805	NELAP	FL
5500 - Acenaphthene	EPA 8270C	10185805	NELAP	FL
5505 - Acenaphthylene	EPA 8270C	10185805	NELAP	FL
5545 - Aniline	EPA 8270C	10185805	NELAP	FL
5555 - Anthracene	EPA 8270C	10185805	NELAP	FL
5595 - Benzidine	EPA 8270C	10185805	NELAP	FL
5575 - Benzo(a)anthracene	EPA 8270C	10185805	NELAP	FL
5580 - Benzo(a)pyrene	EPA 8270C	10185805	NELAP	FL
5585 - Benzo(b)fluoranthene	EPA 8270C	10185805	NELAP	FL
5590 - Benzo(g,h,i)perylene	EPA 8270C	10185805	NELAP	FL
5600 - Benzo(k)fluoranthene	EPA 8270C	10185805	NELAP	FL
5610 - Benzoic acid	EPA 8270C	10185805	NELAP	FL
5630 - Benzyl alcohol	EPA 8270C	10185805	NELAP	FL
5780 - Bis(2-Chloroisopropyl) ether (2,2-	EPA 8270C	10185805	NELAP	FL

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
oxybis(1-chloropropane))				
5670 - Butyl benzyl phthalate	EPA 8270C	10185805	NELAP	FL
5680 - Carbazole	EPA 8270C	10185805	NELAP	FL
5855 - Chrysene	EPA 8270C	10185805	NELAP	FL
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270C	10185805	NELAP	FL
5925 - Di-n-butyl phthalate	EPA 8270C	10185805	NELAP	FL
6200 - Di-n-octyl phthalate	EPA 8270C	10185805	NELAP	FL
5895 - Dibenz(a,h)anthracene	EPA 8270C	10185805	NELAP	FL
5905 - Dibenzofuran	EPA 8270C	10185805	NELAP	FL
6070 - Diethyl phthalate	EPA 8270C	10185805	NELAP	FL
6135 - Dimethyl phthalate	EPA 8270C	10185805	NELAP	FL
6265 - Fluoranthene	EPA 8270C	10185805	NELAP	FL
6270 - Fluorene	EPA 8270C	10185805	NELAP	FL
6275 - Hexachlorobenzene	EPA 8270C	10185805	NELAP	FL
4835 - Hexachlorobutadiene	EPA 8270C	10185805	NELAP	FL
6285 - Hexachlorocyclopentadiene	EPA 8270C	10185805	NELAP	FL
4840 - Hexachloroethane	EPA 8270C	10185805	NELAP	FL
6315 - Indeno(1,2,3-cd)pyrene	EPA 8270C	10185805	NELAP	FL
6320 - Isophorone	EPA 8270C	10185805	NELAP	FL
5005 - Naphthalene	EPA 8270C	10185805	NELAP	FL
5015 - Nitrobenzene	EPA 8270C	10185805	NELAP	FL
6605 - Pentachlorophenol	EPA 8270C	10185805	NELAP	FL
6615 - Phenanthrene	EPA 8270C	10185805	NELAP	FL
6625 - Phenol	EPA 8270C	10185805	NELAP	FL
6665 - Pyrene	EPA 8270C	10185805	NELAP	FL
5095 - Pyridine	EPA 8270C	10185805	NELAP	FL
5760 - bis(2-Chloroethoxy)methane	EPA 8270C	10185805	NELAP	FL
5765 - bis(2-Chloroethyl) ether	EPA 8270C	10185805	NELAP	FL
6545 - n-Nitrosodi-n-propylamine	EPA 8270C	10185805	NELAP	FL
6530 - n-Nitrosodimethylamine	EPA 8270C	10185805	NELAP	FL
6535 - n-Nitrosodiphenylamine	EPA 8270C	10185805	NELAP	FL
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
(1,2,3,6,7,8-Hxcdf)				
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9438 - Total Hpcdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9444 - Total Hpcdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9468 - Total Hxcdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9483 - Total Hxcdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9555 - Total Pecdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9552 - Total Pecdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9609 - Total TCDD	EPA 8290A, Rev.2007	10187403	NELAP	FL
9615 - Total TCDF	EPA 8290A, Rev.2007	10187403	NELAP	FL
1835 - Nitrite	EPA 9056	10199005	NELAP	FL
1575 - Chloride	EPA 9056	10199403	NELAP	FL
1730 - Fluoride	EPA 9056	10199403	NELAP	FL
1805 - Nitrate	EPA 9056	10199403	NELAP	FL
1870 - Orthophosphate as P	EPA 9056	10199403	NELAP	FL
2000 - Sulfate	EPA 9056	10199403	NELAP	FL
6703 - 1,1'-Biphenyl (BZ-0) (Biphenyl)	EPA 8270D SIM	10242509	NELAP	LA
100626 - 1,6,7-Trimethylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
6380 - 1-Methylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
9501 - 1-Methylphenanthrene	EPA 8270D SIM	10242509	NELAP	LA
6188 - 2,6-Dimethylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
6385 - 2-Methylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
5500 - Acenaphthene	EPA 8270D SIM	10242509	NELAP	LA
5505 - Acenaphthylene	EPA 8270D SIM	10242509	NELAP	LA
5555 - Anthracene	EPA 8270D SIM	10242509	NELAP	LA
5575 - Benzo(a)anthracene	EPA 8270D SIM	10242509	NELAP	LA
5580 - Benzo(a)pyrene	EPA 8270D SIM	10242509	NELAP	LA
5585 - Benzo(b)fluoranthene	EPA 8270D SIM	10242509	NELAP	LA
100297 - Benzo(b)thiophene	EPA 8270D SIM	10242509	NELAP	LA
5605 - Benzo(e)pyrene	EPA 8270D SIM	10242509	NELAP	LA
5590 - Benzo(g,h,i)perylene	EPA 8270D SIM	10242509	NELAP	LA
5600 - Benzo(k)fluoranthene	EPA 8270D SIM	10242509	NELAP	LA
6603 - C1-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
6606 - C1-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100629 - C1-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6602 - C1-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6604 - C1-decalins	EPA 8270D SIM	10242509	NELAP	LA
6591 - C1-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6607 - C1-fluorenes	EPA 8270D SIM	10242509	NELAP	LA

STATE OF LOUISIANA
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Eurofins Knoxville
AI Number: 83979
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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Non Potable Water

Analyte	Method Name	Method Code	Type	AB
6609 - C1-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6611 - C1-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
6614 - C2-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
6617 - C2-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100630 - C2-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6613 - C2-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6616 - C2-decalins	EPA 8270D SIM	10242509	NELAP	LA
6592 - C2-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6618 - C2-fluorenes	EPA 8270D SIM	10242509	NELAP	LA
6619 - C2-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6621 - C2-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
6624 - C3-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
6627 - C3-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100631 - C3-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6623 - C3-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6626 - C3-decalins	EPA 8270D SIM	10242509	NELAP	LA
6593 - C3-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6628 - C3-fluorenes	EPA 8270D SIM	10242509	NELAP	LA
6629 - C3-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6631 - C3-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
6634 - C4-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
100619 - C4-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100632 - C4-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6633 - C4-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6636 - C4-decalins	EPA 8270D SIM	10242509	NELAP	LA
6594 - C4-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6637 - C4-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6638 - C4-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
5855 - Chrysene	EPA 8270D SIM	10242509	NELAP	LA
5895 - Dibenz(a,h)anthracene	EPA 8270D SIM	10242509	NELAP	LA
5905 - Dibenzofuran	EPA 8270D SIM	10242509	NELAP	LA
5910 - Dibenzothiophene	EPA 8270D SIM	10242509	NELAP	LA
6265 - Fluoranthene	EPA 8270D SIM	10242509	NELAP	LA
6270 - Fluorene	EPA 8270D SIM	10242509	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	EPA 8270D SIM	10242509	NELAP	LA
5005 - Naphthalene	EPA 8270D SIM	10242509	NELAP	LA
100628 - Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6608 - Perylene	EPA 8270D SIM	10242509	NELAP	LA
6615 - Phenanthrene	EPA 8270D SIM	10242509	NELAP	LA
6665 - Pyrene	EPA 8270D SIM	10242509	NELAP	LA
4621 - cis-decalin	EPA 8270D SIM	10242509	NELAP	LA

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
2065 - Viscosity	ASTM D445	658	NELAP	LA
1525 - Percent ash	ASTM D482	868	NELAP	LA
6380 - 1-Methylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
9501 - 1-Methylphenanthrene	SOP KNOX-ID-0016	2042	NELAP	LA

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
6852 - 2,3,5-Trimethylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6188 - 2,6-Dimethylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6385 - 2-Methylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
5500 - Acenaphthene	SOP KNOX-ID-0016	2042	NELAP	LA
5505 - Acenaphthylene	SOP KNOX-ID-0016	2042	NELAP	LA
5555 - Anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
5575 - Benzo(a)anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
5580 - Benzo(a)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5585 - Benzo(b)fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
5605 - Benzo(e)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5590 - Benzo(g,h,i)perylene	SOP KNOX-ID-0016	2042	NELAP	LA
5600 - Benzo(k)fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
5640 - Biphenyl (1,1'-Biphenyl)	SOP KNOX-ID-0016	2042	NELAP	LA
5855 - Chrysene	SOP KNOX-ID-0016	2042	NELAP	LA
5895 - Dibenz(a,h)anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
6265 - Fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
6270 - Fluorene	SOP KNOX-ID-0016	2042	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5005 - Naphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6608 - Perylene	SOP KNOX-ID-0016	2042	NELAP	LA
6615 - Phenanthrene	SOP KNOX-ID-0016	2042	NELAP	LA
6665 - Pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
100072 - Total Decachlorobiphenyl	SOP KNOX-ID-0013	2061	NELAP	LA
8876 - Total Dichlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8877 - Total Heptachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8888 - Total Hexachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8889 - Total Monochlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8891 - Total Nonachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8892 - Total Octachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8896 - Total Pentachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8893 - Total Tetrachlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
8894 - Total Trichlorobiphenyls	SOP KNOX-ID-0013	2061	NELAP	LA
1765 - Heat of combustion (btu)	ASTM D5865	2066	NELAP	LA
100133 - Soil Density	SOP KNOX-WC-0015	2087	NELAP	LA
100134 - Specific Gravity of Drying Oils, Varnishes, Resins and Related Materials	SOP KNOX-WC-0015	2087	NELAP	LA
1000 - Aluminum	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1005 - Antimony	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1010 - Arsenic	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1015 - Barium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1020 - Beryllium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1025 - Boron	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1030 - Cadmium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1035 - Calcium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1040 - Chromium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1050 - Cobalt	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1055 - Copper	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1070 - Iron	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1075 - Lead	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1080 - Lithium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1085 - Magnesium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA

STATE OF LOUISIANA
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Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
1090 - Manganese	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1095 - Mercury	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1100 - Molybdenum	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1105 - Nickel	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1909 - Phosphorus	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1125 - Potassium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1140 - Selenium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1145 - Silicon	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1150 - Silver	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1155 - Sodium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1160 - Strontium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1165 - Thallium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1175 - Tin	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1180 - Titanium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1185 - Vanadium	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
1190 - Zinc	SOP KNOX-IP-0008, Rev.1	3819	NELAP	LA
2017 - Sulfur	ASTM D129-00	3906	NELAP	LA
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668A	10129405	NELAP	FL
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668A	10129405	NELAP	FL
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668A	10129405	NELAP	FL
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668A	10129405	NELAP	FL
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668A	10129405	NELAP	FL
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668A	10129405	NELAP	FL
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668A	10129405	NELAP	FL
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668A	10129405	NELAP	FL
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668A	10129405	NELAP	FL
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668A	10129405	NELAP	FL
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668A	10129405	NELAP	FL
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668A	10129405	NELAP	FL
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-175)	EPA 1668A	10129405	NELAP	FL
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668A	10129405	NELAP	FL
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668A	10129405	NELAP	FL
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668A	10129405	NELAP	FL
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668A	10129405	NELAP	FL

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)	EPA 1668A	10129405	NELAP	FL
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668A	10129405	NELAP	FL
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668A	10129405	NELAP	FL
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668A	10129405	NELAP	FL
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668A	10129405	NELAP	FL
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668A	10129405	NELAP	FL
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668A	10129405	NELAP	FL
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668A	10129405	NELAP	FL
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668A	10129405	NELAP	FL
8927 - 2,2',3,3',5,6'+2,2',3,5,5',6-Hexachlorobiphenyls (BZ 135+151)	EPA 1668A	10129405	NELAP	FL
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668A	10129405	NELAP	FL
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668A	10129405	NELAP	FL
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668A	10129405	NELAP	FL
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668A	10129405	NELAP	FL
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668A	10129405	NELAP	FL
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl (BZ-146)	EPA 1668A	10129405	NELAP	FL
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668A	10129405	NELAP	FL
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668A	10129405	NELAP	FL
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668A	10129405	NELAP	FL
8951 - 2,2',3,4',6'+2,2',4,5,6'-Pentachlorobiphenyl (BZ-98+102)	EPA 1668A	10129405	NELAP	FL
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668A	10129405	NELAP	FL
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668A	10129405	NELAP	FL
8941 - 2,2',3,4,4'+2,3,4,5,6+2,3,4',5,6-Pentachlorobiphenyl (BZ-85+116+117)	EPA 1668A	10129405	NELAP	FL
8918 - 2,2',3,4,4',5',6+2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-183+185)	EPA 1668A	10129405	NELAP	FL
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668A	10129405	NELAP	FL
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl	EPA 1668A	10129405	NELAP	FL

STATE OF LOUISIANA
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Eurofins Knoxville
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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-203)				
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668A	10129405	NELAP	FL
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668A	10129405	NELAP	FL
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl (BZ-181)	EPA 1668A	10129405	NELAP	FL
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl (BZ-137)	EPA 1668A	10129405	NELAP	FL
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668A	10129405	NELAP	FL
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668A	10129405	NELAP	FL
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668A	10129405	NELAP	FL
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668A	10129405	NELAP	FL
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668A	10129405	NELAP	FL
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668A	10129405	NELAP	FL
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668A	10129405	NELAP	FL
8947 - 2,2',3,4,6+2,2',3,4',6-Pentachlorobiphenyl (BZ-88+91)	EPA 1668A	10129405	NELAP	FL
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668A	10129405	NELAP	FL
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668A	10129405	NELAP	FL
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668A	10129405	NELAP	FL
8956 - 2,2',3,5+2,3',5',6-Tetrachlorobiphenyl (BZ-43+73)	EPA 1668A	10129405	NELAP	FL
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668A	10129405	NELAP	FL
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668A	10129405	NELAP	FL
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668A	10129405	NELAP	FL
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668A	10129405	NELAP	FL
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-46)	EPA 1668A	10129405	NELAP	FL
8958 - 2,2',3,6+2,2',4,6'-Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10129405	NELAP	FL
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668A	10129405	NELAP	FL
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668A	10129405	NELAP	FL
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668A	10129405	NELAP	FL
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl	EPA 1668A	10129405	NELAP	FL

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-154)				
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668A	10129405	NELAP	FL
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668A	10129405	NELAP	FL
9179 - 2,2',4,5',6-Pentachlorobiphenyl (BZ-103)	EPA 1668A	10129405	NELAP	FL
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668A	10129405	NELAP	FL
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668A	10129405	NELAP	FL
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668A	10129405	NELAP	FL
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668A	10129405	NELAP	FL
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668A	10129405	NELAP	FL
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668A	10129405	NELAP	FL
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668A	10129405	NELAP	FL
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668A	10129405	NELAP	FL
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668A	10129405	NELAP	FL
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668A	10129405	NELAP	FL
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668A	10129405	NELAP	FL
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668A	10129405	NELAP	FL
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668A	10129405	NELAP	FL
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668A	10129405	NELAP	FL
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668A	10129405	NELAP	FL
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668A	10129405	NELAP	FL
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668A	10129405	NELAP	FL
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668A	10129405	NELAP	FL
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668A	10129405	NELAP	FL
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668A	10129405	NELAP	FL
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668A	10129405	NELAP	FL
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668A	10129405	NELAP	FL
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668A	10129405	NELAP	FL
8967 - 2,3,3'+2,4,4'-Trichlorobiphenyl (BZ-20+28)	EPA 1668A	10129405	NELAP	FL
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668A	10129405	NELAP	FL
9202 - 2,3,3',4',5'-Pentachlorobiphenyl	EPA 1668A	10129405	NELAP	FL

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-122)				
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668A	10129405	NELAP	FL
9205 - 2,3,3',4',5-Pentachlorobiphenyl (BZ-107)	EPA 1668A	10129405	NELAP	FL
8938 - 2,3,3',4',6+2,3,4,4',6-Pentachlorobiphenyl (BZ-110+115)	EPA 1668A	10129405	NELAP	FL
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668A	10129405	NELAP	FL
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668A	10129405	NELAP	FL
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668A	10129405	NELAP	FL
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668A	10129405	NELAP	FL
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668A	10129405	NELAP	FL
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668A	10129405	NELAP	FL
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668A	10129405	NELAP	FL
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668A	10129405	NELAP	FL
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668A	10129405	NELAP	FL
9194 - 2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ-192)	EPA 1668A	10129405	NELAP	FL
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668A	10129405	NELAP	FL
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668A	10129405	NELAP	FL
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668A	10129405	NELAP	FL
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668A	10129405	NELAP	FL
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668A	10129405	NELAP	FL
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668A	10129405	NELAP	FL
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668A	10129405	NELAP	FL
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-57)	EPA 1668A	10129405	NELAP	FL
8962 - 2,3,3',6+2,3,4,6+2,4,4',6-Tetrachlorobiphenyl (BZ-59+62+75)	EPA 1668A	10129405	NELAP	FL
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668A	10129405	NELAP	FL
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-64)	EPA 1668A	10129405	NELAP	FL
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668A	10129405	NELAP	FL
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl	EPA 1668A	10129405	NELAP	FL

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
(BZ-21+33)				
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668A	10129405	NELAP	FL
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668A	10129405	NELAP	FL
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-Tetrachlorobiphenyls (BZ 61+70+74+76)	EPA 1668A	10129405	NELAP	FL
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668A	10129405	NELAP	FL
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668A	10129405	NELAP	FL
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668A	10129405	NELAP	FL
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668A	10129405	NELAP	FL
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668A	10129405	NELAP	FL
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668A	10129405	NELAP	FL
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668A	10129405	NELAP	FL
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668A	10129405	NELAP	FL
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668A	10129405	NELAP	FL
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668A	10129405	NELAP	FL
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668A	10129405	NELAP	FL
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668A	10129405	NELAP	FL
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668A	10129405	NELAP	FL
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668A	10129405	NELAP	FL
9260 - 3,3',4,5,5'-Pentachlorobiphenyl (BZ-127)	EPA 1668A	10129405	NELAP	FL
9262 - 3,3',4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668A	10129405	NELAP	FL
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668A	10129405	NELAP	FL
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668A	10129405	NELAP	FL
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668A	10129405	NELAP	FL
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668A	10129405	NELAP	FL
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668A	10129405	NELAP	FL
8914 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668A	10129405	NELAP	FL
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668A	10129405	NELAP	FL
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668A	10129405	NELAP	FL
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668A	10129405	NELAP	FL
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668A	10129405	NELAP	FL
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668A	10129405	NELAP	FL
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668A	10129405	NELAP	FL
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668A	10129405	NELAP	FL
8921 - Coelution - Hexachlorobiphenyls (BZ-129 + BZ-138 + BZ-160 + BZ-163)	EPA 1668A	10129405	NELAP	FL
8924 - Coelution - Hexachlorobiphenyls (BZ-134 + BZ-143)	EPA 1668A	10129405	NELAP	FL
8937 - Coelution - Pentachlorobiphenyls (BZ-108 + BZ-124)	EPA 1668A	10129405	NELAP	FL

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8939 - Coelution - Pentachlorobiphenyls (BZ-83 + BZ-99)	EPA 1668A	10129405	NELAP	FL
8952 - Coelution - Tetrachlorobiphenyls (BZ-40 + BZ-41 + BZ-71)	EPA 1668A	10129405	NELAP	FL
8901 - Sum - Pentachlorobiphenyls (BZ-86 + BZ-87 + BZ 97 + BZ-109 + BZ-119 + BZ-125)	EPA 1668A	10129405	NELAP	FL
8580 - 2,4'-DDD	EPA 1699	10133105	NELAP	LA
8585 - 2,4'-DDE	EPA 1699	10133105	NELAP	LA
8590 - 2,4'-DDT	EPA 1699	10133105	NELAP	LA
7355 - 4,4'-DDD	EPA 1699	10133105	NELAP	LA
7360 - 4,4'-DDE	EPA 1699	10133105	NELAP	LA
7365 - 4,4'-DDT	EPA 1699	10133105	NELAP	LA
7025 - Aldrin	EPA 1699	10133105	NELAP	LA
7470 - Dieldrin	EPA 1699	10133105	NELAP	LA
7510 - Endosulfan I	EPA 1699	10133105	NELAP	LA
7515 - Endosulfan II	EPA 1699	10133105	NELAP	LA
7520 - Endosulfan sulfate	EPA 1699	10133105	NELAP	LA
7540 - Endrin	EPA 1699	10133105	NELAP	LA
7530 - Endrin aldehyde	EPA 1699	10133105	NELAP	LA
7535 - Endrin ketone	EPA 1699	10133105	NELAP	LA
7685 - Heptachlor	EPA 1699	10133105	NELAP	LA
7690 - Heptachlor epoxide	EPA 1699	10133105	NELAP	LA
7810 - Methoxychlor	EPA 1699	10133105	NELAP	LA
7870 - Mirex	EPA 1699	10133105	NELAP	LA
3890 - Oxychlordane	EPA 1699	10133105	NELAP	LA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7240 - alpha-Chlordane	EPA 1699	10133105	NELAP	LA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7925 - cis-Nonachlor	EPA 1699	10133105	NELAP	LA
7120 - gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7245 - gamma-Chlordane	EPA 1699	10133105	NELAP	LA
7910 - trans-Nonachlor	EPA 1699	10133105	NELAP	LA
1400 - Acid Digestion of Solids	EPA 3050B	10135601	NELAP	LA
1426 - Microwave Assisted Acid Digestion of Sediments, Sludges, Soils, and Oils	EPA 3051A	10136002	NELAP	LA
100009 - Microwave Assisted Acid Digestion of Siliceous and Organically Based Matrices	EPA 3052	10136206	NELAP	LA
1452 - Soxhlet Extraction	EPA 3540C	10140202	NELAP	LA
1428 - Microwave Extraction	EPA 3546	10141205	NELAP	LA
1468 - Ultrasonic Extraction	EPA 3550C	10142004	NELAP	LA
1470 - Waste Dilution	EPA 3580A	10143007	NELAP	LA
2020 - Sulfuric acid/permanganate clean-up	EPA 3665	10148604	NELAP	LA
1450 - Closed-System Purge-and-Trap and Extraction for Volatile Organics in Soil and Waste Samples	EPA 5035	10154004	NELAP	LA
1408 - Bomb Preparation Method for Solid	EPA 5050	10155007	NELAP	LA

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Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
Waste				
1000 - Aluminum	EPA 6010C	10155803	NELAP	FL
1005 - Antimony	EPA 6010C	10155803	NELAP	FL
1010 - Arsenic	EPA 6010C	10155803	NELAP	FL
1015 - Barium	EPA 6010C	10155803	NELAP	FL
1020 - Beryllium	EPA 6010C	10155803	NELAP	FL
1025 - Boron	EPA 6010C	10155803	NELAP	FL
1030 - Cadmium	EPA 6010C	10155803	NELAP	FL
1035 - Calcium	EPA 6010C	10155803	NELAP	FL
1040 - Chromium	EPA 6010C	10155803	NELAP	FL
1050 - Cobalt	EPA 6010C	10155803	NELAP	FL
1055 - Copper	EPA 6010C	10155803	NELAP	FL
1070 - Iron	EPA 6010C	10155803	NELAP	FL
1075 - Lead	EPA 6010C	10155803	NELAP	FL
1080 - Lithium	EPA 6010C	10155803	NELAP	FL
1085 - Magnesium	EPA 6010C	10155803	NELAP	FL
1090 - Manganese	EPA 6010C	10155803	NELAP	FL
1100 - Molybdenum	EPA 6010C	10155803	NELAP	FL
1105 - Nickel	EPA 6010C	10155803	NELAP	FL
1125 - Potassium	EPA 6010C	10155803	NELAP	FL
1140 - Selenium	EPA 6010C	10155803	NELAP	FL
1150 - Silver	EPA 6010C	10155803	NELAP	FL
1155 - Sodium	EPA 6010C	10155803	NELAP	FL
1160 - Strontium	EPA 6010C	10155803	NELAP	FL
1165 - Thallium	EPA 6010C	10155803	NELAP	FL
1175 - Tin	EPA 6010C	10155803	NELAP	FL
1180 - Titanium	EPA 6010C	10155803	NELAP	FL
1910 - Total Phosphorus	EPA 6010C	10155803	NELAP	FL
1185 - Vanadium	EPA 6010C	10155803	NELAP	LA
1190 - Zinc	EPA 6010C	10155803	NELAP	LA
1095 - Mercury	EPA 6010C	10155803	NELAP	FL
1095 - Mercury	EPA 7470A	10165807	NELAP	FL
8880 - Aroclor-1016 (PCB-1016)	EPA 7471B	10166402	NELAP	FL
8885 - Aroclor-1221 (PCB-1221)	EPA 8082A	10179201	NELAP	FL
8890 - Aroclor-1232 (PCB-1232)	EPA 8082A	10179201	NELAP	FL
8895 - Aroclor-1242 (PCB-1242)	EPA 8082A	10179201	NELAP	FL
8900 - Aroclor-1248 (PCB-1248)	EPA 8082A	10179201	NELAP	FL
8905 - Aroclor-1254 (PCB-1254)	EPA 8082A	10179201	NELAP	FL
8910 - Aroclor-1260 (PCB-1260)	EPA 8082A	10179201	NELAP	FL
5105 - 1,1,1,2-Tetrachloroethane	EPA 8082A	10179201	NELAP	FL
5160 - 1,1,1-Trichloroethane	EPA 8260B	10184802	NELAP	FL
5110 - 1,1,2,2-Tetrachloroethane	EPA 8260B	10184802	NELAP	FL
5185 - 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	EPA 8260B	10184802	NELAP	FL
5165 - 1,1,2-Trichloroethane	EPA 8260B	10184802	NELAP	LA
4630 - 1,1-Dichloroethane	EPA 8260B	10184802	NELAP	FL
4640 - 1,1-Dichloroethylene	EPA 8260B	10184802	NELAP	FL
4670 - 1,1-Dichloropropene	EPA 8260B	10184802	NELAP	FL
5150 - 1,2,3-Trichlorobenzene	EPA 8260B	10184802	NELAP	FL
5180 - 1,2,3-Trichloropropane	EPA 8260B	10184802	NELAP	FL
5155 - 1,2,4-Trichlorobenzene	EPA 8260B	10184802	NELAP	FL
	EPA 8260B	10184802	NELAP	FL

STATE OF LOUISIANA
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Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
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5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
5210 - 1,2,4-Trimethylbenzene	EPA 8260B	10184802	NELAP	FL
4570 - 1,2-Dibromo-3-chloropropane (DBCP)	EPA 8260B	10184802	NELAP	FL
4585 - 1,2-Dibromoethane (EDB, Ethylene dibromide)	EPA 8260B	10184802	NELAP	FL
4610 - 1,2-Dichlorobenzene	EPA 8260B	10184802	NELAP	FL
4635 - 1,2-Dichloroethane (Ethylene dichloride)	EPA 8260B	10184802	NELAP	FL
4655 - 1,2-Dichloropropane	EPA 8260B	10184802	NELAP	FL
5215 - 1,3,5-Trimethylbenzene	EPA 8260B	10184802	NELAP	FL
9318 - 1,3-Butadiene	EPA 8260B	10184802	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA 8260B	10184802	NELAP	FL
4660 - 1,3-Dichloropropane	EPA 8260B	10184802	NELAP	FL
4620 - 1,4-Dichlorobenzene	EPA 8260B	10184802	NELAP	FL
4665 - 2,2-Dichloropropane	EPA 8260B	10184802	NELAP	FL
4410 - 2-Butanone (Methyl ethyl ketone, MEK)	EPA 8260B	10184802	NELAP	FL
5812 - 2-Chloropropane	EPA 8260B	10184802	NELAP	LA
4535 - 2-Chlorotoluene	EPA 8260B	10184802	NELAP	FL
4860 - 2-Hexanone	EPA 8260B	10184802	NELAP	FL
4540 - 4-Chlorotoluene	EPA 8260B	10184802	NELAP	FL
4910 - 4-Isopropyltoluene (p-Cymene)	EPA 8260B	10184802	NELAP	FL
4995 - 4-Methyl-2-pentanone (MIBK)	EPA 8260B	10184802	NELAP	FL
4315 - Acetone	EPA 8260B	10184802	NELAP	FL
4320 - Acetonitrile	EPA 8260B	10184802	NELAP	LA
4340 - Acrylonitrile	EPA 8260B	10184802	NELAP	LA
4375 - Benzene	EPA 8260B	10184802	NELAP	FL
4385 - Bromobenzene	EPA 8260B	10184802	NELAP	FL
4390 - Bromochloromethane	EPA 8260B	10184802	NELAP	FL
4395 - Bromodichloromethane	EPA 8260B	10184802	NELAP	FL
4400 - Bromoform	EPA 8260B	10184802	NELAP	FL
4450 - Carbon disulfide	EPA 8260B	10184802	NELAP	FL
4455 - Carbon tetrachloride	EPA 8260B	10184802	NELAP	FL
4475 - Chlorobenzene	EPA 8260B	10184802	NELAP	FL
4575 - Chlorodibromomethane (dibromochloromethane)	EPA 8260B	10184802	NELAP	FL
4485 - Chloroethane (Ethyl chloride)	EPA 8260B	10184802	NELAP	FL
4505 - Chloroform	EPA 8260B	10184802	NELAP	FL
4595 - Dibromomethane (Methylene bromide)	EPA 8260B	10184802	NELAP	FL
4625 - Dichlorodifluoromethane (Freon-12)	EPA 8260B	10184802	NELAP	FL
4765 - Ethylbenzene	EPA 8260B	10184802	NELAP	FL
4835 - Hexachlorobutadiene	EPA 8260B	10184802	NELAP	FL
4870 - Iodomethane (Methyl iodide)	EPA 8260B	10184802	NELAP	LA
4900 - Isopropylbenzene (Cumene)	EPA 8260B	10184802	NELAP	FL
4950 - Methyl bromide (Bromomethane)	EPA 8260B	10184802	NELAP	FL
4960 - Methyl chloride (Chloromethane)	EPA 8260B	10184802	NELAP	FL
5000 - Methyl tert-butyl ether (MTBE)	EPA 8260B	10184802	NELAP	FL
4975 - Methylene chloride (Dichloromethane)	EPA 8260B	10184802	NELAP	FL
5005 - Naphthalene	EPA 8260B	10184802	NELAP	FL

Clients and Customers are urged to verify the laboratory's current certification status with the Louisiana Environmental Laboratory Accreditation Program.

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
5100 - Styrene	EPA 8260B	10184802	NELAP	FL
5115 - Tetrachloroethylene (Perchloroethylene)	EPA 8260B	10184802	NELAP	FL
5140 - Toluene	EPA 8260B	10184802	NELAP	FL
5170 - Trichloroethene (Trichloroethylene)	EPA 8260B	10184802	NELAP	FL
5175 - Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	EPA 8260B	10184802	NELAP	FL
5230 - Vinyl bromide (Bromoethane)	EPA 8260B	10184802	NELAP	LA
5235 - Vinyl chloride	EPA 8260B	10184802	NELAP	FL
5260 - Xylene (total)	EPA 8260B	10184802	NELAP	FL
4705 - cis & trans-1,2-Dichloroethene	EPA 8260B	10184802	NELAP	FL
4645 - cis-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	FL
4680 - cis-1,3-Dichloropropene	EPA 8260B	10184802	NELAP	FL
4600 - cis-1,4-Dichloro-2-butene	EPA 8260B	10184802	NELAP	LA
5240 - m+p-xylene	EPA 8260B	10184802	NELAP	LA
4435 - n-Butylbenzene	EPA 8260B	10184802	NELAP	FL
4855 - n-Hexane	EPA 8260B	10184802	NELAP	LA
5090 - n-Propylbenzene	EPA 8260B	10184802	NELAP	FL
5250 - o-Xylene	EPA 8260B	10184802	NELAP	LA
4440 - sec-Butylbenzene	EPA 8260B	10184802	NELAP	FL
4445 - tert-Butylbenzene	EPA 8260B	10184802	NELAP	FL
4700 - trans-1,2-Dichloroethylene	EPA 8260B	10184802	NELAP	FL
4685 - trans-1,3-Dichloropropylene	EPA 8260B	10184802	NELAP	FL
4605 - trans-1,4-Dichloro-2-butene	EPA 8260B	10184802	NELAP	LA
6715 - 1,2,4,5-Tetrachlorobenzene	EPA 8270C	10185805	NELAP	LA
5155 - 1,2,4-Trichlorobenzene	EPA 8270C	10185805	NELAP	FL
4610 - 1,2-Dichlorobenzene	EPA 8270C	10185805	NELAP	FL
6220 - 1,2-Diphenylhydrazine	EPA 8270C	10185805	NELAP	FL
6885 - 1,3,5-Trinitrobenzene (1,3,5-TNB)	EPA 8270C	10185805	NELAP	LA
4615 - 1,3-Dichlorobenzene	EPA 8270C	10185805	NELAP	FL
6160 - 1,3-Dinitrobenzene (1,3-DNB)	EPA 8270C	10185805	NELAP	LA
4620 - 1,4-Dichlorobenzene	EPA 8270C	10185805	NELAP	FL
5790 - 1-Chloronaphthalene	EPA 8270C	10185805	NELAP	LA
6735 - 2,3,4,6-Tetrachlorophenol	EPA 8270C	10185805	NELAP	LA
6835 - 2,4,5-Trichlorophenol	EPA 8270C	10185805	NELAP	FL
6840 - 2,4,6-Trichlorophenol	EPA 8270C	10185805	NELAP	FL
6000 - 2,4-Dichlorophenol	EPA 8270C	10185805	NELAP	FL
6130 - 2,4-Dimethylphenol	EPA 8270C	10185805	NELAP	FL
6175 - 2,4-Dinitrophenol	EPA 8270C	10185805	NELAP	FL
6185 - 2,4-Dinitrotoluene (2,4-DNT)	EPA 8270C	10185805	NELAP	FL
6005 - 2,6-Dichlorophenol	EPA 8270C	10185805	NELAP	LA
6190 - 2,6-Dinitrotoluene (2,6-DNT)	EPA 8270C	10185805	NELAP	FL
5515 - 2-Acetylaminofluorene	EPA 8270C	10185805	NELAP	LA
5795 - 2-Chloronaphthalene	EPA 8270C	10185805	NELAP	FL
5800 - 2-Chlorophenol	EPA 8270C	10185805	NELAP	FL
6360 - 2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	EPA 8270C	10185805	NELAP	FL
5145 - 2-Methylaniline (o-Toluidine)	EPA 8270C	10185805	NELAP	LA
6385 - 2-Methylnaphthalene	EPA 8270C	10185805	NELAP	FL
6400 - 2-Methylphenol (o-Cresol)	EPA 8270C	10185805	NELAP	FL
6460 - 2-Nitroaniline	EPA 8270C	10185805	NELAP	FL

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Solid Chemical Materials

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6490 - 2-Nitrophenol	EPA 8270C	10185805	NELAP	FL
6690 - 2-Sec-butyl-4,6-dinitrophenol (DNBP, Dinoseb)	EPA 8270C	10185805	NELAP	LA
6412 - 3+4 Methylphenol	EPA 8270C	10185805	NELAP	LA
5945 - 3,3'-Dichlorobenzidine	EPA 8270C	10185805	NELAP	FL
6355 - 3-Methylcholanthrene	EPA 8270C	10185805	NELAP	LA
6405 - 3-Methylphenol (m-Cresol)	EPA 8270C	10185805	NELAP	LA
6465 - 3-Nitroaniline	EPA 8270C	10185805	NELAP	FL
5660 - 4-Bromophenyl phenyl ether	EPA 8270C	10185805	NELAP	FL
5700 - 4-Chloro-3-methylphenol	EPA 8270C	10185805	NELAP	FL
5745 - 4-Chloroaniline	EPA 8270C	10185805	NELAP	FL
5825 - 4-Chlorophenyl phenylether	EPA 8270C	10185805	NELAP	FL
6105 - 4-Dimethyl aminoazobenzene	EPA 8270C	10185805	NELAP	LA
6410 - 4-Methylphenol (p-Cresol)	EPA 8270C	10185805	NELAP	FL
6470 - 4-Nitroaniline	EPA 8270C	10185805	NELAP	FL
6500 - 4-Nitrophenol	EPA 8270C	10185805	NELAP	FL
6570 - 5-Nitro-o-toluidine	EPA 8270C	10185805	NELAP	LA
6115 - 7,12-Dimethylbenz(a) anthracene	EPA 8270C	10185805	NELAP	LA
5500 - Acenaphthene	EPA 8270C	10185805	NELAP	FL
5505 - Acenaphthylene	EPA 8270C	10185805	NELAP	FL
5510 - Acetophenone	EPA 8270C	10185805	NELAP	LA
5545 - Aniline	EPA 8270C	10185805	NELAP	FL
5555 - Anthracene	EPA 8270C	10185805	NELAP	FL
5595 - Benzidine	EPA 8270C	10185805	NELAP	FL
5575 - Benzo(a)anthracene	EPA 8270C	10185805	NELAP	FL
5580 - Benzo(a)pyrene	EPA 8270C	10185805	NELAP	FL
5585 - Benzo(b)fluoranthene	EPA 8270C	10185805	NELAP	FL
5590 - Benzo(g,h,i)perylene	EPA 8270C	10185805	NELAP	FL
5600 - Benzo(k)fluoranthene	EPA 8270C	10185805	NELAP	FL
5610 - Benzoic acid	EPA 8270C	10185805	NELAP	FL
5630 - Benzyl alcohol	EPA 8270C	10185805	NELAP	FL
5780 - Bis(2-Chloroisopropyl) ether (2,2-oxybis(1-chloropropane))	EPA 8270C	10185805	NELAP	FL
5670 - Butyl benzyl phthalate	EPA 8270C	10185805	NELAP	FL
5680 - Carbazole	EPA 8270C	10185805	NELAP	FL
5855 - Chrysene	EPA 8270C	10185805	NELAP	FL
6065 - Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	EPA 8270C	10185805	NELAP	FL
5925 - Di-n-butyl phthalate	EPA 8270C	10185805	NELAP	FL
6200 - Di-n-octyl phthalate	EPA 8270C	10185805	NELAP	FL
5895 - Dibenz(a,h)anthracene	EPA 8270C	10185805	NELAP	FL
5905 - Dibenzofuran	EPA 8270C	10185805	NELAP	FL
6070 - Diethyl phthalate	EPA 8270C	10185805	NELAP	FL
6135 - Dimethyl phthalate	EPA 8270C	10185805	NELAP	FL
6205 - Diphenylamine	EPA 8270C	10185805	NELAP	LA
6260 - Ethyl methanesulfonate	EPA 8270C	10185805	NELAP	LA
6265 - Fluoranthene	EPA 8270C	10185805	NELAP	FL
6270 - Fluorene	EPA 8270C	10185805	NELAP	FL
6275 - Hexachlorobenzene	EPA 8270C	10185805	NELAP	FL
4835 - Hexachlorobutadiene	EPA 8270C	10185805	NELAP	FL
6285 - Hexachlorocyclopentadiene	EPA 8270C	10185805	NELAP	FL

Solid Chemical Materials

Analyte	Method Name	Method Code	Type	AB
4840 - Hexachloroethane	EPA 8270C	10185805	NELAP	FL
6295 - Hexachloropropene	EPA 8270C	10185805	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	EPA 8270C	10185805	NELAP	FL
6320 - Isophorone	EPA 8270C	10185805	NELAP	FL
6325 - Isosafrole	EPA 8270C	10185805	NELAP	LA
6375 - Methyl methanesulfonate	EPA 8270C	10185805	NELAP	LA
5005 - Naphthalene	EPA 8270C	10185805	NELAP	FL
5015 - Nitrobenzene	EPA 8270C	10185805	NELAP	FL
6590 - Pentachlorobenzene	EPA 8270C	10185805	NELAP	LA
5035 - Pentachloroethane	EPA 8270C	10185805	NELAP	LA
6600 - Pentachloronitrobenzene	EPA 8270C	10185805	NELAP	LA
6605 - Pentachlorophenol	EPA 8270C	10185805	NELAP	FL
6610 - Phenacetin	EPA 8270C	10185805	NELAP	LA
6615 - Phenanthrene	EPA 8270C	10185805	NELAP	FL
6625 - Phenol	EPA 8270C	10185805	NELAP	FL
6665 - Pyrene	EPA 8270C	10185805	NELAP	FL
5095 - Pyridine	EPA 8270C	10185805	NELAP	FL
6685 - Safrole	EPA 8270C	10185805	NELAP	LA
5760 - bis(2-Chloroethoxy)methane	EPA 8270C	10185805	NELAP	FL
5765 - bis(2-Chloroethyl) ether	EPA 8270C	10185805	NELAP	FL
5025 - n-Nitroso-di-n-butylamine	EPA 8270C	10185805	NELAP	LA
6545 - n-Nitrosodi-n-propylamine	EPA 8270C	10185805	NELAP	FL
6525 - n-Nitrosodiethylamine	EPA 8270C	10185805	NELAP	LA
6530 - n-Nitrosodimethylamine	EPA 8270C	10185805	NELAP	FL
6535 - n-Nitrosodiphenylamine	EPA 8270C	10185805	NELAP	FL
6550 - n-Nitrosomethylethylamine	EPA 8270C	10185805	NELAP	LA
6555 - n-Nitrosomorpholine	EPA 8270C	10185805	NELAP	LA
6560 - n-Nitrosopiperidine	EPA 8270C	10185805	NELAP	LA
6565 - n-Nitrosopyrrolidine	EPA 8270C	10185805	NELAP	LA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL

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9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9438 - Total Hpcdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9444 - Total Hpcdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9468 - Total Hxcdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9483 - Total Hxcdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9555 - Total Pecdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9552 - Total Pecdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9609 - Total TCDD	EPA 8290A, Rev.2007	10187403	NELAP	FL
9615 - Total TCDF	EPA 8290A, Rev.2007	10187403	NELAP	FL
1575 - Chloride	EPA 9056	10199005	NELAP	FL
1805 - Nitrate	EPA 9056	10199005	NELAP	FL
1835 - Nitrite	EPA 9056	10199005	NELAP	FL
2000 - Sulfate	EPA 9056	10199005	NELAP	FL
1540 - Bromide	EPA 9056	10199403	NELAP	LA
1730 - Fluoride	EPA 9056	10199403	NELAP	FL
1787 - Iodide	EPA 9056	10199403	NELAP	LA
6703 - 1,1'-Biphenyl (BZ-0) (Biphenyl)	EPA 8270D SIM	10242509	NELAP	LA
100626 - 1,6,7-Trimethylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
6380 - 1-Methylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
9501 - 1-Methylphenanthrene	EPA 8270D SIM	10242509	NELAP	LA
6188 - 2,6-Dimethylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
6385 - 2-Methylnaphthalene	EPA 8270D SIM	10242509	NELAP	LA
5500 - Acenaphthene	EPA 8270D SIM	10242509	NELAP	LA
5505 - Acenaphthylene	EPA 8270D SIM	10242509	NELAP	LA
5555 - Anthracene	EPA 8270D SIM	10242509	NELAP	LA
5575 - Benzo(a)anthracene	EPA 8270D SIM	10242509	NELAP	LA
5580 - Benzo(a)pyrene	EPA 8270D SIM	10242509	NELAP	LA
5585 - Benzo(b)fluoranthene	EPA 8270D SIM	10242509	NELAP	LA
100297 - Benzo(b)thiophene	EPA 8270D SIM	10242509	NELAP	LA
5605 - Benzo(e)pyrene	EPA 8270D SIM	10242509	NELAP	LA
5590 - Benzo(g,h,i)perylene	EPA 8270D SIM	10242509	NELAP	LA
5600 - Benzo(k)fluoranthene	EPA 8270D SIM	10242509	NELAP	LA
6603 - C1-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
6606 - C1-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100629 - C1-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6602 - C1-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6604 - C1-decalins	EPA 8270D SIM	10242509	NELAP	LA
6591 - C1-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6607 - C1-fluorenes	EPA 8270D SIM	10242509	NELAP	LA
6609 - C1-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6611 - C1-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA

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6614 - C2-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
6617 - C2-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100630 - C2-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6613 - C2-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6616 - C2-decalins	EPA 8270D SIM	10242509	NELAP	LA
6592 - C2-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6618 - C2-fluorenes	EPA 8270D SIM	10242509	NELAP	LA
6619 - C2-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6621 - C2-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
6624 - C3-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
6627 - C3-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100631 - C3-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6623 - C3-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6626 - C3-decalins	EPA 8270D SIM	10242509	NELAP	LA
6593 - C3-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6628 - C3-fluorenes	EPA 8270D SIM	10242509	NELAP	LA
6629 - C3-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6631 - C3-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
6634 - C4-Chrysenes	EPA 8270D SIM	10242509	NELAP	LA
100619 - C4-Fluoranthenes/Pyrenes	EPA 8270D SIM	10242509	NELAP	LA
100632 - C4-Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6633 - C4-benzo(b)thiophenes	EPA 8270D SIM	10242509	NELAP	LA
6636 - C4-decalins	EPA 8270D SIM	10242509	NELAP	LA
6594 - C4-dibenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6637 - C4-naphthalenes	EPA 8270D SIM	10242509	NELAP	LA
6638 - C4-phenanthrenes/anthracenes	EPA 8270D SIM	10242509	NELAP	LA
5855 - Chrysene	EPA 8270D SIM	10242509	NELAP	LA
5895 - Dibenz(a,h)anthracene	EPA 8270D SIM	10242509	NELAP	LA
5905 - Dibenzofuran	EPA 8270D SIM	10242509	NELAP	LA
5910 - Dibenzothiophene	EPA 8270D SIM	10242509	NELAP	LA
6265 - Fluoranthene	EPA 8270D SIM	10242509	NELAP	LA
6270 - Fluorene	EPA 8270D SIM	10242509	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	EPA 8270D SIM	10242509	NELAP	LA
5005 - Naphthalene	EPA 8270D SIM	10242509	NELAP	LA
100628 - Naphthobenzothiophenes	EPA 8270D SIM	10242509	NELAP	LA
6608 - Perylene	EPA 8270D SIM	10242509	NELAP	LA
6615 - Phenanthrene	EPA 8270D SIM	10242509	NELAP	LA
6665 - Pyrene	EPA 8270D SIM	10242509	NELAP	LA
4621 - cis-decalin	EPA 8270D SIM	10242509	NELAP	LA
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 1613B	10257600	NELAP	FL
1765 - Heat of combustion (btu)	ASTM D240	30000409	NELAP	LA

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
6380 - 1-Methylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
9501 - 1-Methylphenanthrene	SOP KNOX-ID-0016	2042	NELAP	LA
6852 - 2,3,5-Trimethylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
6188 - 2,6-Dimethylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6385 - 2-Methylnaphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
5500 - Acenaphthene	SOP KNOX-ID-0016	2042	NELAP	LA
5505 - Acenaphthylene	SOP KNOX-ID-0016	2042	NELAP	LA
5555 - Anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
5575 - Benzo(a)anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
5580 - Benzo(a)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5585 - Benzo(b)fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
5605 - Benzo(e)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5590 - Benzo(g,h,i)perylene	SOP KNOX-ID-0016	2042	NELAP	LA
5600 - Benzo(k)fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
5640 - Biphenyl (1,1'-Biphenyl)	SOP KNOX-ID-0016	2042	NELAP	LA
5855 - Chrysene	SOP KNOX-ID-0016	2042	NELAP	LA
5895 - Dibenz(a,h)anthracene	SOP KNOX-ID-0016	2042	NELAP	LA
6265 - Fluoranthene	SOP KNOX-ID-0016	2042	NELAP	LA
6270 - Fluorene	SOP KNOX-ID-0016	2042	NELAP	LA
6315 - Indeno(1,2,3-cd)pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
5005 - Naphthalene	SOP KNOX-ID-0016	2042	NELAP	LA
6608 - Perylene	SOP KNOX-ID-0016	2042	NELAP	LA
6615 - Phenanthrene	SOP KNOX-ID-0016	2042	NELAP	LA
6665 - Pyrene	SOP KNOX-ID-0016	2042	NELAP	LA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 1613B	10120602	NELAP	FL
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 1613B	10120602	NELAP	FL
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 1613B	10120602	NELAP	FL
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 1613B	10120602	NELAP	FL
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 1613B	10120602	NELAP	FL
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 1613B	10120602	NELAP	FL
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 1613B	10120602	NELAP	FL
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 1613B	10120602	NELAP	FL
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 1613B	10120602	NELAP	FL
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	EPA 1613B	10120602	NELAP	FL
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 1613B	10120602	NELAP	FL
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 1613B	10120602	NELAP	FL
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 1613B	10120602	NELAP	FL
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 1613B	10120602	NELAP	FL
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 1613B	10120602	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 1613B	10120602	NELAP	FL
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 1613B	10120602	NELAP	FL
9438 - Total Hpcdd	EPA 1613B	10120602	NELAP	FL
9444 - Total Hpcdf	EPA 1613B	10120602	NELAP	FL
9468 - Total Hxcdd	EPA 1613B	10120602	NELAP	FL
9483 - Total Hxcdf	EPA 1613B	10120602	NELAP	FL
9555 - Total Pecdd	EPA 1613B	10120602	NELAP	FL
9552 - Total Pecdf	EPA 1613B	10120602	NELAP	FL
9609 - Total TCDD	EPA 1613B	10120602	NELAP	FL
9615 - Total TCDF	EPA 1613B	10120602	NELAP	FL
8919 - 2,2',3,3',4,4'+2,3,4,4',5,6-Hexachlorobiphenyl (BZ-128+166)	EPA 1668A	10129405	NELAP	FL
9105 - 2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl (BZ-209)	EPA 1668A	10129405	NELAP	FL
9095 - 2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl (BZ-206)	EPA 1668A	10129405	NELAP	FL
9090 - 2,2',3,3',4,4',5,5'-Octachlorobiphenyl (BZ-194)	EPA 1668A	10129405	NELAP	FL
9102 - 2,2',3,3',4,4',5,6'-Octachlorobiphenyl (BZ-196)	EPA 1668A	10129405	NELAP	FL
9101 - 2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl (BZ-207)	EPA 1668A	10129405	NELAP	FL
9103 - 2,2',3,3',4,4',5,6-Octachlorobiphenyl (BZ-195)	EPA 1668A	10129405	NELAP	FL
9065 - 2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	EPA 1668A	10129405	NELAP	FL
8916 - 2,2',3,3',4,4',6+2,2',3,3',4,5,6-Heptachlorobiphenyl (BZ-171+173)	EPA 1668A	10129405	NELAP	FL
9104 - 2,2',3,3',4,4',6,6'-Octachlorobiphenyl (BZ-197)	EPA 1668A	10129405	NELAP	FL
9114 - 2,2',3,3',4,5',6'-Heptachlorobiphenyl (BZ-177)	EPA 1668A	10129405	NELAP	FL
9112 - 2,2',3,3',4,5',6,6'-Octachlorobiphenyl (BZ-201)	EPA 1668A	10129405	NELAP	FL
9115 - 2,2',3,3',4,5',6-Heptachlorobiphenyl (BZ-175)	EPA 1668A	10129405	NELAP	FL
9117 - 2,2',3,3',4,5'-Hexachlorobiphenyl (BZ-130)	EPA 1668A	10129405	NELAP	FL
8934 - 2,2',3,3',4,5,5',6+2,2',3,3',4,5,5',6'-Octachlorobiphenyl (BZ-198+199)	EPA 1668A	10129405	NELAP	FL
9107 - 2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl (BZ-208)	EPA 1668A	10129405	NELAP	FL
9110 - 2,2',3,3',4,5,5'-Heptachlorobiphenyl (BZ-172)	EPA 1668A	10129405	NELAP	FL
9116 - 2,2',3,3',4,5,6'-Heptachlorobiphenyl (BZ-174)	EPA 1668A	10129405	NELAP	FL
9111 - 2,2',3,3',4,5,6,6'-Octachlorobiphenyl (BZ-200)	EPA 1668A	10129405	NELAP	FL
9120 - 2,2',3,3',4,6'-Hexachlorobiphenyl (BZ-132)	EPA 1668A	10129405	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
9119 - 2,2',3,3',4,6,6'-Heptachlorobiphenyl (BZ-176)	EPA 1668A	10129405	NELAP	FL
9121 - 2,2',3,3',4,6-Hexachlorobiphenyl (BZ-131)	EPA 1668A	10129405	NELAP	FL
9122 - 2,2',3,3',4-Pentachlorobiphenyl (BZ-82)	EPA 1668A	10129405	NELAP	FL
9123 - 2,2',3,3',5,5',6,6'-Octachlorobiphenyl (BZ-202)	EPA 1668A	10129405	NELAP	FL
9124 - 2,2',3,3',5,5',6-Heptachlorobiphenyl (BZ-178)	EPA 1668A	10129405	NELAP	FL
9125 - 2,2',3,3',5,5'-Hexachlorobiphenyl (BZ-133)	EPA 1668A	10129405	NELAP	FL
8927 - 2,2',3,3',5,6'+2,2',3,5,5',6-Hexachlorobiphenyls (BZ 135+151)	EPA 1668A	10129405	NELAP	FL
9126 - 2,2',3,3',5,6,6'-Heptachlorobiphenyl (BZ-179)	EPA 1668A	10129405	NELAP	FL
9130 - 2,2',3,3',6,6'-Hexachlorobiphenyl (BZ-136)	EPA 1668A	10129405	NELAP	FL
9131 - 2,2',3,3',6-Pentachlorobiphenyl (BZ-84)	EPA 1668A	10129405	NELAP	FL
8948 - 2,2',3,4',5+2,2',4,5,5'+2,3,3',5',6-Pentachlorobiphenyl (BZ-90+101+113)	EPA 1668A	10129405	NELAP	FL
9080 - 2,2',3,4',5,5',6-Heptachlorobiphenyl (BZ-187)	EPA 1668A	10129405	NELAP	FL
9144 - 2,2',3,4',5,5'-Hexachlorobiphenyl (BZ-146)	EPA 1668A	10129405	NELAP	FL
9147 - 2,2',3,4',5,6'-Hexachlorobiphenyl (BZ-148)	EPA 1668A	10129405	NELAP	FL
8929 - 2,2',3,4',5,6+2,2',3,4',5',6-Hexachlorobiphenyl (BZ-147+149)	EPA 1668A	10129405	NELAP	FL
9146 - 2,2',3,4',5,6,6'-Heptachlorobiphenyl (BZ-188)	EPA 1668A	10129405	NELAP	FL
8951 - 2,2',3,4',6'+2,2',4,5,6'-Pentachlorobiphenyl (BZ-98+102)	EPA 1668A	10129405	NELAP	FL
9157 - 2,2',3,4',6,6'-Hexachlorobiphenyl (BZ-150)	EPA 1668A	10129405	NELAP	FL
9162 - 2,2',3,4'-Tetrachlorobiphenyl (BZ-42)	EPA 1668A	10129405	NELAP	FL
8941 - 2,2',3,4,4'+2,3,4,5,6+2,3,4',5,6-Pentachlorobiphenyl (BZ-85+116+117)	EPA 1668A	10129405	NELAP	FL
8918 - 2,2',3,4,4',5',6+2,2',3,4,5,5',6-Heptachlorobiphenyl (BZ-183+185)	EPA 1668A	10129405	NELAP	FL
8917 - 2,2',3,4,4',5,5'+2,3,3',4',5,5',6-Heptachlorobiphenyl (BZ-180+193)	EPA 1668A	10129405	NELAP	FL
9133 - 2,2',3,4,4',5,5',6-Octachlorobiphenyl (BZ-203)	EPA 1668A	10129405	NELAP	FL
9136 - 2,2',3,4,4',5,6'-Heptachlorobiphenyl (BZ-182)	EPA 1668A	10129405	NELAP	FL
9135 - 2,2',3,4,4',5,6,6'-Octachlorobiphenyl (BZ-204)	EPA 1668A	10129405	NELAP	FL
9137 - 2,2',3,4,4',5,6-Heptachlorobiphenyl	EPA 1668A	10129405	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
(BZ-181)				
9138 - 2,2',3,4,4',5-Hexachlorobiphenyl (BZ-137)	EPA 1668A	10129405	NELAP	FL
8928 - 2,2',3,4,4',6+2,2',3,4,4',6'-Hexachlorobiphenyl (BZ-139+140)	EPA 1668A	10129405	NELAP	FL
9139 - 2,2',3,4,4',6,6'-Heptachlorobiphenyl (BZ-184)	EPA 1668A	10129405	NELAP	FL
9150 - 2,2',3,4,5',6-Hexachlorobiphenyl (BZ-144)	EPA 1668A	10129405	NELAP	FL
9030 - 2,2',3,4,5,5'-Hexachlorobiphenyl (BZ-141)	EPA 1668A	10129405	NELAP	FL
9145 - 2,2',3,4,5,6,6'-Heptachlorobiphenyl (BZ-186)	EPA 1668A	10129405	NELAP	FL
9148 - 2,2',3,4,5,6-Hexachlorobiphenyl (BZ-142)	EPA 1668A	10129405	NELAP	FL
9161 - 2,2',3,4,6'-Pentachlorobiphenyl (BZ-89)	EPA 1668A	10129405	NELAP	FL
8947 - 2,2',3,4,6+2,2',3,4',6-Pentachlorobiphenyl (BZ-88+91)	EPA 1668A	10129405	NELAP	FL
9156 - 2,2',3,4,6,6'-Hexachlorobiphenyl (BZ-145)	EPA 1668A	10129405	NELAP	FL
8957 - 2,2',3,5'+2,2',4,4'+2,3,5,6-Tetrachlorobiphenyl (BZ-44+47+65)	EPA 1668A	10129405	NELAP	FL
9166 - 2,2',3,5',6-Pentachlorobiphenyl (BZ-95)	EPA 1668A	10129405	NELAP	FL
8956 - 2,2',3,5+2,3',5',6-Tetrachlorobiphenyl (BZ-43+73)	EPA 1668A	10129405	NELAP	FL
9164 - 2,2',3,5,5'-Pentachlorobiphenyl (BZ-92)	EPA 1668A	10129405	NELAP	FL
9167 - 2,2',3,5,6'-Pentachlorobiphenyl (BZ-94)	EPA 1668A	10129405	NELAP	FL
8949 - 2,2',3,5,6+2,2',4,4',6-Pentachlorobiphenyl (BZ-93+100)	EPA 1668A	10129405	NELAP	FL
9165 - 2,2',3,5,6,6'-Hexachlorobiphenyl (BZ-152)	EPA 1668A	10129405	NELAP	FL
9171 - 2,2',3,6'-Tetrachlorobiphenyl (BZ-46)	EPA 1668A	10129405	NELAP	FL
8958 - 2,2',3,6+2,2',4,6'-Tetrachlorobiphenyls (BZ 45 + 51)	EPA 1668A	10129405	NELAP	FL
9170 - 2,2',3,6,6'-Pentachlorobiphenyl (BZ-96)	EPA 1668A	10129405	NELAP	FL
9173 - 2,2',3-Trichlorobiphenyl (BZ-16)	EPA 1668A	10129405	NELAP	FL
8931 - 2,2',4,4',5,5'+2,3',4,4',5',6-Hexachlorobiphenyl (BZ-153+168)	EPA 1668A	10129405	NELAP	FL
9174 - 2,2',4,4',5,6'-Hexachlorobiphenyl (BZ-154)	EPA 1668A	10129405	NELAP	FL
9176 - 2,2',4,4',6,6'-Hexachlorobiphenyl (BZ-155)	EPA 1668A	10129405	NELAP	FL
8959 - 2,2',4,5'+2,3',4,6-Tetrachlorobiphenyl (BZ-49+69)	EPA 1668A	10129405	NELAP	FL
9179 - 2,2',4,5',6-Pentachlorobiphenyl	EPA 1668A	10129405	NELAP	FL

STATE OF LOUISIANA
DEPARTMENT OF ENVIRONMENTAL QUALITY

Eurofins Knoxville
AI Number: 83979
Activity No. ACC20230001
Expiration Date: June 30, 2025

Effective Date: July 1, 2024

5815 Middlebrook Pike, Knoxville, Tennessee 37921-5947

Certificate Number: 03079

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
(BZ-103)				
9181 - 2,2',4,5-Tetrachlorobiphenyl (BZ-48)	EPA 1668A	10129405	NELAP	FL
8961 - 2,2',4,6+2,2',5,6'-Tetrachlorobiphenyl (BZ-50+53)	EPA 1668A	10129405	NELAP	FL
9182 - 2,2',4,6,6'-Pentachlorobiphenyl (BZ-104)	EPA 1668A	10129405	NELAP	FL
9185 - 2,2',4-Trichlorobiphenyl (BZ-17)	EPA 1668A	10129405	NELAP	FL
8966 - 2,2',5+2,4,6-Trichlorobiphenyl (BZ-18+30)	EPA 1668A	10129405	NELAP	FL
8955 - 2,2',5,5'-Tetrachlorobiphenyl (BZ-52)	EPA 1668A	10129405	NELAP	FL
9187 - 2,2',6,6'-Tetrachlorobiphenyl (BZ-54)	EPA 1668A	10129405	NELAP	FL
9188 - 2,2',6-Trichlorobiphenyl (BZ-19)	EPA 1668A	10129405	NELAP	FL
9189 - 2,2'-Dichlorobiphenyl (BZ-4)	EPA 1668A	10129405	NELAP	FL
9000 - 2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	EPA 1668A	10129405	NELAP	FL
9055 - 2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	EPA 1668A	10129405	NELAP	FL
8995 - 2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	EPA 1668A	10129405	NELAP	FL
8960 - 2,3',4,4'-Tetrachlorobiphenyl (BZ-66)	EPA 1668A	10129405	NELAP	FL
9226 - 2,3',4,5',6-Pentachlorobiphenyl (BZ-121)	EPA 1668A	10129405	NELAP	FL
9231 - 2,3',4,5'-Tetrachlorobiphenyl (BZ-68)	EPA 1668A	10129405	NELAP	FL
9223 - 2,3',4,5,5'-Pentachlorobiphenyl (BZ-120)	EPA 1668A	10129405	NELAP	FL
9232 - 2,3',4,5-Tetrachlorobiphenyl (BZ-67)	EPA 1668A	10129405	NELAP	FL
9240 - 2,3',4-Trichlorobiphenyl (BZ-25)	EPA 1668A	10129405	NELAP	FL
9246 - 2,3',5'-Trichlorobiphenyl (BZ-34)	EPA 1668A	10129405	NELAP	FL
8969 - 2,3',5+2,4,5-Trichlorobiphenyl (BZ-26+29)	EPA 1668A	10129405	NELAP	FL
9242 - 2,3',5,5'-Tetrachlorobiphenyl (BZ-72)	EPA 1668A	10129405	NELAP	FL
9248 - 2,3',6-Trichlorobiphenyl (BZ-27)	EPA 1668A	10129405	NELAP	FL
9249 - 2,3'-Dichlorobiphenyl (BZ-6)	EPA 1668A	10129405	NELAP	FL
8967 - 2,3,3'+2,4,4'-Trichlorobiphenyl (BZ-20+28)	EPA 1668A	10129405	NELAP	FL
9201 - 2,3,3',4',5',6-Hexachlorobiphenyl (BZ-164)	EPA 1668A	10129405	NELAP	FL
9202 - 2,3,3',4',5'-Pentachlorobiphenyl (BZ-122)	EPA 1668A	10129405	NELAP	FL
9197 - 2,3,3',4',5,5'-Hexachlorobiphenyl (BZ-162)	EPA 1668A	10129405	NELAP	FL
9205 - 2,3,3',4',5-Pentachlorobiphenyl (BZ-107)	EPA 1668A	10129405	NELAP	FL
8938 - 2,3,3',4',6+2,3,4,4',6-	EPA 1668A	10129405	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
Pentachlorobiphenyl (BZ-110+115)				
9207 - 2,3,3',4'-Tetrachlorobiphenyl (BZ-56)	EPA 1668A	10129405	NELAP	FL
9192 - 2,3,3',4,4',5',6-Heptachlorobiphenyl (BZ-191)	EPA 1668A	10129405	NELAP	FL
8932 - 2,3,3',4,4',5+2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-156+157)	EPA 1668A	10129405	NELAP	FL
9190 - 2,3,3',4,4',5,5',6-Octachlorobiphenyl (BZ-205)	EPA 1668A	10129405	NELAP	FL
9085 - 2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	EPA 1668A	10129405	NELAP	FL
9191 - 2,3,3',4,4',5,6-Heptachlorobiphenyl (BZ-190)	EPA 1668A	10129405	NELAP	FL
9193 - 2,3,3',4,4',6-Hexachlorobiphenyl (BZ-158)	EPA 1668A	10129405	NELAP	FL
8985 - 2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	EPA 1668A	10129405	NELAP	FL
9200 - 2,3,3',4,5',6-Hexachlorobiphenyl (BZ-161)	EPA 1668A	10129405	NELAP	FL
9194 - 2,3,3',4,5,5',6-Heptachlorobiphenyl (BZ-192)	EPA 1668A	10129405	NELAP	FL
9196 - 2,3,3',4,5,5'-Hexachlorobiphenyl (BZ-159)	EPA 1668A	10129405	NELAP	FL
9204 - 2,3,3',4,5-Pentachlorobiphenyl (BZ-106)	EPA 1668A	10129405	NELAP	FL
9208 - 2,3,3',4-Tetrachlorobiphenyl (BZ-55)	EPA 1668A	10129405	NELAP	FL
9213 - 2,3,3',5'-Tetrachlorobiphenyl (BZ-58)	EPA 1668A	10129405	NELAP	FL
9209 - 2,3,3',5,5',6-Hexachlorobiphenyl (BZ-165)	EPA 1668A	10129405	NELAP	FL
9210 - 2,3,3',5,5'-Pentachlorobiphenyl (BZ-111)	EPA 1668A	10129405	NELAP	FL
9211 - 2,3,3',5,6-Pentachlorobiphenyl (BZ-112)	EPA 1668A	10129405	NELAP	FL
9214 - 2,3,3',5-Tetrachlorobiphenyl (BZ-57)	EPA 1668A	10129405	NELAP	FL
8962 - 2,3,3',6+2,3,4,6+2,4,4',6-Tetrachlorobiphenyl (BZ-59+62+75)	EPA 1668A	10129405	NELAP	FL
9233 - 2,3,4',5-Tetrachlorobiphenyl (BZ-63)	EPA 1668A	10129405	NELAP	FL
9236 - 2,3,4',6-Tetrachlorobiphenyl (BZ-64)	EPA 1668A	10129405	NELAP	FL
9241 - 2,3,4'-Trichlorobiphenyl (BZ-22)	EPA 1668A	10129405	NELAP	FL
8968 - 2,3,4+2,3',4'-Trichlorobiphenyl (BZ-21+33)	EPA 1668A	10129405	NELAP	FL
9005 - 2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	EPA 1668A	10129405	NELAP	FL
9221 - 2,3,4,4'-Tetrachlorobiphenyl (BZ-60)	EPA 1668A	10129405	NELAP	FL
8963 - 2,3,4,5+2,3',4',5+2,4,4',5+2,3',4',5'-	EPA 1668A	10129405	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
Tetrachlorobiphenyls (BZ 61+70+74+76)				
9245 - 2,3,5-Trichlorobiphenyl (BZ-23)	EPA 1668A	10129405	NELAP	FL
9247 - 2,3,6-Trichlorobiphenyl (BZ-24)	EPA 1668A	10129405	NELAP	FL
8920 - 2,3-Dichlorobiphenyl (BZ-5)	EPA 1668A	10129405	NELAP	FL
8940 - 2,4',5-Trichlorobiphenyl (BZ-31)	EPA 1668A	10129405	NELAP	FL
9255 - 2,4',6-Trichlorobiphenyl (BZ-32)	EPA 1668A	10129405	NELAP	FL
9256 - 2,4'-Dichlorobiphenyl (BZ-8)	EPA 1668A	10129405	NELAP	FL
9257 - 2,4-Dichlorobiphenyl (BZ-7)	EPA 1668A	10129405	NELAP	FL
9258 - 2,5-Dichlorobiphenyl (BZ-9)	EPA 1668A	10129405	NELAP	FL
9259 - 2,6-Dichlorobiphenyl (BZ-10)	EPA 1668A	10129405	NELAP	FL
8915 - 2-Chlorobiphenyl (BZ-1)	EPA 1668A	10129405	NELAP	FL
9060 - 3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	EPA 1668A	10129405	NELAP	FL
9015 - 3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	EPA 1668A	10129405	NELAP	FL
8965 - 3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	EPA 1668A	10129405	NELAP	FL
9261 - 3,3',4,5'-Tetrachlorobiphenyl (BZ-79)	EPA 1668A	10129405	NELAP	FL
9260 - 3,3',4,5,5'-Pentachlorobiphenyl (BZ-127)	EPA 1668A	10129405	NELAP	FL
9262 - 3,3',4,5-Tetrachlorobiphenyl (BZ-78)	EPA 1668A	10129405	NELAP	FL
9263 - 3,3',4-Trichlorobiphenyl (BZ-35)	EPA 1668A	10129405	NELAP	FL
9264 - 3,3',5,5'-Tetrachlorobiphenyl (BZ-80)	EPA 1668A	10129405	NELAP	FL
9265 - 3,3',5-Trichlorobiphenyl (BZ-36)	EPA 1668A	10129405	NELAP	FL
8925 - 3,3'-Dichlorobiphenyl (BZ-11)	EPA 1668A	10129405	NELAP	FL
9268 - 3,4',5-Trichlorobiphenyl (BZ-39)	EPA 1668A	10129405	NELAP	FL
8914 - 3,4+3,4'-Dichlorobiphenyl (BZ-12+13)	EPA 1668A	10129405	NELAP	FL
8970 - 3,4,4',5-Tetrachlorobiphenyl (BZ-81)	EPA 1668A	10129405	NELAP	FL
9266 - 3,4,4'-Trichlorobiphenyl (BZ-37)	EPA 1668A	10129405	NELAP	FL
9267 - 3,4,5-Trichlorobiphenyl (BZ-38)	EPA 1668A	10129405	NELAP	FL
9271 - 3,5-Dichlorobiphenyl (BZ-14)	EPA 1668A	10129405	NELAP	FL
9272 - 3-Chlorobiphenyl (BZ-2)	EPA 1668A	10129405	NELAP	FL
9273 - 4,4'-Dichlorobiphenyl (BZ-15)	EPA 1668A	10129405	NELAP	FL
9274 - 4-Chlorobiphenyl (BZ-3)	EPA 1668A	10129405	NELAP	FL
8921 - Coelution - Hexachlorobiphenyls (BZ-129 + BZ-138 + BZ-160 + BZ-163)	EPA 1668A	10129405	NELAP	FL
8924 - Coelution - Hexachlorobiphenyls (BZ-134 + BZ-143)	EPA 1668A	10129405	NELAP	FL
8937 - Coelution - Pentachlorobiphenyls (BZ-108 + BZ-124)	EPA 1668A	10129405	NELAP	FL
8939 - Coelution - Pentachlorobiphenyls (BZ-83 + BZ-99)	EPA 1668A	10129405	NELAP	FL
8952 - Coelution - Tetrachlorobiphenyls (BZ-40 + BZ-41 + BZ-71)	EPA 1668A	10129405	NELAP	FL
8901 - Sum - Pentachlorobiphenyls (BZ-86 + BZ-87 + BZ 97 + BZ-109 + BZ-119 +	EPA 1668A	10129405	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
BZ-125)				
8580 - 2,4'-DDD	EPA 1699	10133105	NELAP	LA
8585 - 2,4'-DDE	EPA 1699	10133105	NELAP	LA
8590 - 2,4'-DDT	EPA 1699	10133105	NELAP	LA
7355 - 4,4'-DDD	EPA 1699	10133105	NELAP	LA
7360 - 4,4'-DDE	EPA 1699	10133105	NELAP	LA
7365 - 4,4'-DDT	EPA 1699	10133105	NELAP	LA
7025 - Aldrin	EPA 1699	10133105	NELAP	LA
7470 - Dieldrin	EPA 1699	10133105	NELAP	LA
7510 - Endosulfan I	EPA 1699	10133105	NELAP	LA
7515 - Endosulfan II	EPA 1699	10133105	NELAP	LA
7520 - Endosulfan sulfate	EPA 1699	10133105	NELAP	LA
7540 - Endrin	EPA 1699	10133105	NELAP	LA
7530 - Endrin aldehyde	EPA 1699	10133105	NELAP	LA
7535 - Endrin ketone	EPA 1699	10133105	NELAP	LA
7685 - Heptachlor	EPA 1699	10133105	NELAP	LA
7690 - Heptachlor epoxide	EPA 1699	10133105	NELAP	LA
7810 - Methoxychlor	EPA 1699	10133105	NELAP	LA
7870 - Mirex	EPA 1699	10133105	NELAP	LA
3890 - Oxychlordane	EPA 1699	10133105	NELAP	LA
7110 - alpha-BHC (alpha-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7240 - alpha-Chlordane	EPA 1699	10133105	NELAP	LA
7115 - beta-BHC (beta-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7925 - cis-Nonachlor	EPA 1699	10133105	NELAP	LA
7120 - gamma-BHC (Lindane, gamma-Hexachlorocyclohexane)	EPA 1699	10133105	NELAP	LA
7245 - gamma-Chlordane	EPA 1699	10133105	NELAP	LA
7910 - trans-Nonachlor	EPA 1699	10133105	NELAP	LA
9519 - 1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9516 - 1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9426 - 1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-hpcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9420 - 1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9423 - 1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-hpcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9453 - 1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9471 - 1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9456 - 1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9474 - 1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9459 - 1,2,3,7,8,9-Hexachlorodibenzo-p-	EPA 8290A, Rev.2007	10187403	NELAP	FL

Biological Tissue

Analyte	Method Name	Method Code	Type	AB
dioxin (1,2,3,7,8,9-Hxcdd)				
9477 - 1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9540 - 1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9543 - 1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9480 - 2,3,4,6,7,8-Hexachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9549 - 2,3,4,7,8-Pentachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9618 - 2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	EPA 8290A, Rev.2007	10187403	NELAP	FL
9612 - 2,3,7,8-Tetrachlorodibenzofuran	EPA 8290A, Rev.2007	10187403	NELAP	FL
9438 - Total Hpcdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9444 - Total Hpcdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9468 - Total Hxcdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9483 - Total Hxcdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9555 - Total Pecdd	EPA 8290A, Rev.2007	10187403	NELAP	FL
9552 - Total Pecdf	EPA 8290A, Rev.2007	10187403	NELAP	FL
9609 - Total TCDD	EPA 8290A, Rev.2007	10187403	NELAP	FL
9615 - Total TCDF	EPA 8290A, Rev.2007	10187403	NELAP	FL

EUROFINS TEXAS CERTIFICATION

Texas Commission on
Environmental Quality

Certificate of Accreditation

Accreditation is hereby granted to

Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

State Lab ID: T104704380
Effective Date: 09/01/2024
Expiration Date: 08/31/2025
Certificate ID: TX-C24-00289

Conditions of Accreditation

This laboratory has been found to conform with TCEQ rules and applicable standards for laboratory accreditation. The scope of accreditation is limited to the Fields of Accreditation (FoA) specifically listed on the subsequent page(s) of this certificate. Accreditation is for all version of a method approved per 40 CFR 136, 40 CFR 141, and/ or 40 CFR 143. Continued accreditation requires ongoing compliance with all applicable standards and requirements.

Note: For the attached FoA table, matrices may include DW (drinking water), NPW (non-potable water), S (solid and chemical materials), A (air), and/ or BT (biological tissue).

Issued By: Kelly Keel, Executive Director Texas Commission on Environmental Quality
Date Issued: 09/01/2024

Laboratory Fields of Accreditation

Matrix	Method	Method Code	Analyte	Analyte Code	AB
A	40 CFR Part 50 Appendix B	10000304	Total Suspended Particulate	3973	TX
A	40 CFR Part 50 Appendix J	10000507	Particulates <10 um	3950	TX
A	ASTM D1946	30024465	Carbon dioxide	3755	LA-DEQ
A	ASTM D1946	30024465	Carbon monoxide	3780	LA-DEQ
A	ASTM D1946	30024465	Ethane	4747	LA-DEQ
A	ASTM D1946	30024465	Hydrogen	1772	LA-DEQ
A	ASTM D1946	30024465	Methane	4926	LA-DEQ
A	ASTM D1946	30024465	Nitrogen	1843	LA-DEQ
A	ASTM D1946	30024465	Oxygen	3895	LA-DEQ
A	EPA 0010	10001602	Modified Sample Train	3847	TX
A	EPA 1668	10262007	2,2',3,3',4,4',5-Heptachlorobiphenyl (BZ-170)	9065	TX
A	EPA 1668	10262007	2,2',3,4,4',5,5'-Heptachlorobiphenyl (BZ-180)	9134	TX
A	EPA 1668	10262007	2,3',4,4',5'-Pentachlorobiphenyl (BZ-123)	9000	TX
A	EPA 1668	10262007	2,3',4,4',5,5'-Hexachlorobiphenyl (BZ-167)	9055	TX
A	EPA 1668	10262007	2,3',4,4',5-Pentachlorobiphenyl (BZ-118)	8995	TX
A	EPA 1668	10262007	2,3,3',4,4',5'-Hexachlorobiphenyl (BZ-157)	9045	TX
A	EPA 1668	10262007	2,3,3',4,4',5,5'-Heptachlorobiphenyl (BZ-189)	9085	TX
A	EPA 1668	10262007	2,3,3',4,4',5-Hexachlorobiphenyl (BZ-156)	9050	TX
A	EPA 1668	10262007	2,3,3',4,4'-Pentachlorobiphenyl (BZ-105)	8985	TX
A	EPA 1668	10262007	2,3,4,4',5-Pentachlorobiphenyl (BZ-114)	9005	TX
A	EPA 1668	10262007	3,3',4,4',5,5'-Hexachlorobiphenyl (BZ-169)	9060	TX
A	EPA 1668	10262007	3,3',4,4',5-Pentachlorobiphenyl (BZ-126)	9015	TX
A	EPA 1668	10262007	3,3',4,4'-Tetrachlorobiphenyl (BZ-77)	8965	TX

A	EPA 6010	10155201	Aluminum	1000	LA-DEQ
A	EPA 6010	10155201	Antimony	1005	LA-DEQ
A	EPA 6010	10155201	Arsenic	1010	LA-DEQ
A	EPA 6010	10155201	Barium	1015	LA-DEQ
A	EPA 6010	10155201	Beryllium	1020	LA-DEQ
A	EPA 6010	10155201	Cadmium	1030	LA-DEQ
A	EPA 6010	10155201	Calcium	1035	LA-DEQ
A	EPA 6010	10155201	Chromium	1040	LA-DEQ
A	EPA 6010	10155201	Cobalt	1050	LA-DEQ
A	EPA 6010	10155201	Copper	1055	LA-DEQ
A	EPA 6010	10155201	Iron	1070	LA-DEQ
A	EPA 6010	10155201	Lead	1075	LA-DEQ
A	EPA 6010	10155201	Lithium	1080	LA-DEQ
A	EPA 6010	10155201	Magnesium	1085	LA-DEQ
A	EPA 6010	10155201	Manganese	1090	LA-DEQ
A	EPA 6010	10155201	Molybdenum	1100	LA-DEQ
A	EPA 6010	10155201	Nickel	1105	LA-DEQ
A	EPA 6010	10155201	Potassium	1125	LA-DEQ
A	EPA 6010	10155201	Selenium	1140	LA-DEQ
A	EPA 6010	10155201	Silver	1150	LA-DEQ
A	EPA 6010	10155201	Sodium	1155	LA-DEQ
A	EPA 6010	10155201	Strontium	1160	LA-DEQ
A	EPA 6010	10155201	Thallium	1165	LA-DEQ
A	EPA 6010	10155201	Tin	1175	LA-DEQ

A	EPA 6010	10155201	Total Phosphorus	1910	LA-DEQ
A	EPA 6010	10155201	Vanadium	1185	LA-DEQ
A	EPA 6010	10155201	Zinc	1190	LA-DEQ
A	EPA 7199	10163005	Chromium (VI)	1045	LA-DEQ
A	EPA 7470	10165807	Mercury	1095	LA-DEQ
A	EPA Method 12	10402161	Lead	1075	TX
A	EPA Method 18	10246636	1,3-Butadiene	9318	LA-DEQ
A	EPA Method 18	10246636	Benzene	4375	LA-DEQ
A	EPA Method 18	10246636	Ethane	4747	LA-DEQ
A	EPA Method 18	10246636	Ethene	4752	LA-DEQ
A	EPA Method 18	10246636	Ethylbenzene	4765	LA-DEQ
A	EPA Method 18	10246636	Methane	4926	LA-DEQ
A	EPA Method 18	10246636	n-Butane	5007	LA-DEQ
A	EPA Method 18	10246636	n-Hexane	4855	LA-DEQ
A	EPA Method 18	10246636	n-Pentane	5028	LA-DEQ
A	EPA Method 18	10246636	n-Propane	5029	LA-DEQ
A	EPA Method 18	10246636	Propene	4836	LA-DEQ
A	EPA Method 18	10246636	Toluene	5140	LA-DEQ
A	EPA Method 18	10246636	Total Butene (all isomers)	5142	LA-DEQ
A	EPA Method 18	10246636	Total Xylene	5260	LA-DEQ
A	EPA Method 202	10403006	Condensible Particulate Matter	4467	TX
A	EPA Method 26A	10403200	Bromine	1541	TX
A	EPA Method 26A	10403200	Chlorine	1580	TX
A	EPA Method 26A	10403200	Hydrobromic Acid (Hydrogen Bromide)	1768	TX
A	EPA Method 26A	10403200	Hydrochloric acid (Hydrogen chloride (gas only))	1770	TX
A	EPA Method 26A	10403200	Hydrogen fluoride (Hydrofluoric	1775	TX

			acid)		
A	EPA Method 315	10274438	Methylene Chloride Extractable Material (MCEM)	5123	LA-DEQ
A	EPA Method 315	10274438	Particulate Matter	3915	LA-DEQ
A	EPA Method 5	10404305	Particulate Matter	3915	LA-DEQ
A	EPA TO-14A	10312002	1,1,1-Trichloroethane	5160	FL
A	EPA TO-14A	10312002	1,1,2,2-Tetrachloroethane	5110	FL
A	EPA TO-14A	10312002	1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113)	5185	FL
A	EPA TO-14A	10312002	1,1,2-Trichloroethane	5165	FL
A	EPA TO-14A	10312002	1,1-Dichloroethane	4630	FL
A	EPA TO-14A	10312002	1,1-Dichloroethylene	4640	FL
A	EPA TO-14A	10312002	1,2,4-Trichlorobenzene	5155	FL
A	EPA TO-14A	10312002	1,2,4-Trimethylbenzene	5210	FL
A	EPA TO-14A	10312002	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	FL
A	EPA TO-14A	10312002	1,2-Dichloro-1,1,2,2-tetrafluoroethane (Freon 114)	4695	FL
A	EPA TO-14A	10312002	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	FL
A	EPA TO-14A	10312002	1,2-Dichloroethane (Ethylene dichloride)	4635	FL
A	EPA TO-14A	10312002	1,2-Dichloropropane	4655	FL
A	EPA TO-14A	10312002	1,3,5-Trimethylbenzene	5215	FL
A	EPA TO-14A	10312002	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	FL
A	EPA TO-14A	10312002	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	FL
A	EPA TO-14A	10312002	Benzene	4375	FL
A	EPA TO-14A	10312002	Benzyl chloride	5635	FL
A	EPA TO-14A	10312002	Carbon tetrachloride	4455	FL
A	EPA TO-14A	10312002	Chlorobenzene	4475	FL
A	EPA TO-14A	10312002	Chloroethane (Ethyl chloride)	4485	FL
A	EPA TO-14A	10312002	Chloroform	4505	FL
A	EPA TO-14A	10312002	cis-1,2-Dichloroethylene	4645	FL
A	EPA TO-14A	10312002	cis-1,3-Dichloropropene	4680	FL
A	EPA TO-14A	10312002	Dichlorodifluoromethane (Freon-12)	4625	FL
A	EPA TO-14A	10312002	Ethylbenzene	4765	FL
A	EPA TO-14A	10312002	Hexachlorobutadiene	4835	FL
A	EPA TO-14A	10312002	Methyl bromide (Bromomethane)	4950	FL
A	EPA TO-14A	10312002	Methyl chloride (Chloromethane)	4960	FL
A	EPA TO-14A	10312002	Methylene chloride	4975	FL

			(Dichloromethane)		
A	EPA TO-14A	10312002	Styrene	5100	FL
A	EPA TO-14A	10312002	Tetrachloroethylene (Perchloroethylene)	5115	FL
A	EPA TO-14A	10312002	Toluene	5140	FL
A	EPA TO-14A	10312002	Total Xylene	5260	FL
A	EPA TO-14A	10312002	trans-1,3-Dichloropropylene	4685	FL
A	EPA TO-14A	10312002	Trichloroethene (Trichloroethylene)	5170	FL
A	EPA TO-14A	10312002	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	5175	FL
A	EPA TO-14A	10312002	Vinyl chloride (Chloroethene)	5235	FL
A	EPA TO-15	10248803	1,1,1-Trichloroethane	5160	FL
A	EPA TO-15	10248803	1,1,2,2-Tetrachloroethane	5110	FL
A	EPA TO-15	10248803	1,1,2-Trichloroethane	5165	FL
A	EPA TO-15	10248803	1,1-Dichloroethane	4630	FL
A	EPA TO-15	10248803	1,1-Dichloroethylene	4640	FL
A	EPA TO-15	10248803	1,2,3-Trimethylbenzene	5182	LA-DEQ
A	EPA TO-15	10248803	1,2,4-Trichlorobenzene	5155	FL
A	EPA TO-15	10248803	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	FL
A	EPA TO-15	10248803	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	FL
A	EPA TO-15	10248803	1,2-Dichloroethane (Ethylene dichloride)	4635	FL
A	EPA TO-15	10248803	1,2-Dichloropropane	4655	FL
A	EPA TO-15	10248803	1,3-Butadiene	9318	FL
A	EPA TO-15	10248803	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	FL
A	EPA TO-15	10248803	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	FL
A	EPA TO-15	10248803	1,4-Dioxane (1,4- Diethyleneoxide)	4735	LA-DEQ
A	EPA TO-15	10248803	2,2,4-Trimethylpentane	5220	FL
A	EPA TO-15	10248803	2,3-Dimethylpentane	4671	LA-DEQ
A	EPA TO-15	10248803	2-Butanone (Methyl ethyl ketone, MEK)	4410	FL
A	EPA TO-15	10248803	2-Methylbutane (Isopentane)	4938	LA-DEQ
A	EPA TO-15	10248803	2-Methylpentane (Isohexane)	4941	LA-DEQ
A	EPA TO-15	10248803	4-Ethyltoluene	4542	LA-DEQ
A	EPA TO-15	10248803	Acetaldehyde	4300	LA-

					DEQ
A	EPA TO-15	10248803	Acetonitrile	4320	FL
A	EPA TO-15	10248803	Acrylonitrile	4340	FL
A	EPA TO-15	10248803	Benzene	4375	FL
A	EPA TO-15	10248803	Benzyl chloride	5635	FL
A	EPA TO-15	10248803	Bromodichloromethane	4395	LA-DEQ
A	EPA TO-15	10248803	Bromoform	4400	FL
A	EPA TO-15	10248803	Carbon tetrachloride	4455	FL
A	EPA TO-15	10248803	Chlorobenzene	4475	FL
A	EPA TO-15	10248803	Chlorodibromomethane	4575	LA-DEQ
A	EPA TO-15	10248803	Chloroethane (Ethyl chloride)	4485	FL
A	EPA TO-15	10248803	Chloroform	4505	FL
A	EPA TO-15	10248803	cis-1,2-Dichloroethylene	4645	FL
A	EPA TO-15	10248803	cis-1,3-Dichloropropene	4680	FL
A	EPA TO-15	10248803	Cyclohexane	4555	LA-DEQ
A	EPA TO-15	10248803	Ethyl-t-butylether (ETBE) (2-Ethoxy-2-methylpropane)	4770	LA-DEQ
A	EPA TO-15	10248803	Ethylbenzene	4765	FL
A	EPA TO-15	10248803	Hexachlorobutadiene	4835	FL
A	EPA TO-15	10248803	Isopropylbenzene	4900	FL
A	EPA TO-15	10248803	Methyl bromide (Bromomethane)	4950	FL
A	EPA TO-15	10248803	Methyl chloride (Chloromethane)	4960	FL
A	EPA TO-15	10248803	Methyl isobutyl ketone (Hexone)	4985	FL
A	EPA TO-15	10248803	Methyl methacrylate	4990	FL
A	EPA TO-15	10248803	Methyl tert-butyl ether (MTBE)	5000	FL
A	EPA TO-15	10248803	Methylcyclohexane	4965	LA-DEQ
A	EPA TO-15	10248803	Methylene chloride (Dichloromethane)	4975	FL
A	EPA TO-15	10248803	n-Butane	5007	LA-DEQ
A	EPA TO-15	10248803	n-Decane	5875	LA-DEQ
A	EPA TO-15	10248803	n-Heptane	4825	LA-DEQ
A	EPA TO-15	10248803	n-Hexane	4855	FL
A	EPA TO-15	10248803	n-Nonane	5026	LA-DEQ
A	EPA TO-15	10248803	n-Octane	5027	LA-DEQ
A	EPA TO-15	10248803	n-Pentane	5028	LA-

					DEQ
A	EPA TO-15	10248803	n-Propylbenzene	5090	LA-DEQ
A	EPA TO-15	10248803	n-Undecane	6747	LA-DEQ
A	EPA TO-15	10248803	Propene	4836	LA-DEQ
A	EPA TO-15	10248803	Styrene	5100	FL
A	EPA TO-15	10248803	Tetrachloroethylene (Perchloroethylene)	5115	FL
A	EPA TO-15	10248803	Toluene	5140	FL
A	EPA TO-15	10248803	Total Xylene	5260	FL
A	EPA TO-15	10248803	trans-1,2-Dichloroethylene	4700	FL
A	EPA TO-15	10248803	trans-1,3-Dichloropropylene	4685	FL
A	EPA TO-15	10248803	Trichloroethene (Trichloroethylene)	5170	FL
A	EPA TO-15	10248803	Vinyl acetate	5225	FL
A	EPA TO-15	10248803	Vinyl bromide (Bromoethene)	5230	FL
A	EPA TO-15	10248803	Vinyl chloride (Chloroethene)	5235	FL
A	TCEQ-23	60049743	Particulate Matter	3915	TX
DW	EPA 1613	10120408	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	9618	FL
NPW	EPA 1613	10120408	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	9519	FL
NPW	EPA 1613	10120408	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	9516	FL
NPW	EPA 1613	10120408	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-Hpcdd)	9426	FL
NPW	EPA 1613	10120408	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-Hpcdf)	9420	FL
NPW	EPA 1613	10120408	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-Hpcdf)	9423	FL
NPW	EPA 1613	10120408	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	9453	FL
NPW	EPA 1613	10120408	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	9471	FL
NPW	EPA 1613	10120408	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	9456	FL
NPW	EPA 1613	10120408	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	9474	FL
NPW	EPA 1613	10120408	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	9459	FL
NPW	EPA 1613	10120408	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	9477	FL
NPW	EPA 1613	10120408	1,2,3,7,8-Pentachlorodibenzo-p-	9540	FL

			dioxin (1,2,3,7,8-Pecdd)		
NPW	EPA 1613	10120408	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	9543	FL
NPW	EPA 1613	10120408	2,3,4,6,7,8-Hexachlorodibenzofuran	9480	FL
NPW	EPA 1613	10120408	2,3,4,7,8-Pentachlorodibenzofuran	9549	FL
NPW	EPA 1613	10120408	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	9618	FL
NPW	EPA 1613	10120408	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	9612	FL
NPW	EPA 1613	10120408	Total Heptachlorodibenzo-p-dioxin (Total HPCDD)	9438	FL
NPW	EPA 1613	10120408	Total Heptachlorodibenzofuran (Total HPCDF)	9444	FL
NPW	EPA 1613	10120408	Total Hexachlorodibenzo-p-dioxin (Total HXCDD)	9468	FL
NPW	EPA 1613	10120408	Total Hexachlorodibenzofuran (Total HXCDF)	9483	FL
NPW	EPA 1613	10120408	Total Pentachlorodibenzo-p-dioxin (Total PECDD)	9555	FL
NPW	EPA 1613	10120408	Total Pentachlorodibenzofuran (Total PECDF)	9552	FL
NPW	EPA 1613	10120408	Total Tetrachlorodibenzo-p-dioxin (Total TCDD)	9609	FL
NPW	EPA 1613	10120408	Total Tetrachlorodibenzofuran (Total TCDF)	9615	FL
NPW	EPA 8290	10187209	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	9519	FL
NPW	EPA 8290	10187209	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	9516	FL
NPW	EPA 8290	10187209	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-Hpcdd)	9426	FL
NPW	EPA 8290	10187209	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-Hpcdf)	9420	FL
NPW	EPA 8290	10187209	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-Hpcdf)	9423	FL
NPW	EPA 8290	10187209	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	9453	FL
NPW	EPA 8290	10187209	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	9471	FL
NPW	EPA 8290	10187209	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	9456	FL
NPW	EPA 8290	10187209	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	9474	FL
NPW	EPA 8290	10187209	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	9459	FL
NPW	EPA 8290	10187209	1,2,3,7,8,9-Hexachlorodibenzofuran	9477	FL

			(1,2,3,7,8,9-Hxcdf)		
NPW	EPA 8290	10187209	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	9540	FL
NPW	EPA 8290	10187209	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	9543	FL
NPW	EPA 8290	10187209	2,3,4,6,7,8-Hexachlorodibenzofuran	9480	FL
NPW	EPA 8290	10187209	2,3,4,7,8-Pentachlorodibenzofuran	9549	FL
NPW	EPA 8290	10187209	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	9618	FL
NPW	EPA 8290	10187209	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	9612	FL
NPW	EPA 8290	10187209	Total Heptachlorodibenzo-p-dioxin (Total HPCDD)	9438	FL
NPW	EPA 8290	10187209	Total Heptachlorodibenzofuran (Total HPCDF)	9444	FL
NPW	EPA 8290	10187209	Total Hexachlorodibenzo-p-dioxin (Total HXCDD)	9468	FL
NPW	EPA 8290	10187209	Total Hexachlorodibenzofuran (Total HXCDF)	9483	FL
NPW	EPA 8290	10187209	Total Pentachlorodibenzo-p-dioxin (Total PECDD)	9555	FL
NPW	EPA 8290	10187209	Total Pentachlorodibenzofuran (Total PECDF)	9552	FL
NPW	EPA 8290	10187209	Total Tetrachlorodibenzo-p-dioxin (Total TCDD)	9609	FL
NPW	EPA 8290	10187209	Total Tetrachlorodibenzofuran (Total TCDF)	9615	FL
S	EPA 1668	10262007	Decachlorobiphenyl (BZ-209)	9105	FL
S	EPA 1668	10262007	Total Dichlorobiphenyls	8876	FL
S	EPA 1668	10262007	Total Heptachlorobiphenyls	8877	FL
S	EPA 1668	10262007	Total Hexachlorobiphenyls	8888	FL
S	EPA 1668	10262007	Total Monochlorobiphenyls	8889	FL
S	EPA 1668	10262007	Total Nonachlorobiphenyls	8891	FL
S	EPA 1668	10262007	Total Octachlorobiphenyls	8892	FL
S	EPA 1668	10262007	Total Pentachlorobiphenyls	8896	FL
S	EPA 1668	10262007	Total Tetrachlorobiphenyls	8893	FL
S	EPA 1668	10262007	Total Trichlorobiphenyls	8894	FL
S	EPA 6010	10155201	Aluminum	1000	FL
S	EPA 6010	10155201	Antimony	1005	FL
S	EPA 6010	10155201	Arsenic	1010	FL
S	EPA 6010	10155201	Barium	1015	FL
S	EPA 6010	10155201	Beryllium	1020	FL
S	EPA 6010	10155201	Boron	1025	FL
S	EPA 6010	10155201	Cadmium	1030	FL

S	EPA 6010	10155201	Calcium	1035	FL
S	EPA 6010	10155201	Chromium	1040	FL
S	EPA 6010	10155201	Cobalt	1050	FL
S	EPA 6010	10155201	Copper	1055	FL
S	EPA 6010	10155201	Iron	1070	FL
S	EPA 6010	10155201	Lead	1075	FL
S	EPA 6010	10155201	Lithium	1080	FL
S	EPA 6010	10155201	Magnesium	1085	FL
S	EPA 6010	10155201	Manganese	1090	FL
S	EPA 6010	10155201	Molybdenum	1100	FL
S	EPA 6010	10155201	Nickel	1105	FL
S	EPA 6010	10155201	Potassium	1125	FL
S	EPA 6010	10155201	Selenium	1140	FL
S	EPA 6010	10155201	Silver	1150	FL
S	EPA 6010	10155201	Sodium	1155	FL
S	EPA 6010	10155201	Strontium	1160	FL
S	EPA 6010	10155201	Thallium	1165	FL
S	EPA 6010	10155201	Tin	1175	FL
S	EPA 6010	10155201	Titanium	1180	LA-DEQ
S	EPA 6010	10155201	Total Phosphorus	1910	LA-DEQ
S	EPA 6010	10155201	Vanadium	1185	FL
S	EPA 6010	10155201	Zinc	1190	FL
S	EPA 7470	10165603	Mercury	1095	FL
S	EPA 7471	10166004	Mercury	1095	FL
S	EPA 8260	10184404	1,1,1,2-Tetrachloroethane	5105	FL
S	EPA 8260	10184404	1,1,1-Trichloroethane	5160	FL
S	EPA 8260	10184404	1,1,2,2-Tetrachloroethane	5110	FL
S	EPA 8260	10184404	1,1,2-Trichloroethane	5165	FL
S	EPA 8260	10184404	1,1-Dichloroethane	4630	FL
S	EPA 8260	10184404	1,1-Dichloroethylene	4640	FL
S	EPA 8260	10184404	1,1-Dichloropropene	4670	FL
S	EPA 8260	10184404	1,2,3-Trichlorobenzene	5150	FL
S	EPA 8260	10184404	1,2,3-Trichloropropane	5180	FL
S	EPA 8260	10184404	1,2,4-Trichlorobenzene	5155	FL
S	EPA 8260	10184404	1,2,4-Trimethylbenzene	5210	FL
S	EPA 8260	10184404	1,2-Dibromo-3-chloropropane (DBCP)	4570	FL
S	EPA 8260	10184404	1,2-Dibromoethane (EDB, Ethylene dibromide)	4585	FL
S	EPA 8260	10184404	1,2-Dichlorobenzene (o-	4610	FL

			Dichlorobenzene)		
S	EPA 8260	10184404	1,2-Dichloroethane (Ethylene dichloride)	4635	FL
S	EPA 8260	10184404	1,2-Dichloropropane	4655	FL
S	EPA 8260	10184404	1,3,5-Trimethylbenzene	5215	FL
S	EPA 8260	10184404	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	FL
S	EPA 8260	10184404	1,3-Dichloropropane	4660	FL
S	EPA 8260	10184404	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	FL
S	EPA 8260	10184404	2,2-Dichloropropane	4665	FL
S	EPA 8260	10184404	2-Butanone (Methyl ethyl ketone, MEK)	4410	FL
S	EPA 8260	10184404	2-Chlorotoluene	4535	FL
S	EPA 8260	10184404	2-Hexanone	4860	FL
S	EPA 8260	10184404	4-Chlorotoluene	4540	FL
S	EPA 8260	10184404	4-Isopropyltoluene (p-Cymene)	4910	FL
S	EPA 8260	10184404	4-Methyl-2-pentanone (MIBK)	4995	FL
S	EPA 8260	10184404	Acetone	4315	FL
S	EPA 8260	10184404	Acetonitrile	4320	LA-DEQ
S	EPA 8260	10184404	Acrylonitrile	4340	LA-DEQ
S	EPA 8260	10184404	Benzene	4375	FL
S	EPA 8260	10184404	Bromobenzene	4385	FL
S	EPA 8260	10184404	Bromochloromethane	4390	FL
S	EPA 8260	10184404	Bromodichloromethane	4395	FL
S	EPA 8260	10184404	Bromoform	4400	FL
S	EPA 8260	10184404	Carbon disulfide	4450	FL
S	EPA 8260	10184404	Carbon tetrachloride	4455	FL
S	EPA 8260	10184404	Chlorobenzene	4475	FL
S	EPA 8260	10184404	Chlorodibromomethane	4575	FL
S	EPA 8260	10184404	Chloroethane (Ethyl chloride)	4485	FL
S	EPA 8260	10184404	Chloroform	4505	FL
S	EPA 8260	10184404	cis-1,2-Dichloroethylene	4645	FL
S	EPA 8260	10184404	cis-1,3-Dichloropropene	4680	FL
S	EPA 8260	10184404	Dibromomethane (Methylene bromide)	4595	FL
S	EPA 8260	10184404	Dichlorodifluoromethane (Freon-12)	4625	FL
S	EPA 8260	10184404	Ethylbenzene	4765	FL
S	EPA 8260	10184404	Hexachlorobutadiene	4835	FL
S	EPA 8260	10184404	Iodomethane (Methyl iodide)	4870	LA-DEQ

S	EPA 8260	10184404	Isopropylbenzene	4900	FL
S	EPA 8260	10184404	m+p-xylene	5240	LA-DEQ
S	EPA 8260	10184404	Methyl bromide (Bromomethane)	4950	FL
S	EPA 8260	10184404	Methyl chloride (Chloromethane)	4960	FL
S	EPA 8260	10184404	Methyl tert-butyl ether (MTBE)	5000	FL
S	EPA 8260	10184404	Methylene chloride (Dichloromethane)	4975	FL
S	EPA 8260	10184404	n-Butylbenzene	4435	FL
S	EPA 8260	10184404	n-Propylbenzene	5090	FL
S	EPA 8260	10184404	Naphthalene	5005	FL
S	EPA 8260	10184404	o-Xylene	5250	LA-DEQ
S	EPA 8260	10184404	sec-Butylbenzene	4440	FL
S	EPA 8260	10184404	Styrene	5100	FL
S	EPA 8260	10184404	tert-Butylbenzene	4445	FL
S	EPA 8260	10184404	Tetrachloroethylene (Perchloroethylene)	5115	FL
S	EPA 8260	10184404	Toluene	5140	FL
S	EPA 8260	10184404	Total Xylene	5260	FL
S	EPA 8260	10184404	trans-1,2-Dichloroethylene	4700	FL
S	EPA 8260	10184404	trans-1,3-Dichloropropylene	4685	FL
S	EPA 8260	10184404	trans-1,4-Dichloro-2-butene	4605	LA-DEQ
S	EPA 8260	10184404	Trichloroethene (Trichloroethylene)	5170	FL
S	EPA 8260	10184404	Trichlorofluoromethane (Fluorotrichloromethane, Freon 11)	5175	FL
S	EPA 8260	10184404	Vinyl chloride (Chloroethene)	5235	FL
S	EPA 8270	10185203	1,2,4-Trichlorobenzene	5155	FL
S	EPA 8270	10185203	1,2-Dichlorobenzene (o-Dichlorobenzene)	4610	FL
S	EPA 8270	10185203	1,2-Diphenylhydrazine	6220	FL
S	EPA 8270	10185203	1,3,5-Trinitrobenzene (1,3,5-TNB)	6885	LA-DEQ
S	EPA 8270	10185203	1,3-Dichlorobenzene (m-Dichlorobenzene)	4615	FL
S	EPA 8270	10185203	1,4-Dichlorobenzene (p-Dichlorobenzene)	4620	FL
S	EPA 8270	10185203	2,2'-Oxybis(1-chloropropane), bis(2-Chloro-1-methylethyl)ether	4659	FL
S	EPA 8270	10185203	2,4,5-Trichlorophenol	6835	FL
S	EPA 8270	10185203	2,4,6-Trichlorophenol	6840	FL
S	EPA 8270	10185203	2,4-Dichlorophenol	6000	FL
S	EPA 8270	10185203	2,4-Dimethylphenol	6130	FL

S	EPA 8270	10185203	2,4-Dinitrophenol	6175	FL
S	EPA 8270	10185203	2,4-Dinitrotoluene (2,4-DNT)	6185	FL
S	EPA 8270	10185203	2,6-Dichlorophenol	6005	LA-DEQ
S	EPA 8270	10185203	2,6-Dinitrotoluene (2,6-DNT)	6190	FL
S	EPA 8270	10185203	2-Acetylaminofluorene	5515	LA-DEQ
S	EPA 8270	10185203	2-Chloronaphthalene	5795	FL
S	EPA 8270	10185203	2-Chlorophenol	5800	FL
S	EPA 8270	10185203	2-Methyl-4,6-dinitrophenol (4,6-Dinitro-2-methylphenol)	6360	FL
S	EPA 8270	10185203	2-Methylaniline (o-Toluidine)	5145	LA-DEQ
S	EPA 8270	10185203	2-Methylnaphthalene	6385	FL
S	EPA 8270	10185203	2-Methylphenol (o-Cresol)	6400	FL
S	EPA 8270	10185203	2-Nitroaniline	6460	FL
S	EPA 8270	10185203	2-Nitrophenol	6490	FL
S	EPA 8270	10185203	3,3'-Dichlorobenzidine	5945	FL
S	EPA 8270	10185203	3-Nitroaniline	6465	FL
S	EPA 8270	10185203	4-Bromophenyl phenyl ether (BDE-3)	5660	FL
S	EPA 8270	10185203	4-Chloro-3-methylphenol	5700	FL
S	EPA 8270	10185203	4-Chloroaniline	5745	FL
S	EPA 8270	10185203	4-Chlorophenyl phenylether	5825	FL
S	EPA 8270	10185203	4-Dimethyl aminoazobenzene	6105	LA-DEQ
S	EPA 8270	10185203	4-Methylphenol (p-Cresol)	6410	FL
S	EPA 8270	10185203	4-Nitroaniline	6470	FL
S	EPA 8270	10185203	4-Nitrophenol	6500	FL
S	EPA 8270	10185203	5-Nitro-o-toluidine	6570	LA-DEQ
S	EPA 8270	10185203	Acenaphthene	5500	FL
S	EPA 8270	10185203	Acenaphthylene	5505	FL
S	EPA 8270	10185203	Acetophenone	5510	LA-DEQ
S	EPA 8270	10185203	Aniline	5545	FL
S	EPA 8270	10185203	Anthracene	5555	FL
S	EPA 8270	10185203	Benzidine	5595	FL
S	EPA 8270	10185203	Benzo(a)anthracene	5575	FL
S	EPA 8270	10185203	Benzo(a)pyrene	5580	FL
S	EPA 8270	10185203	Benzo(g,h,i)perylene	5590	FL
S	EPA 8270	10185203	Benzo(k)fluoranthene	5600	FL
S	EPA 8270	10185203	Benzoic acid	5610	FL

S	EPA 8270	10185203	Benzo[b]fluoranthene	5585	FL
S	EPA 8270	10185203	Benzyl alcohol	5630	FL
S	EPA 8270	10185203	bis(2-Chloroethoxy)methane	5760	FL
S	EPA 8270	10185203	bis(2-Chloroethyl) ether	5765	FL
S	EPA 8270	10185203	Butyl benzyl phthalate	5670	FL
S	EPA 8270	10185203	Carbazole	5680	FL
S	EPA 8270	10185203	Chrysene	5855	FL
S	EPA 8270	10185203	Di(2-ethylhexyl) phthalate (bis(2-Ethylhexyl)phthalate, DEHP)	6065	FL
S	EPA 8270	10185203	Di-n-butyl phthalate	5925	FL
S	EPA 8270	10185203	Di-n-octyl phthalate	6200	FL
S	EPA 8270	10185203	Dibenz(a,h) anthracene	5895	FL
S	EPA 8270	10185203	Dibenzofuran	5905	FL
S	EPA 8270	10185203	Diethyl phthalate	6070	FL
S	EPA 8270	10185203	Dimethyl phthalate	6135	FL
S	EPA 8270	10185203	Diphenylamine	6205	LA-DEQ
S	EPA 8270	10185203	Fluoranthene	6265	FL
S	EPA 8270	10185203	Fluorene	6270	FL
S	EPA 8270	10185203	Hexachlorobenzene	6275	FL
S	EPA 8270	10185203	Hexachlorobutadiene	4835	FL
S	EPA 8270	10185203	Hexachlorocyclopentadiene	6285	FL
S	EPA 8270	10185203	Hexachloroethane	4840	FL
S	EPA 8270	10185203	Hexachloropropene	6295	LA-DEQ
S	EPA 8270	10185203	Indeno(1,2,3-cd) pyrene	6315	FL
S	EPA 8270	10185203	Isosafrole	6325	LA-DEQ
S	EPA 8270	10185203	Methyl methanesulfonate	6375	LA-DEQ
S	EPA 8270	10185203	n-Nitroso-di-n-butylamine	5025	LA-DEQ
S	EPA 8270	10185203	n-Nitrosodi-n-propylamine	6545	FL
S	EPA 8270	10185203	n-Nitrosodiethylamine	6525	LA-DEQ
S	EPA 8270	10185203	n-Nitrosodimethylamine	6530	FL
S	EPA 8270	10185203	n-Nitrosodiphenylamine	6535	FL
S	EPA 8270	10185203	n-Nitrosomethylethylamine	6550	LA-DEQ
S	EPA 8270	10185203	n-Nitrosomorpholine	6555	LA-DEQ
S	EPA 8270	10185203	n-Nitrosopiperidine	6560	LA-DEQ
S	EPA 8270	10185203	n-Nitrosopyrrolidine	6565	LA-

					DEQ
S	EPA 8270	10185203	Naphthalene	5005	FL
S	EPA 8270	10185203	Nitrobenzene	5015	FL
S	EPA 8270	10185203	Pentachlorobenzene	6590	LA-DEQ
S	EPA 8270	10185203	Pentachloronitrobenzene	6600	LA-DEQ
S	EPA 8270	10185203	Pentachlorophenol	6605	FL
S	EPA 8270	10185203	Phenanthrene	6615	FL
S	EPA 8270	10185203	Phenol	6625	FL
S	EPA 8270	10185203	Pyrene	6665	FL
S	EPA 8270	10185203	Pyridine	5095	FL
S	EPA 8270	10185203	Safrole	6685	LA-DEQ
S	EPA 8290	10187209	1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	9519	FL
S	EPA 8290	10187209	1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	9516	FL
S	EPA 8290	10187209	1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-Hpcdd)	9426	FL
S	EPA 8290	10187209	1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-Hpcdf)	9420	FL
S	EPA 8290	10187209	1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-Hpcdf)	9423	FL
S	EPA 8290	10187209	1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-Hxcdd)	9453	FL
S	EPA 8290	10187209	1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-Hxcdf)	9471	FL
S	EPA 8290	10187209	1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin(1,2,3,6,7,8-Hxcdd)	9456	FL
S	EPA 8290	10187209	1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8-Hxcdf)	9474	FL
S	EPA 8290	10187209	1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-Hxcdd)	9459	FL
S	EPA 8290	10187209	1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9-Hxcdf)	9477	FL
S	EPA 8290	10187209	1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-Pecdd)	9540	FL
S	EPA 8290	10187209	1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-Pecdf)	9543	FL
S	EPA 8290	10187209	2,3,4,6,7,8-Hexachlorodibenzofuran	9480	FL
S	EPA 8290	10187209	2,3,4,7,8-Pentachlorodibenzofuran	9549	FL
S	EPA 8290	10187209	2,3,7,8-Tetrachlorodibenzo- p-dioxin (2,3,7,8-TCDD)	9618	FL

S	EPA 8290	10187209	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	9612	FL
S	EPA 8290	10187209	Total Heptachlorodibenzo-p-dioxin (Total HPCDD)	9438	FL
S	EPA 8290	10187209	Total Heptachlorodibenzofuran (Total HPCDF)	9444	FL
S	EPA 8290	10187209	Total Hexachlorodibenzo-p-dioxin (Total HXCDD)	9468	FL
S	EPA 8290	10187209	Total Hexachlorodibenzofuran (Total HXCDF)	9483	FL
S	EPA 8290	10187209	Total Pentachlorodibenzo-p-dioxin (Total PECDD)	9555	FL
S	EPA 8290	10187209	Total Pentachlorodibenzofuran (Total PECDF)	9552	FL
S	EPA 8290	10187209	Total Tetrachlorodibenzo-p-dioxin (Total TCDD)	9609	FL
S	EPA 8290	10187209	Total Tetrachlorodibenzofuran (Total TCDF)	9615	FL
S	EPA 9056	10199209	Bromide	1540	FL
S	EPA 9056	10199209	Chloride	1575	FL
S	EPA 9056	10199209	Fluoride	1730	FL

Jon Niermann, *Chairman*
Bobby Janecka, *Commissioner*
Catarina R. Gonzales, *Commissioner*
Kelly Keel, *Executive Director*

TEXAS COMMISSION ON ENVIRONMENTAL QUALITY

Protecting Texas by Reducing and Preventing Pollution

August 19, 2024

Ms. Anna Barlozhetskaya
Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921-5947

Subject: Texas NELAP accreditation renewal with drops

Dear Ms. Barlozhetskaya:

I am pleased to advise you the Texas Commission on Environmental Quality is renewing your laboratory's accreditation with the parameter withdrawals requested on July 01, 2024. The accreditation is valid until the expiration date on the certificate and scope, contingent on continued compliance with the standards for accreditation and requirements of the state of Texas.

We are also continuing secondary accreditation based on your application and primary NELAP accreditation from the states of Florida and Louisiana according to the attached Fields of Accreditation.

Your laboratory's secondary accreditation is valid until the expiration date on the certificate and scope, contingent on continued compliance with the requirements of the state of Texas as well as those of your primary accreditation bodies.

Please contact me at frank.jamison@tceq.texas.gov if I can provide any additional information or assistance.

Sincerely,

Frank Jamison
Data and Records Specialist

Enclosures

EUROFINS OKLAHOMA CERTIFICATION

Robert Singletary
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

August 30, 2024

Dear Laboratory Partners,

As you know, we have pursued a new model for renewal accreditation applications this year. Part of this shift included invoicing for the requested scope of accreditation rather than invoicing based on the laboratory's previously requested scope.

We will be issuing the renewal invoices as soon as possible and will set a deadline to ensure sufficient time for payment. However, we are unable to issue renewal accreditation certificates and scopes prior to receipt of payment.

In order to protect laboratories from experiencing a lapse in accreditation due to these factors, we are administratively extending your existing accreditation certificate and scope. Any accredited laboratory who was granted accreditation prior to the date of this letter will automatically remain covered by the continued scope of accreditation until their new certificate is issued or until December 31, 2024, whichever occurs first.

Please contact our Laboratory Accreditation staff by email at LabAccreditation@deq.ok.gov or by phone at (405) 702-1000 option 5, if you have any questions or concerns.

We appreciate your patience.

Sincerely,

George Russell IV

Interim Director
State Environmental Laboratory Services Division
Oklahoma Department of Environmental Quality

OKLAHOMA Environmental Quality

OKLAHOMA

Oklahoma Department of Environmental Quality
Laboratory Accreditation Program

State Laboratory ID: 9415
EPA ID: TN00009

Certificate #: 2023-039

Eurofins Knoxville

5815 Middlebrook Pike
Knoxville, TN 37921

has been accredited for the analysis of environmental samples for analytes listed on the attached Scope of Accreditation.

Continued accreditation is contingent upon successful on-going compliance with OAC 252:301 which was promulgated and adopted pursuant to the Oklahoma Environmental Quality Code (Code), 27AO.S. § 2-4-101 *et seq.*
Specific methods and analytes certified are cited on the laboratory's Scope of Accreditation.

The Scope of Accreditation, inspections reports, and accreditation status are on file and may be obtained from:
Oklahoma DEQ, State Environmental Laboratory Services Division,
Laboratory Accreditation Program,
707 N Robinson, P.O. Box 1677, Oklahoma City, Oklahoma 73101-1677,
(405) 702-1000, www.deq.ok.gov.

ISSUED: 1/1/2024

EXPIRES: 8/31/2024

Jeff Franklin, State Environmental Laboratory Services Division Director

This certificate is valid proof of Accreditation only when associated with its Scope of Accreditation.

7000-STR01-R02-091919

Oklahoma Department of Environmental Quality
Laboratory Accreditation Program

OKLAHOMA Environmental Quality

Scope of Accreditation

Eurofins Knoxville
5815 Middlebrook Pike
Knoxville, TN 37921
(865) 291-3000

Laboratory ID: TN00009
State Lab ID: 9415
Clean Water Program

Certificate Number: 2023-039
Date of Issue: 1/1/2024
Expiration Date: 8/31/2024

Has demonstrated the capability to analyze environmental samples in accordance with Oklahoma Rules 252:301 and is hereby granted CERTIFICATION FOR:

Matrix/Analyte	Method	Status	Notes
Non-Potable water			
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,7,8-Hxcdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,7,8-Hxcdf	EPA 8290A_(1/98)	Good Standing	
1,2,3,6,7,8-Hxcdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,6,7,8-Hxcdf	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8,9-Hxcdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8,9-Hxcdf	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8-Pecdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8-Pecdf	EPA 8290A_(1/98)	Good Standing	
2,3,4,6,7,8-Hxcdf	EPA 8290A_(1/98)	Good Standing	
2,3,4,7,8-Pecdf	EPA 8290A_(1/98)	Good Standing	
2,3,7,8-TCDF	EPA 8290A_(1/98)	Good Standing	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (Dioxin)	EPA 8290A_(1/98)	Good Standing	
Hpcdd, total	EPA 8290A_(1/98)	Good Standing	
Hpcdf, total	EPA 8290A_(1/98)	Good Standing	
Hxcdd, total	EPA 8290A_(1/98)	Good Standing	
Hxcdf, total	EPA 8290A_(1/98)	Good Standing	
Pecdd, total	EPA 8290A_(1/98)	Good Standing	
Pecdf, total	EPA 8290A_(1/98)	Good Standing	

Matrix/Analyte	Method	Status	Notes
TCDD, total	EPA 8290A_(1/98)	Good Standing	
TCDF, total	EPA 8290A_(1/98)	Good Standing	
Solids			
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,7,8-Hxcdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,4,7,8-Hxcdf	EPA 8290A_(1/98)	Good Standing	
1,2,3,6,7,8-Hxcdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,6,7,8-Hxcdf	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8,9-Hxcdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8,9-Hxcdf	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8-Pecdd	EPA 8290A_(1/98)	Good Standing	
1,2,3,7,8-Pecdf	EPA 8290A_(1/98)	Good Standing	
2,3,4,6,7,8-Hxcdf	EPA 8290A_(1/98)	Good Standing	
2,3,4,7,8-Pecdf	EPA 8290A_(1/98)	Good Standing	
2,3,7,8-TCDF	EPA 8290A_(1/98)	Good Standing	
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) (Dioxin)	EPA 8290A_(1/98)	Good Standing	
Hpcdd, total	EPA 8290A_(1/98)	Good Standing	
Hpcdf, total	EPA 8290A_(1/98)	Good Standing	
Hxcdd, total	EPA 8290A_(1/98)	Good Standing	
Hxcdf, total	EPA 8290A_(1/98)	Good Standing	
Pecdd, total	EPA 8290A_(1/98)	Good Standing	
Pecdf, total	EPA 8290A_(1/98)	Good Standing	
TCDD, total	EPA 8290A_(1/98)	Good Standing	
TCDF, total	EPA 8290A_(1/98)	Good Standing	

Accredited Parameter Note Detail

Authentication Signature

1/1/2024

Date

Scott A. Thompson
Executive Director

OKLAHOMA Environmental Quality

Kevin Stitt
Governor

January 1, 2024

MEMORANDUM

TO: Laboratory Directors

FROM: DEQ Laboratory Accreditation Program

SUBJECT: Laboratory accreditation renewal application and invoice for the accreditation period of January 1, 2024, through August 31, 2024.

We have received your laboratory's application for accreditation and associated fees, and we have reviewed your proficiency testing results, inspection reports, and quality system. After reviewing all the information/documents received, the DEQ Laboratory Accreditation Program is issuing accreditation for the analytes and methods as listed in the enclosed Scope of Accreditation. The enclosed certificate is valid proof of accreditation only when associated with its accompanying Scope of Accreditation. The certificate supersedes any previous certificate of accreditation.

As a reminder, your laboratory must analyze proficiency testing samples every six months (unless otherwise stated in applicable rules) from an approved provider for each accredited method and analyte by July 15th of each year. The laboratory must forward the results of these proficiency testing samples to the DEQ within 30 days from the date your laboratory receives them. In addition, it is the laboratory's duty to notify the DEQ within 30 days of changes in laboratory location or ownership, major analytical equipment, test methodology, or supervisory staff as detailed in Subchapter 3 of the OAC 252:302 and Subchapter 3 of the OAC 252:301 rules.

Please review your Scope of Accreditation for accuracy. Any errors not reported by January 22, 2024, will remain as listed or require interim accreditation to correct them.

Listed under "Parameters Not Accredited" are all analytes that have been reviewed and deemed not in good standing due to proficiency testing performance, inspections, quality system deficiencies, or lack of primary accreditation.

For any questions regarding this memorandum, certificate, or accreditation requirements, please contact the Laboratory Accreditation Program team at LabAccreditation@deq.ok.gov or 405-702-1000 option 5.

EUROFINS TENNESSEE CERTIFICATION

The State of Tennessee

DEPARTMENT OF ENVIRONMENT AND CONSERVATION

DIVISION OF WATER RESOURCES

Certifies That

The Eurofins TestAmerica - Knoxville Laboratory

Having Met the Requirements of the Regulations for the Certification of Laboratories Analyzing Drinking Water is hereby Approved as a

State Certified Laboratory in Chemistry

To perform the Analyses of Nitrate by EPA Method 300.0, and

2378 TCDD (Dioxin) by EPA Method 1613B, for the Public Water Systems of Tennessee

Laboratory ID Number 02014

Prasad Subbanna

Prasad Subbanna
Laboratory Certification Program Manager
Division of Water Resources

Issue Date: 8/22/2022 Expiration Date: 7/27/2025

This certification is subject to performance on E.P.A. Proficiency Testing Samples, laboratory inspections, payment of annual fees, is non-transferable, and supersedes previously issued certificates

ATTACHMENT D
DOCUMENTATION ASSOCIATED WITH APPROVAL OF METHOD 23 COMBINED PCB-DF-SVOC RCL SAMPLING AND ANALYSIS

From:	Chris McBride
To:	shappley.ned@epa.gov
Cc:	Garcia-Aranoz, Amber; Shah, Harry; Rosales, Claire; Reyes, Corbin; Baniya, Sunita; Philpott.kwai@Epa.gov; christianson.erik@epa.gov; berkowitz.david@epa.gov; Melvin Keener (mel@crwi.org); Billy Anderson; Lynn Fritz; Courtney.Adkins@ET.EurofinsUS.com; Ryan, Jeff
Subject:	Method 23 Combined Sampling and Analysis for DF, PCB, and SVOC RCl
Date:	Friday, January 17, 2025 10:57:00 AM
Attachments:	Method 23 (2023) (DF-PCB-SVOC) 10-14-2024.pdf

Hello, Ned.

I hope all is well with you in this new year.

I am following up with you on doing combined dioxin/furan, PCB, and SVOC RCl sampling and analysis using EPA Method 23 as revised March 2023. The attached write-up was provided to you during the November Coalition for Responsible Waste Incineration (CRWI) Meeting in Durham, NC. Unfortunately, Billy Anderson nor I were able to attend the meeting in order to have a direct conversation with you about this topic.

Focus is working with A-Line T.D.S. located at Tonkawa, Oklahoma in renewing the TSCA permit. A-Line is a service company that drains electrical components of possible PCB-containing liquids, then dismantles and thermally treats the residual electrical (primarily metal) components via thermal desorption in the Metals Recovery Furnace (MRF). The thermally treated metal components are then sold for scrap. Depending upon PCB concentration, the removed liquids are treated on-site via a separate chemical dichlorination process or shipped off site for treatment via incineration at a TSCA-permitted TSDF.

As part of the permit renewal, EPA Region 6 is requiring the MRF to demonstrate 99.9999% DRE of PCB. In conjunction with the DRE testing, we are measuring dioxin/furan and chlorinated organic (RCl) emissions as required by the TSCA regulations at 761.70(a)(6)(iii). Method 23 as revised March 2023 specifically accommodates sampling for dioxin/furan and PCB with analysis via HRGC/HRMS. However, the revision does not accommodate measurement of SVOC RCl via Method 8270 GCMS. Specifically, combining the toluene rinses with the acetone solvent rinses in the revised Method 23 does not create issues for the HRGC/HRMS analyses but does interfere with early eluting SVOC RCls during GCMS analysis.

Appendix C (Section C.3.5) of *"GUIDANCE FOR APPLICANTS REQUESTING TO TREAT/DISPOSE OF PCBS USING INCINERATION OR AN ALTERNATIVE METHOD"*, EPA 530-R-19-005 (October 2019) specifically recommends use of SW-846 Method 0023A for the combined measurement of dioxin/furan, PCB, and SVOC emissions. Method 0023A uses a series of three (3) consecutive solvents rinses, 1) acetone, 2) methylene chloride, and 3) toluene. To accommodate the combined sampling for SVOC, the TSCA guidance recommends recovering the toluene rinses separately from the acetone and methylene chloride rinses. Focus, and the Eurofins-Knoxville laboratory, concur with the separate toluene rinse recoveries having extensive experience doing combined sampling and analysis of dioxin/furan and other SVOC using Method 0023A.

The March 2023 revision of Method 23 is subsequent to the EPA TSCA guidance (October 2019). The previous Method 23 was simply limited to dioxin/furan emissions. The revised Method 23 also incorporates PCB and PAH emissions with all three analyte groups being analyzed via HRGC/HRMS. The revised Method 23 also includes changes to the analyses, particularly the suite of isotopically labeled surrogates used. The "improvement" in the analysis portion was the elimination of deuterated hydrogen surrogates in favor of only ^{13}C isotopes.

EPA Region 6 is requiring use of Method 23 as the reference method for the A-line test in the context of being the latest and an "improved" method. The Eurofins-Knoxville laboratory has implemented the "improved" aspect of the Method 23 dioxin/furan and PCB analyses for emissions samples. However, this does not resolve the problem of toluene and SVOC analysis. Therefore, to accommodate the EPA

Region 6 requirement for using Method 23 for dioxin/furan and PCB emissions, and to concurrently measure SVOC RCI, Focus' sampling method write up incorporates methylene chloride as an additional rinse solvent consistent with Method 0023A (revised Method 23 uses only acetone followed by toluene) and maintains the toluene rinses separately as suggested by the EPA guidance. We believe the methylene chloride rinse is imperative to assure recovery of SVOC RCI from the sampling train components. Additionally, the front half and back half solvent rinses are combined consistent with Method 23 instead of the separate front half and back half solvent recovery required by Method 0023A. In general, the proposed sampling train recovery is consistent with the revised Method 23 with the addition of methylene chloride rinses and the separate handling of the toluene rinses. One additional difference is the recovery of the solvent rinses of the impingers. The revised Method 23 has one adding the solvent rinses to the recovered condensate. We believe this to be an error in the revised Method 23 as this would create a two-phase mixture which is problematic for the sample preparation for analysis process. Therefore, our write up has these solvent rinses being recovered in discrete, dedicated sample bottles.

Lastly, the sampling and analysis for dioxin/furan, PCB, and SVOC are performance-based methodologies with the isotopically-labeled surrogates applied before sampling, and during sample preparation and analysis providing quality indicators throughout the process.

If you have any questions, please do not hesitate to contact Billy Anderson [865-694-7517, x-3055] or me. Please note that I have included interested parties from A-Line, EPA, and Eurofins on this email. EPA Region 6 would like to commence testing no later than August 2025. Input from OAQPS is key to moving this project forward.

Thank you for your time and consideration.

Regards,

Chris M.

Chris E. McBride, PE
Focus Environmental, Inc.
4700 Papermill Drive
Knoxville, TN 37909
(865) 271-7776 (Mobile)
cemcbride@focusenv.com

Sample Name: Stack Gas Method 23 Sampling Train
PCDDs/PCDFs, PCBs, and SVOCs including PICs and R-Cls

Sampler: Stack sampling engineer

Locations: Exhaust stack sampling platform

Equipment: Method 23 sampling train as shown in Figure 1 of this table; clean and inspected glass fiber particulate filters sealed in petri dishes; prepared XAD-2 resin traps; amber glass sample bottles with Teflon-lined lids; cleaned aluminum foil; scale balance; glass graduated cylinder, as

- Method 23 Sampling Train (see Figure 1)
- Organic-free DI water (note that HPLC grade water is not an appropriate grade for use in this sampling train)
- Aluminum foil
- 500 mL amber Boston Round Bottle - acetone and methylene chloride rinses of the probe, nozzle, and front-half of the filter holder, combined with the acetone and methylene chloride rinses of the back-half of the filter holder behind the particulate filter, the coil condenser and connecting glassware
- 250 mL amber Boston Round Bottle – toluene rinses of the probe, nozzle, and front-half of the filter holder, combined with the toluene rinses of the back-half of the filter holder behind the particulate filter, the coil condenser and connecting glassware
- Glass Petri Dish - particulate filter sample
- XAD-2 Resin Tube
- 1 Liter Boston Round Bottle – condensate catch and impinger contents of impingers #1, #2, #3 and #4 with the D.I. Water rinses of the impingers and all connecting glassware (Note: A 1 gallon Wheaton jug may be necessary for this sample when high moisture volumes of condensate are expected.)
- 250 mL amber Boston Round bottle - acetone and methylene chloride rinses of the impingers and connecting glassware
- New Teflon squirt bottles for acetone, methylene chloride, and toluene rinses
- Graduated cylinder
- Digital weight scale
- Safety glasses or face shield
- Powder free Silver Shield, Nitrile or Latex gloves for handling Method 0010 sampling train equipment and samples
- Other site-specific safety equipment, as required

Frequency: Minimum of 180 minutes to sample a minimum of 2.5 dry standard cubic meters (dscm) of stack gas during each sampling run. Three (3) runs typically constitute a Test.

Procedure Summary: Stack gases are sampled iso-kinetically to collect Polychlorinated Dibenzo-p-Dioxins/Polychlorinated Dibenzofurans (PCDDs/PCDFs), Polychlorinated Biphenyls (PCBs), and semi-volatile organic compounds (SVOCs) on particulate filter media, on XAD-2 adsorbent resin media and in an aqueous fraction. The train components are recovered from the sampling train at the test site and shipped to an analytical laboratory for analysis.

In the laboratory, sample fractions are extracted and concentrated. The sample extracts are split and combined proportionally for PCDD/PCDF analysis, a second portion for PCB analysis, and a third portion for the SVOC analysis. The mass concentrations of PCDD/PCDF and PCB are determined using high resolution gas chromatograph/high resolution mass spectrometry (HRGC/HRMS) instrumentation. The mass concentrations of SVOCs are determined using standard resolution gas chromatograph/mass spectrometry (GC/MS) instrumentation.

The Method 23 sampling train includes a glass nozzle and probe. The probe is equipped with a heated borosilicate or quartz glass probe liner, and a heated borosilicate glass filter holder with a PTFE (Teflon®) or PTFE-coated wire filter support (frit). Behind the filter holder is a water-cooled coil condenser and chilled adsorbent resin trap, a condensate knockout impinger, two water impingers, a second empty impinger, and a silica gel impinger. A water pump is provided to circulate ice water through the coil condenser and the water jacket of the XAD-2 resin trap. (Note: The size and number of impingers can vary based on the expected moisture content of the sampled gas and/or impinger box space.) The impingers are placed in an ice bath. An airtight gas pump, dry gas flow meter, and flow rate meter complete the train components

The train construction, reagents, and cleaning solutions are prepared according to the procedures specified in the EPA methods referenced below. The pretest preparations include soaking the train glassware in hot (50°C) soapy (Alconox or equivalent) water, rinsing (3) three times each with hot water, and distilled/deionized water, and then drying in an oven for 2 hours at 400 °C. After cooling, the glassware is rinsed three (3) times each with pesticide grade methylene chloride ($MeCl_2$) and pesticide grade toluene. When the glassware is dry, all openings are covered with cleaned aluminum foil or clean glass plugs until sample train assembly takes place at the test site.

The particulate filters and the XAD-2 adsorbent resin tubes are prepared according to the Method 23 procedures summarized as follows:

- The filters are cleaned using toluene and dried in a stream of clean nitrogen. The cleaned filters are stored in a glass petri dish sealed with Teflon® tape.
- XAD-2 resin is cleaned by HPLC water rinses followed by Soxhlet extractions with HPLC water, methanol, and methylene chloride then dried using a flow of inert gas. An extract from a portion of the prepared XAD-2 resin is analyzed to confirm that the resin is free from significant background contamination. As an alternative to in-house resin cleaning, resin that is certified clean by laboratory analysis prior to use may be purchased from Supelco®, or other commercial laboratory suppliers.
- The glass adsorbent trap is loaded with approximately 35-40 grams of the XAD-2 resin and the open end of the trap is packed with clean glass wool. The adsorbent traps are spiked with isotopically-labeled sampling surrogates for monitoring PCDDs/PCDFs, PCBs and SVOCs. The ends of the adsorbent trap are capped, and the traps are wrapped in aluminum foil, sealed in a plastic bag, and stored in an insulated cold chest.

At the test site the sampling train is assembled in a clean area and the train components are handled in a manner that minimizes the potential for contamination from air or direct contact. The train glassware may be rinsed with acetone and/or methylene chloride before

assembly. A particulate filter is placed in the filter holder. Before each sampling run, the XAD-2 adsorbent trap weight is measured and recorded to the nearest 0.5 gram before installing in the train. The trap is wrapped with aluminum foil to protect from light and installed in the train. Impingers 1 and 4 are initially empty at the start of a run, impingers 2 and 3 each contain 100 ml of distilled deionized water, and impinger 5 contains 200 to 300 grams of indicating silica gel. All impingers are weighed separately to nearest 0.5 gram and installed in the sample train. No sealant grease is used in assembling the train.

The sampling point locations within the stack are determined in accordance with EPA Method 1. An initial traverse is made with a pitot tube at each sample point following Method 2 to establish a stack gas velocity profile, stack temperature and flow rate, and to check for cyclonic flow (cyclonic flow is checked only on the first day of testing). An analyzer is typically used to determine stack gas oxygen, carbon dioxide, and dry molecular weight according to Method 3A procedures. The stack gas moisture content is determined according to Method 4. Pretest and post-test leak checks, isokinetic sampling rate, filter change outs (if needed), and data recording are performed according to EPA Method 5 procedures.

The stack gas sampling is conducted following the procedures given in Method 23. The sample probe exit and filter assembly temperatures are maintained at 248°F ± 25°F, and the gas sample entering the adsorbent module is maintained to be less than 68°F. The sampling rate is adjusted during the test to maintain isokinetic conditions at the probe nozzle within ± 10% of 100%.

After sampling, the probe is removed from the stack and a post-test leak check is conducted on the sampling train. The probe nozzle exterior is wiped off to remove particulate matter and covered with aluminum foil. After cooling, the probe's exterior is wiped down to remove external particulate matter, disconnected from the train, and both ends are capped. The probe and filter box-impinger assemblies are transported to the sample recovery area. The sample recovery and sample train cleanup procedures are summarized as follows:

- Particulate Filter - The filter is removed from the holder and frit using tweezers and placed back into the original Petri dish (Container 1). Any visible or loose particulate is brushed into the Petri dish with the filter. The container is sealed with Teflon® tape and then placed sealed in a plastic baggie and chilled on ice or by refrigeration.
- XAD-2 Adsorbent Resin Trap - The XAD-2 adsorbent resin trap is removed from the train and both ends are sealed with Teflon tape. The aluminum foil is removed and the XAD-2 adsorbent resin trap is then weighed to the nearest 0.5 gram and the weight recorded. The trap is then labeled, re-wrapped in aluminum foil to protect from light, sealed in a plastic baggie, and chilled on ice or by refrigeration.
- Front-Half and Back-Half Acetone Rinses - The internal surfaces of the nozzle, probe, front half of the filter holder, and any connecting tubing or connecting glassware are brushed and rinsed three (3) times with acetone. The acetone rinses are placed into a glass sample bottle (Container 2A). The back half of the filter holder, the filter support, transfer line (if used) and coil condenser are rinsed three (3) times with acetone. The acetone rinses are all combined in Container 2A.

- Front-Half and Back-Half Methylene Chloride Rinses - The front half and back half acetone chloride rinse procedure described above is repeated a second time using methylene chloride as the solvent. The methylene chloride rinse portions are all collected in the same glass sample bottle as the acetone rinses (Container 2A).
- Front-Half and Back-Half Toluene Rinses - The front half and back half acetone chloride and methylene chloride rinse procedure described above is repeated a third time using toluene as the solvent. The toluene rinse portions are collected in a separate glass sample bottle from the acetone and methylene chloride rinses (Container 2B). [Note: The toluene rinses are recovered separately to allow the performing laboratory to extract samples in the correct order, and to prevent toluene solvent interference from occurring during the SVOC analysis.]
- Condensate and Impinger Content - The contents of the knockout impinger and impingers 2, 3, and 4 are measured to the nearest milliliter or weighed to the nearest 0.5 g and observed for the presence or absence of film or color. Observations of film or color are recorded on the sample recovery sheet. The contents of the impingers are collected in a separate container (Container 3A).
- Impinger Deionized Water Rinses - The knockout impinger, impingers 2, 3, and 4 and connecting glassware are rinsed three (3) times with deionized water. The waters rinses are all collected in the same glass sample bottle as the impinger water (Container 3A).
- Impinger Acetone Rinses - The knockout impinger, impingers 2, 3, and 4 and connecting glassware are rinsed three (3) times with acetone. The acetone rinses are collected in separate glass sample bottle (Container 3B). [Note: Method 23 as revised March 2023 has the acetone rinses combined with the impinger water contents. The performing laboratory prefers the acetone rinses to be recovered in a separate container and not added to the impinger water.]
- Impinger Methylene Chloride Rinses - The acetone rinse procedure described above for the knockout impinger and impingers 2, 3 and 4 is repeated a second time using methylene chloride as the solvent. The methylene chloride rinses are collected in the same glass sample bottle as the acetone impinger rinses (Container 3B).
- Impinger Toluene Rinses - The acetone and methylene chloride rinse procedure described above is repeated a third time using toluene as the solvent. The toluene rinses are collected in a separate glass sample bottle (Container 3C) from the acetone and methylene chloride rinses. [Note: Method 23 as revised March 2023 contains instructions to place the toluene rinses in with the impinger water content. The performing laboratory prefers the toluene rinses to be recovered in a separate container for the reasons previously noted above and not added to the impinger water.]
- Silica Gel - The silica gel contents of impinger 5 are weighed to the nearest 0.5 g.

A schematic diagram of the Method 23 Sampling Train recovery and cleanup procedures is provided as Figure 2.

Field Train Proof Blank samples are collected once during the field test program. A complete sampling train setup, including particulate filter and resin trap is assembled from glassware derived from the same preparation batch as the field samples will use. The field train proof blank will be constructed from glassware prepared for the test campaign but not yet used to collect field samples. The train is taken to the sampling area or platform, brought up to operating temperature, leak checked, and allowed to remain at that location for the duration of one sampling run. Upon completion of the final leak check, the Field Proof Blank Train samples are recovered from the train in the same location, and by the same person performing the setup and breakdown of the sampling trains for the actual sampling runs.

Reagent Blanks are collected for each solvent, media, and deionized water source as those used for the testing campaign. Reagent blanks will be collected from the acetone, methylene chloride, and toluene wash bottles used in recovering the sampling train components. A particulate filter and an XAD-2 resin trap will also be collected as reagent blanks. (Note: The reagent blanks may be archived at the laboratory and activated for analysis in the event that laboratory data indicate that a potential contamination problem has occurred.)

Sample Labeling and Storage Prior to and for Shipment to the Laboratory
Sample containers will be assigned unique numbers and labeled with the date and test run identification. The samples are inventoried as they are collected and again just prior to shipment from the test site to the laboratory. For on-site storage and shipment to the laboratory, samples will be packaged in insulated coolers. Prior to shipment, samples will be stored in a holding area separate from sources of contamination. Samples will be chilled using water ice prior to and during shipment to the laboratory. Completed request for analysis and chain of custody (RFA/COC) forms will accompany samples from the test site to the laboratory.

Sample Holding Times and Preservation
The extraction holding time for samples receiving the combination of dioxin/furan analysis, PCB analysis, and semi-volatile compound analysis is fourteen (14) days from the date of sample collection. The more restrictive 14-day holding times will be observed for all Method 23 sample fractions due to semi-volatile holding time requirements. The holding times for semi-volatile extracts from the time of extraction to the time of analysis is 40 days. The holding time for dioxin and furan extracts from the time of extraction to the time of analysis is 45 days.

The storage temperature of all samples from collection to delivery to the laboratory is ≤6ºC. Samples are to be protected from ultra-violet light.

References:

"Method 23 - Determination of Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofurans, Polychlorinated Biphenyls, and Polycyclic Aromatic Hydrocarbons from Stationary Sources", Appendix A, 40 CFR 60, March 20, 2023.

SW-846 Method 0023A, "Sampling Method for Polychlorinated Dibenzo-p-Dioxin (PCDD) and Polychlorinated Dibenzofuran (PCDF) Emissions from Stationary Sources", Test Methods for Evaluating Solid Waste, SW-846, December 1996.

SW-846 Method 0010, "Modified Method 5 Sampling Train," September 1986

"Method 1 - Sample and Velocity Traverses for Stationary Sources"

"Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)"

"Method 3A – Determination of Oxygen and Carbon Dioxide Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)"

"Method 4 – Determination of Moisture Content in Stack Gases"

"Method 5 – Determination of Particulate Emissions from Stationary Sources"

Source for Methods 1, 2, 3A, 4, 5 and 23: Appendix A - Test Methods, New Source Performance Standards, 40 CFR 60.

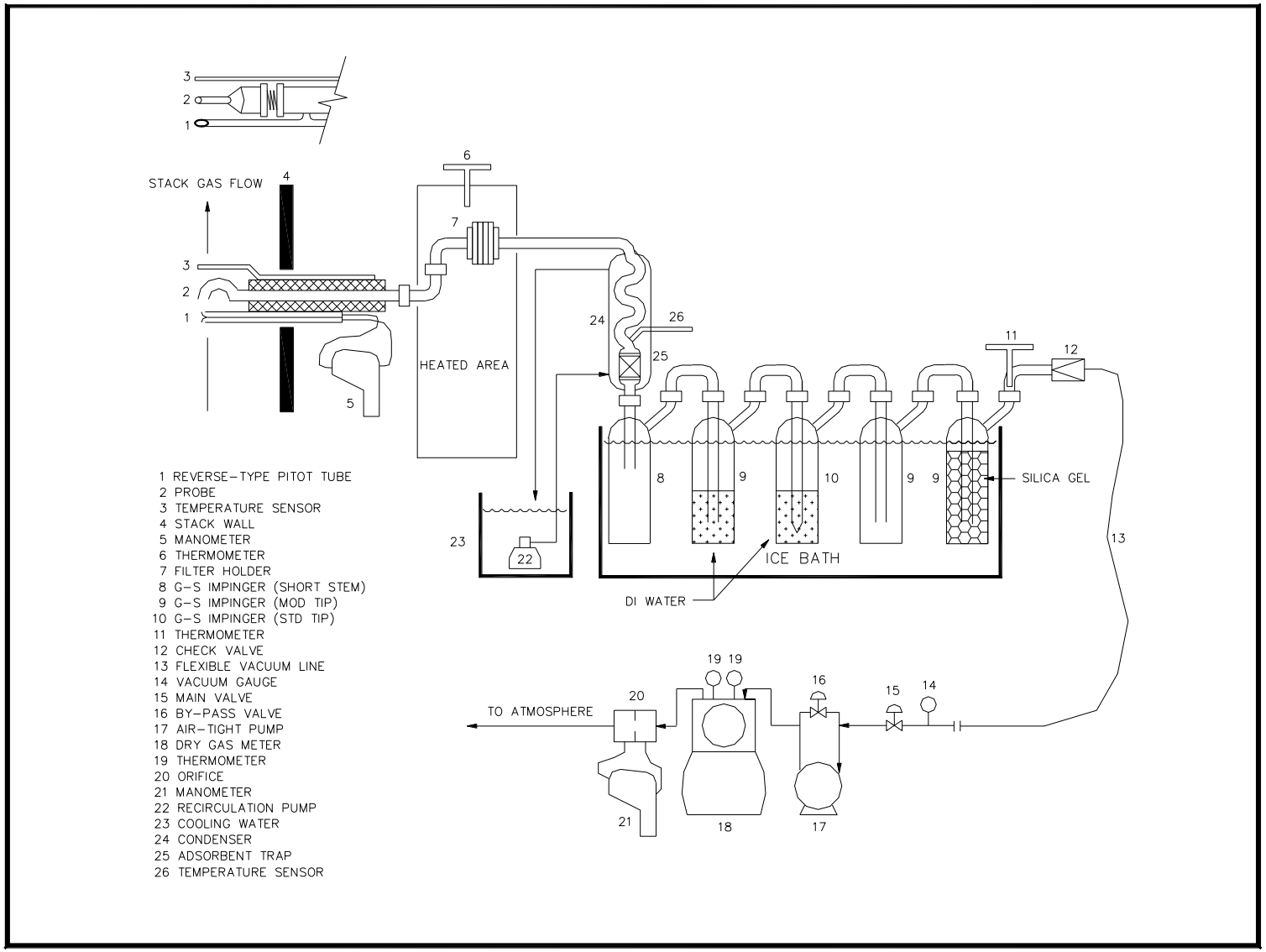

Figure 1. Method 23 Sample Train

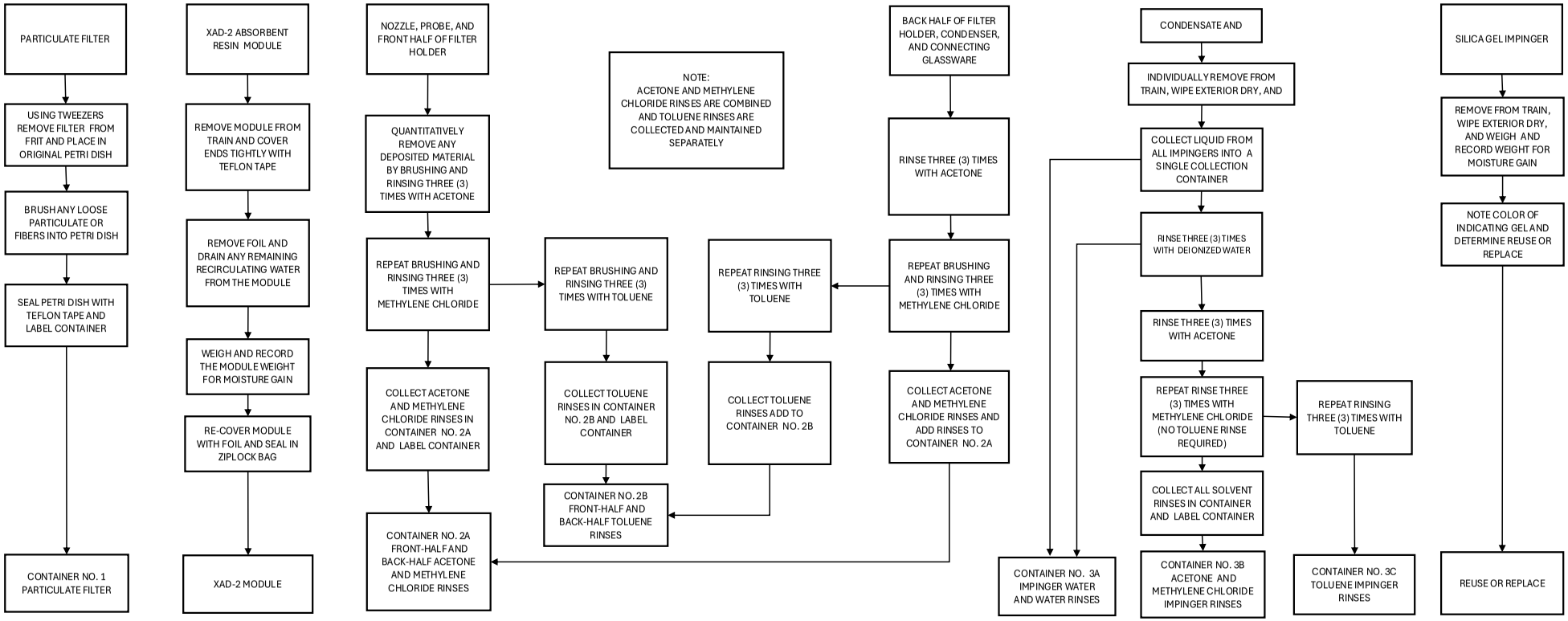

Figure 2. Method 23 PCDD/PCDF, PCB, and SVOC Sample Recovery

Missing Item/Item of Major Concern	PCB Incinerator Guidance Document Reference/ Other Reference	Requirement
		Line must replace the generalized analysis flow chart with an analysis flow chart that matches Method 5. • Table 4-9 Document Method 202, EPA Method 202 Analytical Flow Chart (Page 33-34 of 40)- The order of the procedures and/or missing procedural steps for several containers do not match Method 202. These method modifications are not approved. A-Line must follow the EPA Method 202. • Table 4-9 Document EPA Method 5/202 Sampling Train Configuration (Page 28 of 40)- The sampling train set up does not match Method 5/202. These modifications are not approved. A-Line must ensure the sampling train configuration matches Method 5/202. All EPA Methods must be followed. Any deviations from the methods are not approved.
31. Method SW-846 0030 Deviations		• Table 4-9 Document SW-846 0030 Sampling Train Configuration (Page 38 of 40)- The sampling train configuration provided does not match the sampling train configuration for SW-846 0030 (Page 4 of 18). The empty impinger is not shown. This method modification is not approved. The sampling configuration must match what is shown in the method. • Table 4-9 Document SW-846 0030 Sampling and Analytical Flow charts (Pages 39-40 of 40)- A-Line will ensure that flow charts follow Method SW-846 0030. All EPA Methods must be followed. Any deviations from the methods are not approved.
32. Method 23 Deviations	EPA Method 23	The use of methylene chloride rinses as explained in the Method 23 Waiver Request submitted by Mr. Chris McBride on January 17, 2025 was reviewed by EPA HQ's and has been approved. • Table 4-9 document Method 23, Bullet 8 (Page 9 of 40)-This bullet only discussed weighing the silica gel. Method 23 Section 8.2.10 (Page 25 of 85) states to document the color and document in field data sheet if the silica is spent. A-Line must conform to Method 23. • Table 4-9 Document Method 23, 4th paragraph, 2nd bullet (Page 8 of 40)- The procedure for the adsorbent resident trap does not follow the procedure in Method 23 Section 8.2.5 (Page 24 of 85). A-Line must verify if the recirculating water is drained before weighing the module, as specified in the method. Any deviations to the requirements to obtain a conditional approval are denied and unapproved by the EPA. A-Line must follow the requirements of each condition to receive conditional approval from EPA on

Missing Item/Item of Major Concern	PCB Incinerator Guidance Document Reference/ Other Reference	Requirement
		method modifications. In addition, all EPA Methods must be followed. Any deviations from the methods are not approved.
33. Modifications to Test Method 26A	EPA Method 26A	• Table 4-9 Document Method 26A, Sample Recovery Flowchart, Container 3, third step (Page 23 of 40)- A-Line must add rinsing the back portion of filter holder, as specified in Section 8.2.3 Container 3 in Method 26A (Page 8 of 13). • Table 4-9 Document Method 26A, Sample Recovery Flowchart, Container 4, fourth step (Page 23 of 40)- Information regarding the addition of sodium thiosulfate is incomplete. Please add, "multiplied by the volume (dscm) of stack gas sampled (0.7 mg/ppm-dscf)," as specified in Section 8.2.4 Container 4 in Method 26A (Page 8 of 13). • Table 4-9 Document Method 26A, Sample Recovery Flowchart, Container 5, 1st step (Page 23 of 40)- A-Line must include to check and document any color change of silica gel to determine if it is spent as shown in Section 8.2.5 Container 5 (Page 8 of 13) in Method 26A. • Table 4-9 Document Method 26A, Sample Recovery Flowchart (Page 23 of 40)- Container 9 is missing. Also, the step of adding sodium thiosulfate is not showing for Containers 6-9, as specified in Section 8.2.6 (Page 8 of 13) in Method 26A. • Table 4-9 Document Method 26A, Analytical Flowchart (Page 23 of 40)- There are several containers, and additional steps shown in A-Line's flowchart that are not shown in Method 26A. These method modifications are not approved. The analytical flowchart must follow the procedures in Method 26A. Any deviations to the requirements to obtain a conditional approval are denied and unapproved by the EPA. A-Line must follow the requirements of each condition to receive conditional approval from EPA on method modifications. In addition, all EPA Methods must be followed. Any deviations from the methods are not approved.
34. Method 5 Modifications Spec Sheet	EPA Method 5	• The use of titanium for the probe liner material is conditionally approved following: the tubing must be a seamless piece (no welding), titanium must be grade 2 or equivalent, and the brush must be run through the probe no less than six times.

ATTACHMENT E

EUROFINS ANALYSIS STANDARD OPERATING PROCEDURES

STANDARD OPERATING PROCEDURE	PAGE NO.
POLYCHLORINATED BIPHENYLS	E-2
DIOXINS/FURANS	E-77
SEMI-VOLATILE ORGANICS	E-146
VOLATILE ORGANICS BY VOST	E-205
ANIONS BY ION CHROMATOGRAPHY	E-257
TOTAL HAOLGENS	E-290

EUROFINS STANDARD OPERATING PROCEDURE

POLYCHLORINATED BIPHENYLS BY METHOD 1668ABC

Controlled Copy
Copy No. E1

EUROFINS KNOXVILLE
SOP CHANGE FORM

SOP NUMBER: KNOX-ID-0013, Rev 21

SOP TITLE: Analysis of Polychlorinated Biphenyl (PCB) Isomers by Isotope Dilution HRGC/HRMS

SOP SECTIONS AFFECTED BY CHANGE **Tables**

CHANGE EFFECTIVE FROM: 06/28/2023 Type text here

CHANGE OR ADDITION (SPECIFY SECTION; USE ADDITIONAL SHEETS IF NECESSARY)

Please add the attached summary of co-elutions for the SPB-Octyl column we use for 1668 analyses as a table to the 1668 SOP.

SUBMITTED BY/DATE: **Jon Nordquist**

APPROVED BY:

Technical Reviewer Signature	Date 6/27/23
Environmental Health & Safety Signature	Date 6.28.23
QA Signature	Date 6/28/23
Management Signature	Date 6/28/23

SPB-Octyl Coeluting Compounds

Congener Group		Colelutions
Mono	None	
Di	1	12/13
Tri	4	18/30, 26/29, 20/28,21/33
Tetra	8	50/53, 45/51, 43/73, 49/69, 44/47/65, 59/62/75, 40/41/71, 61/70/74/76
Penta	9	93/100, 98/102, 88/91, 90/101/113, 83/99, 86/87/97/109/119/125, 85/116/117, 110/115, 108/124
Hexa	8	135/151, 147/149, 134/143, 139/140, 153/168, 129/138/160/163, 128/166, 156/157
Hepta	3	183/185, 171/173, 180/193
Octa	1	198/199
Nona	None	
Deca	None	

STANDARD OPERATING PROCEDURE
TITLE: Analysis of Polychlorinated Biphenyl (PCB) Isomers by Isotope Dilution HRGC/HRMS

(SUPERSEDES: KNOX-ID-0013, Revision 20)

Approvals (Signature/Date):

Jon Nordquist — Date 4/5/23
Prepared by:

Linda McWhirter — Date 4-5-23
Technical Specialist

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Kevin McGee — Date 4/5/2023
Quality Assurance Manager

Kevin Woodcock — Date 4-7-23
Lab Manager

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1 Scope and Application

1.1 This procedure is designed to meet analytical program requirements where HRGC/HRMS analysis of polychlorinated biphenyl (PCB) isomers is specified. The procedure is used by Eurofins Knoxville for the qualitative and quantitative measurement of all 209 PCB congeners in a variety of environmental matrices at part-per-trillion (ppt) to part-per-quadrillion (ppq) concentrations. This procedure is based on EPA method 1668A, 1668B and 1668C.

1.2 The compounds listed in Table 1 may be determined by this procedure. The detection limits and quantitation levels in this method are usually dependent on the level of interferences rather than instrumental limitations. The estimated minimum levels (EMLs) in Table 4 are the levels at which the PCBs can be determined with only common laboratory interferences present. The actual limits of detection and quantitation will vary depending on the complexity of the matrix.

1.3 The Low Calibration Levels (LCLs) of the method are listed in Table 3 for individual congeners. Analysis of a one-tenth aliquot of the sample permits measurements of concentrations up to 10 times the upper calibration range. Samples containing concentrations of PCBs that are greater than ten times the upper calibration are analyzed by protocols designed for such concentration levels.

1.4 The GC/MS portions of this method are for use only by analysts experienced with HRGC/HRMS or under the close supervision of such qualified persons. Each laboratory that uses this method must demonstrate the ability to generate acceptable results using the procedure in section 9.1.

1.5 This procedure is a "performance-based" method. These reference methods allow modifications to overcome interferences or lower the cost of measurements, if all performance criteria in the methods are met and method equivalency is established. Deviations from the referenced methods have been incorporated into this procedure and are listed in section 17.1. Deviations to this procedure are only allowed as specified in section 11.1.

1.6 Because of the extreme toxicity of many of these compounds, the analyst must take the necessary precautions to prevent exposure to materials known or believed to contain PCBs. It is the responsibility of the laboratory personnel to ensure that safe handling procedures are employed. Section 5 of this procedure discusses safety procedures.

2 Summary of Method

2.1 All solid and semi-solid samples are screened by GC/ECD prior to extraction. Other sample matrices may be screened if the potential for high congener concentrations exists. Variations in sample size, spiking levels and final volume are established based on the screening result.

2.2 After sample extraction, cleanup, and concentration, recovery standards are added to each extract, and an aliquot of the extract is injected into the gas chromatograph. The analytes are separated by the GC and detected by a high-resolution (≥10,000) mass spectrometer. Two exact masses are monitored for each analyte.

2.3 An individual PCB congener is identified by comparing the GC retention time and ion-

abundance ratio of two exact masses with the corresponding retention time of an authentic standard and the theoretical or acquired ion-abundance ratio of the two exact masses.

2.4 Quantitative analysis is performed using selected ion current profile areas using the internal standard technique.

2.5 The quality of the analysis is assured through reproducible calibration and verification of the extraction, cleanup, and GC/MS systems.

3 Definitions

These definitions and purposes are specific to this method but conform to common usage as much as possible.

Note: Terminology differences existing in some isotope dilution reference methods regarding the functionality of the labeled analogs may lead to confusion. For example, EPA's Office of Solid Waste methods (8280, 8290) use the term "Internal Standards" to describe the labeled analogs which are added to the sample prior to extraction and used to quantitate the native targets. EPA's Office of Water methods (1613B, 1668) use the term "Labeled Analogs" to describe these same compounds while using the term "Internal Standards" to describe the labeled analogs which are added to the extract just prior to analysis and used to quantitate the recovery of the labeled analogs added before extraction. EPA's Office of Solid Waste methods (8280, 8290) uses the term "Recovery Standards" to describe these later labeled analogs.

The terminology conventions established by the EPA's Office of Solid Waste methods (8280, 8290) are used in the laboratory for all Standard Operating Procedures and internal communications as defined in this section.Analyte – A PCB tested for by this method. The analytes are listed in Table 1.

3.1 Calibration verification standard (VER) – The mid-point calibration standard (CS3) that is used to verify calibration. See Table 6a.

3.2 CB – Chlorinated biphenyl congener. One of the 209 individual chlorinated biphenyl congeners determined using this method. The 209 CBs are listed in Table 1.

3.3 Congener – Any member of a particular homologous series, for example, 2,2’-DiCB.

3.4 CS0.5, CS1, CS2, CS3, CS4, CS5 – See Calibration standards and Table 6a.

3.5 Estimated Detection Limit (EDL) – The sample specific estimated detection limit (EDL) is the concentration of a given analyte required to produce a signal with a peak height of at least 2.5 times the background signal level (noise level).

3.6 Estimated Maximum Possible Concentration (EMPC) – The calculated concentration of a signal having the same retention time as a PCB congener but which does not meet all of the other qualitative identification criteria defined in the method.

3.7 Estimated Minimum Level (EML) – The lowest concentration at which an analyte can be measured reliably with common laboratory interferences present. This is the reporting limit (RL).

3.8 FC-43 (PFTBA) - Perfluorotributylamine; used to calibrate the exact mass scale in the HRMS.

3.9 Field blank – An aliquot of reagent water or other reference matrix that is placed in a sample container in the laboratory or the field, and treated as a sample in all respects, including exposure to sampling site conditions, storage, preservation, and all analytical procedures. The purpose of the field blank is to determine if the field or sample transporting procedures and environments have contaminated the sample.

3.10 GC – Gas chromatograph or gas chromatography.

3.11 Homologous Series – A series of compounds in which each member contains the same number of chlorine atoms. The members of the series are called homologs.

3.12 HRGC – High resolution GC.

3.13 HRMS – High resolution MS.

3.14 ICV – Initial Calibration Verification Standard. A calibration standard from a second source, traceable to a national standard if possible. The ICV is analyzed after the Initial calibration to verify the concentration of the initial calibration standards.

3.15 Isotope Dilution Analytes (IDAs) – Isotopically labeled analogs of the target analytes that are added to every sample, blank, quality control spike sample, and calibration solution. They are added to the sample before extraction and are used to calculate the concentration of the target analytes or detection limits.

3.16 IPR (also known as IDOC) – Initial precision and recovery; four aliquots of the PAR standard analyzed to establish the ability to generate acceptable precision and accuracy. An IPR is performed prior to the first time this method is used and any time the method or instrumentation undergoes significant modification.

3.17 Isomer – PCB congeners that contain the same number of chlorine atoms, but differ in the structural arrangement of the chlorine atoms. For example, PCB-4 and PCB-9 are isomers.

3.18 Laboratory blank – See Method blank.

3.19 Laboratory control sample (LCS) – See ongoing precision and recovery standard (OPR).

3.20 Laboratory reagent blank – See Method blank.

3.21 Level of Chlorination (LOC) Congeners – The first and last eluting congeners in each homolog (or level of chlorination). (For the SPB-Octyl Column the LOC Congeners are 1, 3; 4, 15; 19, 37; 54, 77; 104, 126; 155, 169; 188, 189; 202, 205; 208, 206; 209)

3.22 Method blank – An aliquot of a clean test matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with samples. The method blank is used to determine if analytes or interferences are present in the laboratory environment, the reagents, or the apparatus.

3.23 Minimum Level (ML) – The level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. It is equivalent to the concentration of the lowest calibration standard, assuming that all method-specified sample weights, volumes, and

cleanup procedures have been employed.

Note: EML is the lowest concentration at which an analyte can be measured reliably with common laboratory interferences present

3.24 MS – Mass spectrometer or mass spectrometry.

3.25 OPR (also know as ODOC) – Ongoing precision and recovery standard (OPR); a laboratory blank spiked with known quantities of analytes. The OPR is analyzed exactly like a sample. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in this method for precision and recovery.

3.26 PAR – Precision and recovery standard; secondary standard that is diluted and spiked to form the IPR and OPR.

3.27 Primary dilution standard – A solution containing the specified analytes that is purchased or prepared from stock solutions and diluted as needed to prepare calibration solutions and other solutions.

3.28 Quality control check sample (QCS) – A sample containing all or a subset of the analytes at known concentrations. The QCS is obtained from a source external to the laboratory or is prepared from a source of standards different from the source of calibration standards. It is used to check laboratory performance with test materials prepared external to the normal preparation process.

3.29 PCB – Polychlorinated biphenyl.

3.30 Reagent water – Water demonstrated to be free from the analytes of interest and potentially interfering substances at the method minimum level for the analyte.

3.31 Recovery Standard (RS) – Isotopically labeled compounds which are added to every sample, blank, and quality control spike sample extract prior to analysis. They are used to measure the recovery of the internal standards and the cleanup standards.

3.32 Relative Percent Difference (RPD) – A measure of the difference between two values normalized to one of the values. It is used to determine the accuracy of the concentration measurements of second source verification standards.

3.33 Relative standard deviation (RSD) – The standard deviation times 100 divided by the mean. Also termed "coefficient of variation."

3.34 RF or RRF (Relative Response Factor) - The ratio of the response of the mass spectrometer to a known amount of a compound relative to that of a known amount of a reference standard as measured in the initial and continuing calibrations. It is used to determine instrument performance and it is used to calculate the concentration of target analytes, internal standard recoveries, or detection limits in samples, blanks, and quality control samples. See Section 10.3.4.2.

3.35 SPE – Solid-phase extraction; an extraction technique in which an analyte is extracted from an aqueous sample by passage over or through a material capable of reversibly adsorbing the

analyte. Also termed liquid-solid extraction.

3.36 Specificity – The ability to measure an analyte of interest in the presence of interferences and other analytes of interest encountered in a sample.

3.37 Stock solution - A solution containing an analyte that is prepared using a reference material traceable to EPA, the National Institute of Science and Technology (NIST), or a source that will attest to the purity and authenticity of the reference material.

3.38 Field Surrogate Standards (SU) - Isotopically labeled compounds that are added to XAD samples and calibration solution. They are added to XAD sampling tubes before sampling and are used to measure sampling and recovery efficiency.

3.39 Surrogate Standard (SU) – Isotopically labeled compounds that are added to samples, blanks, quality control samples, and calibration solutions. They are added to the samples after extraction but prior to extract cleanup, and are used to assess the efficiency of the cleanup procedures.

3.40 Toxic Congeners (or Toxic Isomers) – PCBs determined by the World Health Organization and USEPA to have dioxin-like toxicity. (PCBs 77, 81, 105, 114, 118, 123, 126, 156, 157, 167, 169, 189)

3.41 Toxic/LOC Congeners – PCBs belonging to either the Toxic Congeners list or the LOC Congeners list.

3.42 VER – See Calibration verification standard.

3.43 Additional definitions can be found in the Eurofins Knoxville Quality Assurance Manual (QAM), current revision.

4 Interferences

4.1 Solvents, reagents, glassware, and other sample processing hardware may yield artifacts and/or elevated baselines causing misinterpretation of chromatograms. Where possible, glassware is cleaned by extraction or solvent rinse. The non-coplanar PCB congeners 105, 114, 118, 123, 156, 157, 167, and 180 have been shown to be very difficult to completely eliminate from the laboratory at the minimum levels in this method, and baking of glassware in a kiln or furnace at 450 - 500°C may be necessary to remove these and other contaminants.

4.2 All materials used in the analysis shall be demonstrated to be free from interferences by running laboratory method blanks (section 9.5) initially and with each sample batch.

4.3 Interferences coextracted from samples will vary considerably from source to source, depending on the diversity of the site being sampled. Interfering compounds may be present at concentrations several orders of magnitude higher than the PCBs. The most frequently encountered interferences are chlorinated dioxins and dibenzofurans, methoxy biphenyls, hydroxy-diphenyl ethers, benzylphenyl ethers, polynuclear aromatics, and pesticides. Because very low levels of PCBs are measured by this method, the elimination of interferences is essential. Cleanup steps can be used to reduce or eliminate these interferences and thereby permit reliable determination of the PCBs at the levels shown in Table 3.

5 Safety

5.1 Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.2 Eye protection that satisfies ANSI Z87.1 (as per the Corporate Safety Manual), laboratory coat and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated will be removed and discarded, other gloves will be cleaned immediately.

5.2.1 Latex and vinyl gloves provide no protection against most of the organic solvents used in this method. For the operations described herein, Nitrile gloves are to be worn. For operations using solvents that may splash, SilverShield® gloves are recommended. SilverShield® gloves protect against breakthrough for most of the solvents used in this procedure.

5.3 The effluents of sample splitters for the gas chromatograph and roughing pumps on the mass spectrometer must be vented to the laboratory hood exhaust system or must pass through an activated charcoal filter.

5.4 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them or use thermal protection when working on them while they are above room temperature.

5.5 The mass spectrometer is under high vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source. Alternatively, the source may be removed from the vacuum manifold through a vacuum interlock.

5.6 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power. If the work involved requires measurement of voltage supplies, the instrument may be left on.

5.7 Primary Materials Used: The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material	Hazards	Exposure Limit (1)	Signs and symptoms of exposure
Methylene Chloride	Carcinogen, Irritant	25 ppm-TWA, 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
Hexane	Flammable, Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure may cause lightheadedness, nausea, headache, and blurred vision. Vapors may cause irritation to the skin and eyes.
Methanol	Flammable, Poison, Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
Toluene	Flammable, Poison, Irritant	200 ppm-TWA 300 ppm-Ceiling	Inhalation may cause irritation of the upper respiratory tract. Symptoms of overexposure may include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness may be produced. Causes severe eye and skin irritation with redness and pain. May be absorbed through the skin.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
Nonane	Flammable	None established	Harmful if inhaled/swallowed. Vapor/mist is irritating to eyes, mucous memebranes and upper respiratory tract. Causes skin irritiation.
1 – Exposure limit refers to the OSHA regulatory exposure limit.			

5.8 Chemicals that have been classified as **carcinogens**, **potential carcinogens**, or **mutagens include**: methylene chloride, polychlorinated biphenyls, and toluene. The toxicity or carcinogenicity of each reagent used in this method is not precisely defined; however, each chemical compound should be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be kept to a minimum.)

5.9 Chemicals known to be **flammable** are: acetone, hexane, nonane and toluene.

5.10 Exposure to chemicals will be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples will be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers will be kept closed unless transfers are being made.

5.11 The preparation of all standards will be conducted in a fume hood with the sash closed as far as the operations will permit.

5.12 Confinement: Work areas should be isolated and posted with signs. Glassware and tools should be segregated. Bench tops should be covered with plastic backed absorbent paper.

5.13 Waste: Good technique includes minimizing contaminated waste. Plastic bag liners should be used in waste cans.

5.14 Accidents: Remove contaminated clothing immediately, taking precautions not to contaminate skin or other articles. Wash exposed skin vigorously and repeatedly until medical attention is obtained.

5.15 All work must be stopped in the event of a known or potential compromise to the health or safety of laboratory personnel. The situation must be reported immediately to a laboratory supervisor.

6 Equipment and Supplies

6.1 Gas chromatograph - Shall have splitless or on-column injection port for capillary column, temperature program with isothermal hold, and shall meet all of the performance specifications in Section 10.

6.1.1 Column #1 – 30±5-m long x 0.25±0.02-mm ID; 0.25-µm film SPB-Octyl (Supelco 2-4218, or equivalent).

6.2 Mass spectrometer - Electron impact ionization, shall be capable of repetitively selectively monitoring 20 exact masses minimum at high resolution (≥10,000) during a period less than 1.0 second, and shall meet all of the performance specifications in Section 10.

6.3 GC/MS interface - The mass spectrometer (MS) shall be interfaced to the GC such that the end of the capillary column terminates within 1 cm of the ion source but does not intercept the electron or ion beams.

6.4 Data system - Capable of collecting, recording, and storing MS data.

7 Reagents and Standards

CAUTION: Refer to Safety Data Sheets (SDS) for specific safety information on chemicals and reagents prior to use or as needed.

CAUTION: During preparation of reagents, associates shall wear lab coat, gloves, safety glasses with side shields, and laboratory approved shoes as a minimum. Reagents shall be prepared in a fume hood.

7.1 Solvents - Acetone, toluene, n-hexane, methanol, methylene chloride, and nonane; pesticide quality.

7.2 FC-43 (PFTBA) is used in neat form to tune and calibrate the mass spectrometer. [redacted]

7.3 $^{13}C_{12}$ Labeled PCB Congener Isotope Dilution Analytes (IDA): Obtained as individual Certified Reference Standards from [redacted] Refer to Table 5b for a list of individual standards. These standards are purchased at 40 µg/mL or 50 µg/mL in nonane. If the chemical

purity is 98% or greater, the stated manufacturer concentration may be used without correction to compute the concentration of the standard. Once a standard ampoule has been vortexed and opened, the solution is transferred to an amber glass vial with a Teflon®-lined screw cap. When not being used, standards are stored in a dark box at room temperature. These purchased standards are used to prepare the following mixed stock solutions and spiking solutions:

7.3.1 IDA Stock Solution: Prepared by diluting the individual $^{13}C_{12}$ labeled IDAs listed in Table 5b, to a concentration of 1000 ng/mL in nonane. The concentration is verified by GC/MS before use.

7.3.2 IDA Spiking Solution: Prepared by diluting the 1000 ng/mL IDA stock solution to a concentration of 10 ng/mL in acetone. 1.0 to 4.0 mL of this solution is added to each solid/tissue sample prior to extraction. Refer to Table 12, "Assignment of Sample Preparation Protocols" to determine the exact volume to add. Prior to extraction, aqueous samples are spiked with IDA spiking solution at 1/5 the levels of solid/tissue samples (typically 20 uL).

7.3.3 Internal Standard Stock Solution (IS): Prepared by diluting the individual $^{13}C_{12}$ labeled ISTDslisted in Table 5b to a concentration of 1000 ng/mL in nonane. The concentration is verified by GC/MS before use.

7.3.4 Internal Standard Spiking Solution: Prepared by diluting the 1000 ng/mL internal standard stock solution to a concentration of 100 ng/mL in nonane. Fifty to 100 µL of this spiking solution is added to each solid/tissue sample extract prior to analysis (refer to Table 12), whereas, 20 µL is added to each aqueous sample extract.

7.3.5 Surrogate Stock Solution: Prepared by diluting the individual $^{13}C_{12}$ labeled cleanup standards listed in Table 5b, to a concentration of 5000 ng/mL in nonane. The concentration is verified by GC/MS before use.

7.3.6 Surrogate Standard Spiking Solution: Prepared by diluting the 5000 ng/mL surrogate standard stock solution to a concentration of 10 ng/mL in hexane. One half to 1.0 mL of this solution is added to each solid/tissue sample extract prior to cleanup (refer to Table 12), whereas, 0.20 mL is added to each aqueous sample extract.

7.3.7 Air Surrogate Standard Stock Solution: Prepared by diluting the individual $^{13}C_{12}$ labeled sampling air standards listed in Table 5b to a concentration of 5000 ng/mL in nonane. The concentration is verified by GC/MS before use.

7.3.8 Air Surrogate Spiking Solution: Prepared by diluting the 5000 ng/mL air surrogate stock solution to a concentration of 50 ng/mL in nonane.

7.4 Target PCB Congener Standard Mix: Obtained as a Certified Reference Standard from [redacted] If the chemical purity is 98% or greater, the weight may be used without correction to compute the concentration of the standard. Once a standard ampoule has been vortexed and opened, the solution is transferred to an amber glass vial with a Teflon®-lined screw cap. When not being used, the standard is stored in a dark box at room temperature. This purchased standard

is used to prepare the following target stock solution and spiking solution:

7.4.1 Target PCB Congener Stock Solution: Prepared by diluting the 4000 ng/mL target PCB congener standard mix to a concentration of 40 ng/mL in nonane. The concentration is verified by GC/MS before use.

7.4.2 LCS Target Spiking Solution: Prepared by diluting the 4000 ng/mL target PCB congener standard to a concentration of 5.0 ng/mL in acetone. One mL of this solution is added to each solid/tissue LCS prior to extraction, whereas, 0.20 mL is added to each aqueous LCS.

7.5 Calibration Standard Solutions (CS 0.5 through CS 5) are prepared by dilution of the target PCB congener standards in section 7.5 and 7.5.1 and the IDA standards in section 7.4 in nonane. Table 6a shows the calibration solution analytes and final concentrations. Table 6b provides details for preparation of these calibration solutions.

7.5.1 This series of solutions is used to establish linearity and relative response factors for all compounds in the initial calibration solutions. These RRFs are used to quantify PCB congeners in the calibration verification (VER) and all samples. The CS3 standard is used for calibration verification. The VER solution is also used to verify chromatographic performance.

7.6 PCB Congener Mix 1 through 5 standard solutions containing all 209 isomers are Certified Reference Standards [redacted] Once the ampoule has been sonicated and opened, the solution is transferred to an amber glass vial with Teflon®-lined cap and is used as received. These five mixes are run to determine the retention times for each of the congeners and which congeners will co-elute for each new SPB Octyl column used.

7.6.1 Initial Calibration Verification Standard. This is a single solution containing all 209 individual PCBs as well as IDA and Istd at the following concentrations:

- mono, di, and tri CBs at 50 ng/mL
- tetra, penta, hexa and hepta CBs at 100 ng/mL
- octa, nona, and deca CBs at 150 ng/mL
- IDAs and Istds are at the same concentration as the calibration standards (CS 0.5 – CS 5).

This solution is always analyzed immediately after the initial calibration.

7.6.1.1 [redacted]

7.6.2 [redacted]

7.7 QC Check Sample - A QC Check Sample should be obtained from a source independent of the calibration standards. This check sample is a certified standard reference material (SRM) containing the PCBs in known concentrations in a sample matrix similar to the matrix under test. [redacted]

8 Sample Collection, Preservation and Storage

8.1 Sampling is not performed for this method by Eurofins Knoxville. For information regarding sample shipping, refer to SOP KNOX-SC-0003, “Sample Receipt and Login”, current revision.

8.2 Holding Times

8.2.1 Store sample extracts in a dark box at room temperature until analyzed. If stored in the dark at room temperature, sample extracts may be stored for up to one year.

9 Quality Control

9.1 Initial precision and recovery (IPR) or initial demonstration of capabilty (IDOC) samples are analyzed to demonstrate the ability to generate acceptable precision and accuracy.

9.1.1 For aqueous samples, extract, clean, concentrate, and analyze four 1-L aliquots of reagent water spiked with IDAs, surrogate standard, internal standard and the LCS spiking solution, according to the procedures in section 11. For solid/tissue samples, extract, clean, concentrate, and analyze four aliquots of sodium sulfate/corn oil spiked with IDAs, surrogate standard, internal standard and the LCS spiking solution, according to the procedures in section 11. All steps that are to be used for processing samples, including preparation, extraction and cleanup, shall be included in this test.

9.1.2 Using the results of the set of four analyses, compute the average percent recovery (%R) of the extracts and the relative standard deviation (%RSD) of the concentration in ng/L (aqueous) and ng/g (solid) for each compound.

9.1.3 For each PCB and labeled compound, compare the %RSD and %R with the corresponding limits for initial precision and recovery in the approprirate Table 10A or 10B. If the RSD and %R for all compounds meet the acceptance criteria, system performance is acceptable and analysis of samples may begin. If, however, any individual %RSD exceeds the precision limit or any individual %R falls outside the range for accuracy, system performance is unacceptable for that compound. Correct the problem and repeat the test.

9.2 Isotope Dilution Analytes (IDAs)

9.2.1 Every sample, blank, and QC sample is spiked with isotope dilution analytes. IDA recoveries in samples, blanks, and QC samples must be assessed to ensure that recoveries are within established limits. When properly applied, results from isotope dilution techniques are independent of recovery. The recovery of each IDA should be within the limits in Table 10A or 10B depending on the method revision being used. If the recovery is outside these limits the following corrective action should be taken:

- Check all calculations for error.
- Ensure that instrument performance is acceptable; if applicable, a daily CCV will be analyzed to confirm instrument performance.
- Recalculate the data and/or reanalyze if either of the above checks reveal a problem.
- If the recovery of any IDA is less than the limits indicated in Tables 10A and 10B, calculate the S/N ratio of the IDA. If the S/N is > 10 and the estimated detection limits (EDLs) are less than the estimated minimum levels (EMLs), report the data as is with qualifiers in the report and a discussion in the case narrative. If the S/N is < 10 or the estimated detection limits (EDLs) are greater than the estimated minimum levels (EMLs), re-extract and reanalyze the sample. If the ion chromatogram of the FC-43 lock mass indicates ion suppression in the region where the IDA elutes, reanalyzing the extract at up to a 1/10 dilution may improve the IDA recovery. If the poor IDA recovery is judged to be a result of sample matrix, a reduced portion of the sample may be re-extracted or additional cleanups may be employed. The decision to reanalyze or flag the data should be made in consultation with the client.

9.3 Surrogate Standards: Every sample, blank, and QC sample extract is spiked with $^{13}C_{12}$ labeled surrogate standards after extraction but prior to extract cleanup. They are used to assess the efficiency of the cleanup procedures.

9.4 ISTDs: Every sample, blank, and QC sample extract is spiked with $^{13}C_{12}$ labeled istds prior to analysis. They are used to measure the recovery of the istds and the surrogate standards.

9.5 Method Blanks

9.5.1 A laboratory method blank must be run along with each analytical batch of 20 or fewer samples. The method blank consists of reagent water for aqueous samples, sodium sulfate for solid and tissue samples, processed in the same manner and at the same time as the associated samples. The method blank is used to identify any background interference or contamination of the analytical system that may lead to the reporting of elevated concentration levels or false positive data. Analyze the method blank immediately after analysis of the LCS to demonstrate freedom from contamination. If CBs will be carried over from the LCS into the method blank, analyze one or more aliquots of solvent between the LCS and the method blank. The method blank should not contain any of the compounds of interest at a concentration above the estimated minimum level (EML) shown in Table 4.

9.5.2 Corrective action is required when compounds of interest are detected in the method blank above the EML. Corrective action may include reanalysis of the method blank. Contact the Project Manager to determine further corrective action. At a minimum, all associated results are qualified with a B flag. Re-extraction and reanalysis of all samples associated with a contaminated method blank is required if requested by the client or Project Manager. Investigation of the source of the method blank contamination will be initiated before further samples are extracted.

9.5.3 The method blank should have acceptable IDA recoveries. If IDA recoveries are not acceptable, the data must be evaluated to determine if the method blank has served the purpose of demonstrating that the analysis is free of contamination. If IDA recoveries are low and the following criteria are met, the MB is considered acceptable: S/N > 10/1 for all IDA masses, EDL<ML for all target analytes, all positive detections are below the ML.

9.6 Instrument Blank

9.6.1 Instruments must be evaluated for contamination during each 12-hour analytical run. This may be accomplished by analysis of a method blank. If a method blank is not available, an instrument blank must be analyzed.

9.6.2 An instrument blank consists of solvent with the IDAs and internal standards added. It is evaluated in the same way as the method blank.

9.7 Laboratory Control Sample – A laboratory control sample (LCS) is prepared and analyzed with every batch of 20 or fewer samples. All target analytes listed in Table 10A or 10B must be within established control limits. The LCS is spiked with the compounds listed in Table 5a.

9.7.1 If any target in the LCS is outside the control limits, corrective action must occur. Corrective action may include re-extraction and reanalysis of the batch.

- If the batch is not re-extracted and reanalyzed, the reasons for accepting the batch must be clearly presented in the project records and the report.
- If re-extraction and reanalysis of the batch is not possible due to limited sample volume or other constraints, the LCS is reported and the failure is documented in the project narrative.

9.8 QC Check Sample - Analyze the QC Check Sample (section 7.8) periodically to assure the accuracy of calibration standards and the overall reliability of the analytical process. It is suggested that the QC Check Sample be analyzed at least annually.

10 Calibration and Standardization

10.1 Three types of calibration procedures are required. The first type establishes retention times, relative retention times and relative retention time windows to be used during the subsequent calibrations and analyses. The second type, initial calibration, is required to establish response factors and is required before any samples are analyzed. It may be required intermittently throughout sample analyses as dictated by the results of continuing calibration procedures

described below. The third type, continuing calibration, consists of analyzing the continuing calibration verification solution (VER). No samples are to be analyzed until acceptable calibration as described in sections 10.2, 10.3 and 10.4 is demonstrated and documented.

10.2 Retention Time Calibration

Retention time calibration is required if the retention time criteria cannot be met.

10.2.1 The absolute retention time of CB 209 must exceed 55 minutes. Otherwise the GC temperature program must be adjusted and the test repeated until the requirement is met.

10.2.2 **NOTE**: When adjusting chromatographic conditions, the resolution requirements of sections 10.4.5.7 to 10.4.5.8 must be maintained.

10.2.3 Tune the instrument to meet the mass resolution and mass accuracy requirements of section 10.3.2. Document the resolution and accuracy.

10.2.4 Analyze 1 µL of each of the five individual PCB mixtures (section 7.7.3). Set the switch-points for the MID descriptors. The switch-points must be set to insure that the first and last eluting isomer of each homolog group and the labeled IDAs are acquired properly. Determine the average retention time of each PCB congener using the elution order information in Table 11.

NOTE 1: PCB Mixture 5 (M-1668A-5) contains the first and last eluting isomer in each homolog group for the SPB-Octyl column (see Table 7).

NOTE 2: Laboratory data has indicated that the SPB-Octyl column can exhibit significant differences in performance from column to column. It has also been indicated that the column's performance can change significantly due to oxidation with subsequent changes in congener retention times and elution order. The individual PCB mixtures should be analyzed whenever the column's performance or specific congeners retention times are in doubt.

10.2.5 Calculate the relative retention times for all target and labeled congeners, using their retention time references from Table 2 (RT Ref). Calculate the relative retention time for each run in which the congener and its retention time reference are present Five RRTs will be calculated for each IDA. Use the generated retention times for all target and labeled congeners as the RT calibration source in the calculation software.

10.2.6 Calculate the relative retention time window using the absolute retention time windows (RT Window) from Table 2.

$$\text{RRT Limit Low} = \frac{RT_A - (RT_{WIN}/2)}{RT_{IS}}$$

$$\text{RRT Limit High} = \frac{RT_A + (RT_{WIN}/2)}{RT_{IS}}$$

Where:

RT_A = Average retention time of analyte.

RT_{IS} = Average retention time of RT reference.

RT_{WIN} = Absolute RT window in seconds from Table 2.

10.2.7 A single pair of RRT limits is used for all congeners in coeluting set. Use the RRT Limit Low that was calculated for the first eluting congener, and the RRT Limit High calculated for the last eluting congener (in the coelution set).

10.3 Initial Calibration

Initial calibration is required before any samples are analyzed for PCBs. Initial calibration is also required if any continuing calibration (section 10.4) does not meet the required criteria in section 10.4.5 after routine maintenance.

10.3.1 Prepare multi-level calibration standards containing the compounds and concentrations as specified in Table 6a. Calibration standards should be stored at room temperature and preferably in amber vials. Calibration standard solutions have an expiration date of ten (10) years from date of receipt based on stability of PCBs and history of vendor's recertification of standard lots.

10.3.2 Establish operating parameters for the GC/MS system (suggested operating conditions are displayed in Figure 1 and Figure 2). By using a FC43 molecular leak, tune the instrument (see the appropriate instrument manufacturer's operating manual for tuning instructions) to meet the minimum resolving power of 10,000 (10 percent valley) at mass 313.9834 (FC43). For each MID descriptor group, monitor and record the mass resolution and exact masses of three reference peaks covering the mass range of the descriptor (see below). By using peak matching techniques, verify that the deviation between the exact mass and the theoretical mass for each mass monitored is less than 5 ppm. Iteratively adjust operating parameters and tuning values until the mass resolution and mass accuracy criteria are met for each ion. Document the mass resolution and mass accuracy for each of MID group ion sets.

MID Group 1 FC43 ions - 168.9883, 213.9897, 263.9866
MID Group 2 FC43 ions - 263.9866, 313.9834, 375.9802
MID Group 3 FC43 ions - 313.9834, 375.9802, 413.9770
MID Group 4 FC43 ions - 413.9770, 463.9738, 501.9706

10.3.3 Inject a 1 µL aliquot of the CS 0.5 calibration solution.

10.3.3.1 Ion abundance ratios, minimum levels, and signal-to-noise ratios.

10.3.3.1.1 Measure the selected ion current profile areas for each congener or congener group, and compute the ion abundance ratios at the exact masses specified in Table 8. Compare the computed ratio to the theoretical ratio given in Table 9.

10.3.3.1.2 All Toxic/LOC and labeled compounds in the CS-0.5 standard must be within the QC limits in Table 9 for their respective ion abundance ratios; otherwise, the mass spectrometer must be adjusted and this test repeated until the mass ratios fall within the limits specified. If the adjustment alters the resolution of the mass spectrometer, resolution must be verified (Section 10.3.2) prior to repeat of the test.

10.3.3.1.3 The peaks representing the CBs and labeled compounds in the CS-0.5 calibration standard must have signal-to-noise ratios (S/N) ≥ 10; otherwise, the mass spectrometer must be adjusted and this test repeated until the signal to noise criteria are met.

10.3.3.1.4 FC-43 does not interfer with dichlorinated biphenyls.

10.3.4 Analyze 1 µL of each of the other calibration standards.

10.3.4.1 Isomer specificity

10.3.4.1.1 Use the CS-3 calibration standard to evaluate column performance. The toxic isomers must be uniquely resolved from all other congeners. Isomers may be unresolved so long as they have the same toxicity equivalency factor (TEF) and response factor and so long as these unresolved isomers are uniquely resolved from all other congeners. For example, the SPB-Octyl column achieves unique GC resolution of all Toxics except congeners with IUPAC numbers 156 and 157. This isomeric pair is uniquely resolved from all other congeners and these congeners have the same TEF and response factor.

10.3.4.1.2 Evaluate and document the percent valley between PCBs 34 and 23. The valley height must be less than 40 percent of the height of the shorter of the two peaks.

10.3.4.1.3 Evaluate and document the percent valley between PCBs 187 and 182. The valley height must be less than 40 percent of the height of the shorter of the two peaks.

10.3.4.1.4 Classify each congener as resolved or as a member of a coelution set. To be documented as resolved, the valleys between any two isomers must be less than 40 percent of the height of the shorter of the two adjacent peaks. Each member of a coelution set is designated with a qualifier in the format of CXXX, where XXX = the lowest numbered congener in the set. For example, if PCB 156 and PCB 157 coelute, qualify PCB 157 with “C156”.

10.3.4.2 Calculate the RRF of each compound of interest (target analytes, coelution sets, IDAs, and surrogate standards) vs. the appropriate reference standard (as specified in Table 2) using the following equation:

$$RRF = \frac{As \times Cis}{Ais \times Cs}$$

Where:

As = sum of the areas of the quantitation ions of the compound of interest.
Ais = sum of the areas of the quantitation ions of the appropriate reference standard.
Cis = concentration of the appropriate reference standard.
Cs = concentration of the compound of interest.

NOTE: When calculating the RRF for a coelution set, sum the areas of all isomers in the set. Use the resulting RRF for all congeners within the set.

10.3.4.3 Calculate the mean relative response factor (mean RRF) and the percent relative standard deviation (%RSD) of the response factors for each compound of interest in the six calibration standard solutions using the following equations:

$$\overline{RRF}_{n=6} = \frac{1}{n} \times \sum_{i=1}^{n} RF_i$$

$$\%RSD_{n=6} = \sqrt{\frac{\sum_{i=1}^{n}\left(RF_i - \overline{RRF}\right)^2}{n-1}} \times \frac{100}{\overline{RRF}}$$

10.3.4.4 Criteria for Acceptable Calibration - The criteria listed below for acceptable calibration must be met before sample analyses are performed. If acceptable initial calibration is not achieved, identify the root cause, perform corrective action, and repeat the initial calibration. If the root cause can be traced to problems with an individual analysis within the calibration series, repeat the individual analysis and recalculate the percent relative standard deviation. If the calibration is acceptable, document the problem and proceed, otherwise repeat the initial calibration.

10.3.4.5 The percent relative standard deviation (%RSD) for the mean relative response factors for the unlabeled native analytes calculated by isotope dilution must not exceed 20 percent. The percent RSD for the mean relative response factors for the unlabeled target analytes calculated by IDA must not exceed 35 percent. The percent RSD for the mean relative response factors for the labeled IDAs must not exceed 35 percent.

10.3.5 Analyze 1 µL of the Initial Calibration Verification (ICV) Standard in section 7.6.1 after completion of the ICAL prior to sample analysis. Calculate the concentration of the ICV

using the RRFs from the CS-3 standard analyzed in section 10.3.4. Calculate the percent difference (%D) between the expected and the calculated ICV concentration using the following formula:

$$\%D = \frac{(C_{Exp} - C_{Calc})}{C_{Exp}} \times 100$$

Where:
C_{Exp} = The expected concentration of the ICV Standard.
C_{Calc} = The calculated concentration of the ICV Standard.

10.3.5.1 The criteria for acceptance of the ICV Standard are as follows:

10.3.5.2 The %D may not exceed ±35% for more than 4 of the native and labeled compounds.

- The %D may not exceed ±50% for any native or labeled compound.

10.3.5.3 All data associated with compounds with percent differences exceeding ±35% must be reviewed before acceptance and shall be documented as a NCM. In addition, all data associated with these compounds require corrective action that may include the following:

- Reanalyze the ICV Standard.
- Replace and reanalyze the ICV Standard.
- Evaluate the instrument performance.
- Evaluate the Initial Calibration Standards.

10.3.6 A readback of the low calibration point used in the calibration curve should have a read-back (%D) of no more than 50% for any calibration model. The readback of the non low level standards of the initial calibration should have a read-back (%D) of no more than 30% for any calibration model.

10.4 Continuing Calibration

10.4.1 Continuing calibration is performed at the beginning of a 12-hour period after successful mass resolution check.

10.4.2 Document the mass resolution performance as specified in section 10.3.2 at both the beginning and end of the 12-hour period.

10.4.3 Analyze 1 µL of the Continuing Calibration Verification Standard (VER/CS3). Calculate the concentration (C) of the compounds of interest (target analytes, IDAs, and surrogate standards) vs. the appropriate quantitation reference (as specified in Table 2) using the following equation:

$$C = \frac{As \times Cis}{Ais \times RRF}$$

Where:

As = sum of the areas of the quantitation ions of the compound of interest.
Ais = sum of the areas of the quantitation ions of the appropriate reference standard.
Cis = concentration of the appropriate reference standard.
RRF = mean relative response factor from section 10.3.4.2.

10.4.4 Calculate the concentrations as percentages of the test concentrations and compare them to the limits specified in the appropriate Table 10A or 10B using the following equation:

$$C_{ver}\% = \frac{C_{ver}}{C_{test}} \times 100$$

Where:

C_{ver} = the concentration of the VER standard calculated in section 10.4.3
C_{test} = the test concentration of the VER standard listed in Table 6a.

10.4.5 Criteria for Acceptable Calibration - The criteria listed below for acceptable calibration must be met before sample analyses are performed. If the acceptance criteria are met, the calibration is deemed to be in control and the RRFs generated from the initial calibration are used to quantify samples. If acceptable calibration is not achieved, identify the root cause, perform corrective action, and repeat the continuing calibration. If a second consecutive attempt at a continuing calibration fails, two consecutive calibrations must meet the criteria, or an initial calibration must be run before proceeding with client samples.

10.4.5.1 The ion abundance ratios of the peaks representing the Toxics/LOCs and labeled standards must be within the control limits specified in Table 9.

10.4.5.2 The S/N for the GC signals present in every selected ion current profile (including those for labeled standards) must be ≥ 10.

10.4.5.3 For Toxic and LOC congeners, as listed in the first section of Table 10A or 10B, the percent of the calculated concentration relative to the test concentration must be within 70-130% for 1668A and 1668B and 75-125% for 1668C.

10.4.5.4 For non-Toxic congeners the calculated concentrations must be within 70-130% of the test concentrations for 1668A, 1668B and 1668C.

10.4.5.5 The absolute retention times (RT) of the labeled IDAs must be within ±15 seconds of the retention times obtained during initial calibration.

10.4.5.6 The relative retention times (RRT) of the Toxics/LOC congeners must be within their respective RRT limits generated in the retention time calibration in section 10.2.

10.4.5.6.1 If the RRTs or RTs are not within the limits above, the GC may not be performing properly. However, routine column maintenance

may include removing short amounts of the beginning of the column when active sites or non-volatile compounds in sample extracts cause poor chromatography and loss of specificity. Shortening of the column can cause the RRTs or RTs to fall outside the above limits.

10.4.5.6.2 When the RRT of any compound or the RT of any IDA is not within the above limits, corrective action must be taken. If the GC is not performing properly, correct the problem and repeat the test. If the GC is performing properly but the RRTs or RTs have changed due to routine column maintenance, adjust the GC or replace the GC column, then repeat the test or repeat the retention time calibration.

10.4.5.7 Evaluate and document the percent valley between PCBs 34 and 23. The valley height must be less than 40 percent of the height of the shorter of the two peaks.

10.4.5.8 Evaluate and document the percent valley between PCBs 187 and 182. The valley height must be less than 40 percent of the height of the shorter of the two peaks.

10.4.6 Daily calibration must be performed every 12 hours of instrument operation. The 12-hour shift begins with the documentation of the mass resolution followed by the injection of the Continuing Calibration Standard (VER).

11 Procedure

11.1 One time procedural variations are allowed only if deemed necessary in the professional judgement of supervision to accommodate variations in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variations in the procedure, except those specified by project specific instructions, shall be completely documented using a Nonconformance Memo and approved by a Technical Specialist, Project Manager, and QA Manager. If contractually required, the client shall be notified.

Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

11.2 Sample Extraction and Cleanup

The extraction and cleanup procedures are described in SOP KNOX-OP-0021, "Extraction of Polychlorinated Biphenyl (PCB) Isomers for Analysis by Isotope Dilution HRGC/HRMS", current revision.

11.3 Sample Analysis

11.3.1 Analyze the sample extracts under the same instrument operating conditions used to perform the instrument calibrations. Inject 2 µL into the GC/MS and acquire data beginning at 11 minutes and ending after decachlorobiphenyl has eluted from the column.

11.3.2 The RTs of the unambiguous labeled congeners (RT Markers) are used to calculate a least squares best fit regression for retention times compared to those of the retention time calibration.

11.3.3 The resulting regression is used to calculate predicted retention times for target analytes. These predicted retention times are used by the software to identify candidate peaks for targets.

11.3.4 The analyst reviews the peaks identified as targets and determines whether to accept the identification. This determination is made by evaluating the retention time values against the shift from the predicted retention times

11.3.5 A RRT window is calculated by multiplying the RRT Limit High and the RRT Limit Low by the retention time of the designated RT reference.

11.4 HRGC/HRMS Troubleshooting Guide

11.4.1 Perform the instrument's leak check: Evaluate the air spectrum. Mass 28 should be less than 5 times mass 69. If the air spectrum is not acceptable, replace transfer line ferrule and/or pump out PFK reservoir.

11.4.2 Check daily calibration standard: Evaluate the signal to noise (S/N), examine peak shape/chromatography, and evaluate response factors. Refer to specific SOP's requirements and acceptance criteria for all natives and internal standards. If daily calibration is not acceptable , perform the following troubleshooting options as needed and reanalyze a daily CS-3 calibration standard:

- Replace the inlet seal and clean the injection port body with methanol to improve response factor.
- Perform column/injector port maintenance and/or retune the instrument to resolve chromatography/resolution, signal to noise issues.
- Perform a gain test on the electron multiplier.
- Adjust the tuning parameters of the instrumentation to achieve optimum sensitivity and peak shape.
- Evaluate carryover from sample analyses. If carryover or contamination is suspected, run solvent rinses (nonane) under MID to evaluate the contamination.
- When troubleshooting cannot resolve an instrument problem, a manufacture's service engineer may be consulted for possible solution, or called onsite for diagnosis/repair.

11.5 Refer to the Eurofins Knoxville Quality Assurance Manual, KX-QAM, current revision for the HRGC/HRMS instrument equipment maintenance table.

12 Data Analysis and Calculations

12.1 Qualitative Identification Criteria for PCBs

For a gas chromatographic peak to be identified as a PCB, it must meet all of the following criteria:

12.1.1 The signals for the two exact masses in Table 8 must be present and must maximize within ±2 seconds.

12.1.2 The ratio of the integrated areas of the two exact masses specified in Table 8 must be within the limits in Table 9. Alternately, the ratios may be within ±15% of the ratio in the midpoint (CS-3) calibration or calibration verification (VER), whichever is most recent.

12.1.3 The relative retention time of the peak for a CB must be within the RRT QC limits calculated in section 10.2.5.

NOTE: For target CBs determined by IDA quantitation, a given CB congener may fall within more than one RT window and be misidentified unless the RRT windows are made very narrow, as in Table 2. Therefore, consistency of the RT and RRT with other congeners and the labeled compounds may be required for rigorous congener identification. Retention time regression analysis may be employed for this purpose.

12.1.4 If identification is ambiguous, (i.e., some, but not all of the identification criteria are met for a congener) an experienced analyst must determine the presence or absence of the congener.

12.2 Quantitation for PCBs

12.2.1 Calculate the IDA Recoveries (Ris) relative to the istd according to the following equation:

$$Ris = \frac{Ais \times Qrs}{Ars \times RRFis \times Qis} \times 100\%$$

Where:

Ais = sum of the areas of the quantitation ions of the appropriate IDA
Ars = sum of the areas of the quantitation ions of the istd
Qrs = ng of istd added to extract
Qis = ng of IDA added to sample
RRFis = mean relative response factor of IDA obtained during initial calibration

NOTE: In some situations, such as source testing, the extract is split for multiple analyses. In this case, Qrs must be correctly calculated to account for the splitting of extracts before the istd was added.

$$\mathrm{Qrs} = \mathrm{Qrss} \times \mathrm{Split}$$

Where:

Qrs = ng of istd added to extract
Qrss= ng of istd added to the split portion of the extract

Split= split ratio of the extract

12.2.2 Calculate the concentration of individual PCBs according to the following equation:

$$Concentration = \frac{As \times Qis}{Ais \times RRF \times W \times S}$$

Where:

As = sum of the areas of the quantitation ions of the compound of interest
Ais = sum of the areas of the quantitation ions of the appropriate IDA
Qis = ng of IDA added to sample
RRF = mean relative response factor of compound obtained during initial calibration
W = amount of sample extracted (grams or liters)
S = decimal expression of solids (optional, if results are requested to be reported on dry weight basis)

12.2.3 If reporting results for Total Homolog Groups, calculate the total concentration of all isomers within each homolog group by summing the concentrations of the individual PCB isomers within that homolog group.

12.2.4 If no peaks are present in the region of the ion chromatogram where the compounds of interest are expected to elute, calculate the estimated detection limit (EDL) for that compound according to the following equation:

$$\mathrm{EDL} = \frac{\mathrm{N} \times 2.5 \times \mathrm{Qis}}{\mathrm{His} \times \mathrm{RRF} \times \mathrm{W}}$$

Where:

N = sum of peak to peak noise of quantitation ion signals in the region of the ion chromatogram where the compound of interest is expected to elute
His = sum of peak heights of quantitation ions for appropriate IDA
Qis = ng of IDA added to sample
RRF = mean relative response factor of compound obtained during initial calibration
W = amount of sample extracted (grams or liters)

12.2.5 If peaks are present in the region of the ion chromatogram which do not meet the qualitative criteria listed in section 12.1, calculate an Estimated Maximum Possible Concentration (EMPC). Use the equation in section 12.2.2, except that “As” should represent the sum of the area under each mass peak calculated using the theoretical chlorine isotope ratio. The peak selected to calculate the theoretical area should be the one which gives the lower of the two possible results (i.e., the EMPC will always be lower than the result calculated from the uncorrected areas).

12.2.6 If the concentration in the final extract of any PCB isomer exceeds the upper method calibration limits, a dilution of the extract must be performed. If compound concentrations exceeding the calibration range cannot be brought within the calibration range by a dilution, a post dilution spike can be performed. The lab may report the measured concentration and indicate that the value exceeds the calibration limit by

flagging the results with "E". Consultation with the client should occur before compounds are reported which exceed the calibration range.

12.3 The estimated minimum level (EML) is defined as the lowest concentration at which an analyte can be measured reliably with common laboratory interferences present assuming a sample is extracted at the recommended weight or volume and is carried through all normal extraction and analysis procedures. The EMLs for different matrices and extract volumes are listed in Table 4. Deviations from the extraction amounts or final volumes listed will result in corresponding changes in the actual sample EMLs.

12.4 Flag all compound results in the sample which are below the estimated minimum level with a "J" qualifier.

12.5 Flag all compound results in the sample which were detected in the method blank with a "B" qualifier.

12.6 Flag all compound results in the sample which are above the upper calibration limit with an "E" qualifier.

12.7 Flag all compound results in the sample which are "Estimated Maximum Possible Concentrations" with a "Q" qualifier or appropriate program qualifier.

12.8 Flag compound results in the sample that may contain co-eluting compounds with a "C" qualifier.

12.8.1 Flag congeners known to coelute with a higher numbered congener with a "C" qualifier.

12.8.2 Flag congeners that coelute with a lower numbered congener with a "Cx" qualifier where x is the CAS PCB number of the lowest numbered congener in the coeluting group.

12.9 If DOD QSM requirements are used, refer to SOP KNOX-QA-0021.

12.10 Flag compound results in the sample that may be affected by ion suppression with a "S" qualifier. When ion suppression of a FC-43 trace occurs at greater than or equal to 20% of full scale on both the lock mass and QC mass traces, and when the suppression is sustained for greater than 4 seconds, the suppression must be evaluated to determine which, if any, PCB congeners co-elute with the suppression. Samples may be diluted to decrease the effects of the ion suppression and rerun. Congeners that are determined to co-elute with the suppression are flagged with an "S" qualifier.

12.11 Data Review

12.11.1 Refer to Figure 3 for an example data review checklists used to perform and document the review of the data. Using the data review checklist, the analyst also creates a narrative which includes any qualifications of the sample data.

12.11.2 The analyst who performs the initial data calculations must first level review the raw data to document that they have performed the qualitative and quantitative analysis on the sample data.

12.11.3 A second analyst must verify all qualitative peak identifications and second level review the raw data. If discrepancies are found, the data must be reviewed by the first analyst before a change is made.

12.11.4 All items listed on the data review checklist must be checked by both the analyst who performed the initial qualitative and quantitative analysis and the analyst who performed the second level review. An example data review checklist is shown in Figure 3.

13 Method Performance

13.1 Method Detection Limit (MDL) - An MDL must be determined for each analyte in each routine matrix prior to the analysis of any samples. Method Detection limits are determined and verified as specified in the current revision of SOP NDSC-QA-SOP42091,current revision, based on 40 CFR Part 136 Appendix B. The result of the MDL determination must support the reporting limit. Current method detection limits are available in the TestAmerica Laboratory Information Management System (TALS).

13.2 Initial Demonstration of Capability – Each analyst must perform an initial demonstration of capability (IDOC) for each target analyte prior to performing the analysis independently. The IDOC is determined by analyzing four replicate spikes (e.g., LCSs) as detailed in Eurofins Knoxville SOP KNOX-QA-0009.

13.3 Training Qualification: The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its use and has the required experience. Refer to SOP KNOX-QA-0009 current revision for further requirements for performing and documenting initial and on-going demonstrations of capability**.**

14 Pollution Prevention

14.1 All attempts will be made to minimize the use of solvents and standard materials.

15 Waste Management

15.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for “Waste Management and Pollution Prevention.”

15.2 Waste Streams Produced by the Procedure: The following waste streams are produced when this method is carried out.

15.2.1 Miscellaneous disposable glassware, chemical resistant gloves, bench paper and similar materials shall be placed in the incinerable laboratory waste stream, contained in a steel or poly satellite accumulation container.

16 References

16.1 Knoxville Laboratory Quality Assurance Manual (QAM), current revision.

16.2 Method 1668, Revision A, B and C: Chlorinated Biphenyl Congeners in Water, Soil, Sediment and Tissue by HRGC/HRMS, EPA-821-R-00-002, December 1999.

16.3 Method 1613: Tetra- through Octa-Chlorinated Dioxins and Furans by Isotope Dilution HRGC/HRMS [Revision B], EPA#: 821/B-94-005a YEAR: 1994

16.4 Ballschmiter, K. and M. Zell, "Analysis of Polychlorinated Biphenyls (PCB) by Glass Capillary Gas Chromatography", *Fresenius Z. Anal. Chem*., 302:20-31 (1980).

16.5 Schulte, E. and R. Malisch, "Berechnung der Wahren PCB-Gehalte in Umweltproben I. Ermittlung der Zusammensetzung Zweier Technischer PCB-Gemische," *Fresenius Z. Anal. Chem*., 314:545-551 (1983).

16.6 Guitart, R., P. Puig and J. Gómez-Catalán, "Requirement for a Standardized Nomenclature Criterion for PCBs: Computer-Assisted Assignment of Correct Congener Denomination and Numbering," *Chemosphere*, 27(8):1451-1459 (1993).

16.7 Rigaudy, J. and Klesney, S.P., Nomenclature of Organic Chemistry, Pergamon, 1979.

16.8 Pretsch, Clerc, Seibl, Simon, Tables of Spectral Data for Structure Determination of Organic Compounds, Second Edition, Springer-Verlag, 1989.

16.9 CRC Handbook of Chemistry and Physics, 71st edition, CRC Press, 1990-1991.

16.10 Email dated 03/02/10 from Richard Reding Ph.D., Chief U.S. EPA, Engineering & Analytical Support Branch. Engineering & Analysis Division Office of Science and Technology, Office of Water – Subject: Use of QC Acceptance Limits."

16.11 NDSC-QA-SOP43862, "Manual Integrations", current revision.

16.12 NDSC-QA-QP44940, "Calibration Curves and the Selection of Calibration Points", current revision.

16.13 Eurofins SOP NDSC-QA-SOP42091, "Detection and Quantitation Limits", current revision

17 Miscellaneous

17.1 Deviations from EPA Method 1668, Revisions A, B and C.

17.1.1 Additional internal standards are used in this procedure. The additional standards are listed in Table 1.

17.1.2 Additional labeled standards are used in this procedure as field sampling surrogates. The additional standards are listed in Table 1

17.1.3 This procedure uses IDAs which are within the same MID group as the target congener that is being calculated. This improvement is used to reduce the effects of full verses reduced accelerating voltage tuning differences which can be exaggerated when crossing MID groups.

17.1.4 The calibration procedure in the method 1668A, revision B, and C call for a single point

standard for the non-Toxic/LOC congeners. This procedure uses a multi-point calibration for all 209 congeners.

17.1.5 This procedure uses MID groups that differ from the method. The procedure uses 4 groups, rather than 6, to improve instrument stability, by holding the magnet current steady for longer periods. Therefore alternate reference gas lock masses are monitored, to reflect the mass ranges of the procedures MID groups. The SOP allows the use of FC-43 as the instrument reference compound based on the manufacturer's recommendation. Section 10.2.1 of Methods 1668A, 1668B and 1668C allows the use of other reference material than PFK.

17.1.6 This procedure uses average retention times (and average relative retention times) produced by analysis of the 5 mixes specified, rather than single analyses of the diluted 209 standard.

17.1.7 The absolute retention times, relative retention times, and relative retention time limits used by the laboratory differ from those listed in all versions of Method 1668. Each SPB-Octyl column lot used by the laboratory has exhibited slightly different retention time characteristics resulting in different absolute retention times than those listed in the method or those observed with another SPB-Octyl column lot. To ensure that the correct peak assignments are made, a retention time study is performed for each new column lot to verify the original study. This study includes the analysis of the five retention time mixes listed in Method 1668A as described in Section 10.2. If the retention time study is found to be different than the original elution pattern, a new ICAL will be performed. This procedure requires a minimum elution time of 55 minutes for PCB 209.

17.1.8 The calibration verification procedures in the method call for updating the retention times, relative retention times and response factors for non-Toxic compounds during daily calibration and use the retention times, relative retention times and response factors from the initial calibration for Toxic and LOC compounds. This laboratory uses the retention times and relative retention times from analysis of the 5-mix series, which contains all congeners, and uses response factors from the initial calibration for all 209 compounds. The practice of updating the relative retention times of only a subset of compounds causes significant error in the linear regression prediction formulas used by targeting software to identify the compounds. This procedure has provisions for updating all RTs and RRTs by analyzing a new retention time calibration series.

17.1.9 The EMLs listed in Table 4 differ from those listed in the reference method. The EMLs are set above the mean plus 2 standard deviations for the higher of detections or EDLs for method blanks. In no case is the EML lower than the low calibration limit. The survey period was approximately 14 months.

17.1.10 This procedure uses a 100uL final volume for solid samples, or a variation depending on the protocol assigned to the sample based on screen results prior to extraction.

17.1.11 Method 1668C requires istd standards be added immediately prior to analysis. In this procedure istd standards are added to sample extracts at the conclusion of the extraction / clean up process prior to analysis.

17.1.12 Method 1668C implies that all qualitative criteria must be met in order for a positive hit to be reported. This procedure allows positive hits to be reported with "Q" qualifiers or appropriate program qualifier.

17.1.13 This procedure uses calculated concentrations for determining if a dilution is required not area counts as suggested by Method 1668C, section 17.5.

17.1.14 This procedure reports positive hits below the estimated minimum level (EML) which are determined to be greater than 2.5 signal to noise. These hits are qualified with a "J" or appropriate program qualifier.

17.1.15 This procedure does not report blank corrected values.

17.1.16 When samples are diluted to bring a native analyte within the upper calibration range all 209 congeners are reported from this analysis. This procedure reports all congeners from one analytical analysis.

17.1.17 This procedure uses a daily calibration CCV consisting of all 209 congeners at the beginning of each 12 hour analytical shift.

17.1.18 Extracts are stored in a dark box at room temperature in the same manner as standards.

17.1.19 1668C EML limits are listed in Table 4. However, this laboratory currently uses the 1668A/B limits

17.1.20 The limits established in 1668B, Table 6 for the IPR and OPR performance evaluations have been observed by EPA reviewers to penalize an analyst who achieves better performance than those observed in the inter-laboratory study. Based on EPA's recommendations (section 16.10), Eurofins TestAmerica Knoxville performs analysis by Method 1668B with the QC acceptance criteria in Table 6 of EPA Method 1668A. Table 10 "Acceptance Criteria for Performance Tests" of this SOP will be used for the IPR and OPR limits.

17.2 List of tables and figures referenced in the body of the SOP.

17.2.1 Table 1 – Polychlorinated Biphenyls Determined by High Resolution Gas Chromatography (HRGC)/High Resolution Mass Spectrometry (HRMS)

17.2.2 Table 2 – RT References, Quantitation References, Retention Times (RT), and Relative Retention Times (RRTs) for the 209 CB congeners on SPB-Octyl

17.2.3 Table 3 – Low Calibration Levels Based on Various Final Extract Volumes

17.2.4 Table 4 – Estimated Minimum Levels EPA 1668A, B & C– Matrix and Concentration

17.2.5 Table 5a – Concentration of Native PCB Congener Stock and Spiking Solutions

17.2.6 Table 5b – Concentration of $^{13}C_{12}$ Labeled PCB Congener Stock and Spiking Solutions

17.2.7 Table 6a – Concentration of PCBs in Calibration Solutions

17.2.8 Table 6b – Preparation of Calibration Solutions

17.2.9 Table 7 – Window Defining Mixture and SPB-Octyl Resolution Test Compounds

17.2.10 Table 8 – Ions Monitored for HRGC/HRMS Analysis of PCBs

17.2.11 Table 9 – Theoretical Ion Abundance Ratios and Control Limits for PCBs

17.2.12 Table 10A – Acceptance Criteria for Performance Tests (1668A & B)

17.2.13 Table 10B – Acceptance Criteria for Performance Tests (1668C)

17.2.14 Table 11 – Retention Times of Isomers on SPB-Octyl Column for PCB Standard Mixes

17.2.15 Table 12 – Assignment of Sample Preparation Protocols

17.2.16 Figure 1 – Recommended GC Operating Conditions

17.2.17 Figure 2 – Recommended MID Descriptors

17.2.18 Figure 3 – Example Data Review Checklist

17.2.19 Appendix I SPB-Octyl Guard Column Installation and Conditioning

Table 1 - Polychlorinated Biphenyls Determined by HRGC/HRMS

PCB Number[1]	BZ/IUPAC Number[2].	PCB Chemical Structure Name[3]	CAS Registry[4] Number	Labeled Analog	CAS Registry[4] Number	Usage
1	1	2-monochlorobiphenyl	2051-60-7	$^{13}C_{12}$-2-monochlorobiphenyl	234432-85-0	IDA
2	2	3-monochlorobiphenyl	2051-61-8			
3	3	4-monochlorobiphenyl	2051-62-9	$^{13}C_{12}$-4-monochlorobiphenyl	208263-77-8	IDA
4	4	2,2'-dichlorobiphenyl	13029-08-8	$^{13}C_{12}$-2,2'-dichlorobiphenyl	234432-86-1	IDA
5	5	2,3-dichlorobiphenyl	16605-91-7			
6	6	2,3'-dichlorobiphenyl	25569-80-6			
7	7	2,4-dichlorobiphenyl	33284-50-3			
8	8	2,4'-dichlorobiphenyl	34883-43-7	$^{13}C_{12}$-2,4'-dichlorobiphenyl		Air Surrogate
9	9	2,5-dichlorobiphenyl	34883-39-1	$^{13}C_{12}$-2,5-dichlorobiphenyl	250694-89-4	Istd
10	10	2,6-dichlorobiphenyl	33146-45-1			
11	11	3,3'-dichlorobiphenyl	2050-67-1			
12	12	3,4-dichlorobiphenyl	2974-92-7			
13	13	3,4'-dichlorobiphenyl	2974-90-5			
14	14	3,5-dichlorobiphenyl	34883-41-5			
15	15	4,4'-dichlorobiphenyl	2050-68-2	$^{13}C_{12}$-4,4'-dichlorobiphenyl	208263-67-6	IDA
16	16	2,2',3-trichlorobiphenyl	38444-78-9			
17	17	2,2',4-trichlorobiphenyl	37680-66-3			
18	18	2,2',5-trichlorobiphenyl	37680-65-2			
19	19	2,2',6-trichlorobiphenyl	38444-73-4	$^{13}C_{12}$-2,2',6-trichlorobiphenyl	234432-87-2	IDA
20	20	2,3,3'-trichlorobiphenyl	38444-84-7			
21	21	2,3,4-trichlorobiphenyl	55702-46-0			
22	22	2,3,4'-trichlorobiphenyl	38444-85-8			
23	23	2,3,5-trichlorobiphenyl	55720-44-0			
24	24	2,3,6-trichlorobiphenyl	55702-45-9			
25	25	2,3',4-trichlorobiphenyl	55712-37-3			
26	26	2,3',5-trichlorobiphenyl	38444-81-4			
27	27	2,3',6-trichlorobiphenyl	38444-76-7			
28	28	2,4,4'-trichlorobiphenyl	7012-37-5	$^{13}C_{12}$-2,4,4'-trichlorobiphenyl	208263-76-7	Surrogate Std
29	29	2,4,5-trichlorobiphenyl	15862-07-4			
30	30	2,4,6-trichlorobiphenyl	35693-92-6			
31	31	2,4',5-trichlorobiphenyl	16606-02-3	$^{13}C_{12}$-2,4',5-trichlorobiphenyl		Istd
32	32	2,4',6-trichlorobiphenyl	38444-77-8	$^{13}C_{12}$-2,4',6-trichlorobiphenyl		Istd
33	33	2',3,4-trichlorobiphenyl (2,3',4'-trichlorobiphenyl)	38444-86-9			
34	34	2',3,5-trichlorobiphenyl (2,3',5'-trichlorobiphenyl)	37680-68-5			
35	35	3,3',4-trichlorobiphenyl	37680-69-6			
36	36	3,3',5-trichlorobiphenyl	38444-87-0			
37	37	3,4,4'-trichlorobiphenyl	38444-90-5	$^{13}C_{12}$-3,4,4'-trichlorobiphenyl	208263-79-0	IDA
38	38	3,4,5-trichlorobiphenyl	53555-66-1			
39	39	3,4',5-trichlorobiphenyl	38444-88-1			
40	40	2,2',3,3'-tetrachlorobiphenyl	38444-93-8			
41	41	2,2',3,4-tetrachlorobiphenyl	52663-59-9			
42	42	2,2',3,4'-tetrachlorobiphenyl	36559-22-5			
43	43	2,2',3,5-tetrachlorobiphenyl	70362-46-8			
44	44	2,2',3,5'-tetrachlorobiphenyl	41464-39-5			
45	45	2,2',3,6-tetrachlorobiphenyl	70362-45-7			
46	46	2,2',3,6'-tetrachlorobiphenyl	41464-47-5			
47	47	2,2',4,4'-tetrachlorobiphenyl	2437-79-8			
48	48	2,2',4,5-tetrachlorobiphenyl	70362-47-9			
49	49	2,2',4,5'-tetrachlorobiphenyl	41464-40-8			
50	50	2,2',4,6-tetrachlorobiphenyl	62796-65-0			
51	51	2,2',4,6'-tetrachlorobiphenyl	68194-04-7			
52	52	2,2',5,5'-tetrachlorobiphenyl	35693-99-3	$^{13}C_{12}$-2,2',5,5'-tetrachlorobiphenyl	160901-66-6	Istd
53	53	2,2',5,6'-tetrachlorobiphenyl	41464-41-9			
54	54	2,2',6,6'-tetrachlorobiphenyl	15968-05-5	$^{13}C_{12}$-2,2',6,6'-tetrachlorobiphenyl	234432-88-3	IDA
55	55	2,3,3',4-tetrachlorobiphenyl	74338-24-2			
56	56	2,3,3',4'-tetrachlorobiphenyl	41464-43-1			

PCB Number[1]	BZ/IUPAC Number[2].	PCB Chemical Structure Name[3]	CAS Registry[4] Number	Labeled Analog	CAS Registry[4] Number	Usage
57	57	2,3,3’,5-tetrachlorobiphenyl	70424-67-8			
58	58	2,3,3’,5’-tetrachlorobiphenyl	41464-49-7			
59	59	2,3,3’,6-tetrachlorobiphenyl	74472-33-6			
60	60	2,3,4,4’-tetrachlorobiphenyl	33025-41-1			
61	61	2,3,4,5-tetrachlorobiphenyl	33284-53-6			
62	62	2,3,4,6-tetrachlorobiphenyl	54230-22-7			
63	63	2,3,4’,5-tetrachlorobiphenyl	74472-34-7			
64	64	2,3,4’,6-tetrachlorobiphenyl	52663-58-8			
65	65	2,3,5,6-tetrachlorobiphenyl	33284-54-7			
66	66	2,3’,4,4’-tetrachlorobiphenyl	32598-10-0			
67	67	2,3’,4,5-tetrachlorobiphenyl	73575-53-8			
68	68	2,3’,4,5’-tetrachlorobiphenyl	73575-52-7			
69	69	2,3’,4,6-tetrachlorobiphenyl	60233-24-1			
70	70	2,3’,4’,5-tetrachlorobiphenyl	32598-11-1			
71	71	2,3’,4’,6-tetrachlorobiphenyl	41464-46-4			
72	72	2,3’,5,5’-tetrachlorobiphenyl	41464-42-0			
73	73	2,3’,5’,6-tetrachlorobiphenyl	74338-23-1			
74	74	2,4,4’,5-tetrachlorobiphenyl	32690-93-0			
75	75	2,4,4’,6-tetrachlorobiphenyl	32598-12-2			
76	76	2’,3,4,5-tetrachlorobiphenyl (2,3’,4’,5’-tetrachlorobiphenyl)	70362-48-0			
77	77	3,3’,4,4’-tetrachlorobiphenyl	32598-13-3	$^{13}C_{12}$-3,3’,4,4’-tetrachlorobiphenyl	160901-67-7	IDA
78	78	3,3’,4,5-tetrachlorobiphenyl	70362-49-1			
79	79	3,3’,4,5’-tetrachlorobiphenyl	41464-48-6	$^{13}C_{12}$-3,3’,4,5’-tetrachlorobiphenyl		Air Surrogate
80	80	3,3’,5,5’-tetrachlorobiphenyl	33284-52-5			
81	81	3,4,4’,5-tetrachlorobiphenyl	70362-50-4	$^{13}C_{12}$-3,4,4’,5-tetrachlorobiphenyl	160901-68-8	IDA
82	82	2,2’,3,3’,4-pentachlorobiphenyl	52663-62-4			
83	83	2,2’,3,3’,5-pentachlorobiphenyl	60145-20-2			
84	84	2,2’,3,3’,6-pentachlorobiphenyl	52663-60-2			
85	85	2,2’,3,4,4’-pentachlorobiphenyl	65510-45-4			
86	86	2,2’,3,4,5-pentachlorobiphenyl	55312-69-1			
87	87	2,2’,3,4,5’-pentachlorobiphenyl	38380-02-8			
88	88	2,2’,3,4,6-pentachlorobiphenyl	55215-17-3			
89	89	2,2’,3,4,6’-pentachlorobiphenyl	73575-57-2			
90	90	2,2’,3,4’,5-pentachlorobiphenyl	68194-07-0			
91	91	2,2’,3,4’,6-pentachlorobiphenyl	68194-05-8			
92	92	2,2’,3,5,5’-pentachlorobiphenyl	52663-61-3			
93	93	2,2’,3,5,6-pentachlorobiphenyl	73575-56-1			
94	94	2,2’,3,5,6’-pentachlorobiphenyl	73575-55-0			
95	95	2,2’,3,5’,6-pentachlorobiphenyl	38379-99-6	$^{13}C_{12}$-2,2’,3,5’,6-pentachlorobiphenyl		Air Surrogate
96	96	2,2’,3,6,6’-pentachlorobiphenyl	73575-54-9			
97	97	2,2’,3’,4,5-pentachlorobiphenyl (2,2’,3,4’,5’-pentachlorobiphenyl)	41464-51-1			
98	98	2,2’,3’,4,6-pentachlorobiphenyl (2,2’,3,4’,6’-pentachlorobiphenyl)	60233-25-2			
99	99	2,2’,4,4’,5-pentachlorobiphenyl	38380-01-7			
100	100	2,2’,4,4’,6-pentachlorobiphenyl	39485-83-1			
101	101	2,2’,4,5,5’-pentachlorobiphenyl	37680-73-2	$^{13}C_{12}$-2,2’,4,5,5’-pentachlorobiphenyl	160901-69-9	istd
102	102	2,2’,4,5,6’’-pentachlorobiphenyl	68194-06-9			
103	103	2,2’,4,5’,6-pentachlorobiphenyl	60145-21-3			
104	104	2,2’,4,6,6’-pentachlorobiphenyl	56558-16-8	$^{13}C_{12}$-2,2’,4,6,6’-pentachlorobiphenyl	234432-89-4	IDA
105	105	2,3,3’,4,4’-pentachlorobiphenyl	32598-14-4	$^{13}C_{12}$-2,3,3’,4,4’-pentachlorobiphenyl	160901-70-2	IDA
106	106	2,3,3’,4,5-pentachlorobiphenyl	70424-69-0			
107	107/109	2,3,3',4',5-pentachlorobiphenyl	70424-68-9			
108	108/107	2,3,3',4,5'-pentachlorobiphenyl	70362-41-3			
109	109/108	2,3,3',4,6-pentachlorobiphenyl	74472-35-8			
110	110	2,3,3’,4’,6-pentachlorobiphenyl	38380-03-9			
111	111	2,3,3’,5,5’-pentachlorobiphenyl	39635-32-0	$^{13}C_{12}$-2,3,3’,5,5’-pentachlorobiphenyl	160901-71-3	Surrogate Std
112	112	2,3,3’,5,6-pentachlorobiphenyl	74472-36-9			
113	113	2,3,3’,5’,6-pentachlorobiphenyl	68194-10-5			

PCB Number[1]	BZ/IUPAC Number[2].	PCB Chemical Structure Name[3]	CAS Registry[4] Number	Labeled Analog	CAS Registry[4] Number	Usage
114	114	2,3,4,4’,5-pentachlorobiphenyl	74472-37-0	$^{13}C_{12}$-2,3,4,4’,5-pentachlorobiphenyl	160901-72-4	IDA
115	115	2,3,4,4’,6-pentachlorobiphenyl	74472-38-1			
116	116	2,3,4,5,6-pentachlorobiphenyl	18259-05-7			
117	117	2,3,4’,5,6-pentachlorobiphenyl	68194-11-6			
118	118	2,3’,4,4’,5-pentachlorobiphenyl	31508-00-6	$^{13}C_{12}$-2,3’,4,4’,5-pentachlorobiphenyl	160901-73-5	IDA
119	119	2,3’,4,4’,6-pentachlorobiphenyl	56558-17-9			
120	120	2,3’,4,5,5’-pentachlorobiphenyl	68194-12-7			
121	121	2,3’,4,5’,6-pentachlorobiphenyl	56558-18-0			
122	122	2’,3,3’,4,5-pentachlorobiphenyl (2,3,3’,4’,5’-pentachlorobiphenyl)	76842-07-4			
123	123	2’,3,4,4’,5-pentachlorobiphenyl (2,3’,4,4’,5’-pentachlorobiphenyl)	65510-44-3	$^{13}C_{12}$-2’,3,4,4’,5-pentachlorobiphenyl	160901-74-6	IDA
124	124	2’,3,4,5,5’-pentachlorobiphenyl (2,3’,4’,5’,5-pentachlorobiphenyl)	70424-70-3			
125	125	2’,3,4,5,6’-pentachlorobiphenyl (2,3’,4’,5’,6-pentachlorobiphenyl)	74472-39-2			
126	126	3,3’,4,4’,5-pentachlorobiphenyl	57465-28-8	$^{13}C_{12}$-3,3’,4,4’,5-pentachlorobiphenyl	160901-75-7	IDA
127	127	3,3’,4,5,5’-pentachlorobiphenyl	39635-33-1	$^{13}C_{12}$-3,3’,4,5,5’-pentachlorobiphenyl		Istd
128	128	2,2’,3,3’,4,4’-hexachlorobiphenyl	38380-07-3			
129	129	2,2’,3,3’,4,5-hexachlorobiphenyl	55215-18-4			
130	130	2,2’,3,3’,4,5’-hexachlorobiphenyl	52663-66-8			
131	131	2,2’,3,3’,4,6-hexachlorobiphenyl	61798-70-7			
132	132	2,2’,3,3’,4,6’-hexachlorobiphenyl	38380-05-1			
133	133	2,2’,3,3’,5,5’-hexachlorobiphenyl	35694-04-3			
134	134	2,2’,3,3’,5,6-hexachlorobiphenyl	52704-70-8			
135	135	2,2’,3,3’,5,6’-hexachlorobiphenyl	52744-13-5			
136	136	2,2’,3,3’,6,6’-hexachlorobiphenyl	38411-22-2			
137	137	2,2’,3,4,4’,5-hexachlorobiphenyl	35694-06-5			
138	138	2,2’,3,4,4’,5’-hexachlorobiphenyl	35065-28-2	$^{13}C_{12}$-2,2’,3,4,4’,5’-hexachlorobiphenyl	160901-76-8	Istd
139	139	2,2’,3,4,4’,6-hexachlorobiphenyl	56030-56-9			
140	140	2,2’,3,4,4’,6’-hexachlorobiphenyl	59291-64-4			
141	141	2,2’,3,4,5,5’-hexachlorobiphenyl	52712-04-6			
142	142	2,2’,3,4,5,6-hexachlorobiphenyl	41411-61-4			
143	143	2,2’,3,4,5,6’-hexachlorobiphenyl	68194-15-0			
144	144	2,2’,3,4,5’,6-hexachlorobiphenyl	68194-14-9			
145	145	2,2’,3,4,6,6’-hexachlorobiphenyl	74472-40-5			
146	146	2,2’,3,4’,5,5’-hexachlorobiphenyl	51908-16-8			
147	147	2,2’,3,4’,5,6-hexachlorobiphenyl	68194-13-8			
148	148	2,2’,3,4’,5,6’-hexachlorobiphenyl	74472-41-6			
149	149	2,2’,3,4’,5’,6-hexachlorobiphenyl	38380-04-0			
150	150	2,2’,3,4’,6,6’-hexachlorobiphenyl	68194-08-1			
151	151	2,2’,3,5,5’,6-hexachlorobiphenyl	52663-63-5			
152	152	2,2’,3,5,6,6’-hexachlorobiphenyl	68194-09-2			
153	153	2,2’,4,4’,5,5’-hexachlorobiphenyl	35065-27-1	$^{13}C_{12}$-2,2’,4,4’,5,5’-hexachlorobiphenyl		Air Surrogate
154	154	2,2’,4,4’,5,6’-hexachlorobiphenyl	60145-22-4			
155	155	2,2’,4,4’,6,6’-hexachlorobiphenyl	33979-03-2	$^{13}C_{12}$-2,2’,4,4’,6,6’-hexachlorobiphenyl	234432-90-7	IDA
156	156	2,3,3’,4,4’,5-hexachlorobiphenyl	38380-08-4	$^{13}C_{12}$-2,3,3’,4,4’,5-hexachlorobiphenyl	160901-77-9	IDA
157	157	2,3,3’,4,4’,5’-hexachlorobiphenyl	69782-90-7	$^{13}C_{12}$-2,3,3’,4,4’,5’-hexachlorobiphenyl	160901-78-0	IDA
158	158	2,3,3’,4,4’,6-hexachlorobiphenyl	74472-42-7			
159	159	2,3,3’,4,5,5’-hexachlorobiphenyl	39635-35-3			
160	160	2,3,3’,4,5,6-hexachlorobiphenyl	41411-62-5			
161	161	2,3,3’,4,5’,6-hexachlorobiphenyl	74472-43-8			
162	162	2,3,3’,4’,5,5’-hexachlorobiphenyl	39635-34-2			
163	163	2,3,3’,4’,5,6-hexachlorobiphenyl	74472-44-9			
164	164	2,3,3’,4’,5’,6-hexachlorobiphenyl	74472-45-0			
165	165	2,3,3’,5,5’,6-hexachlorobiphenyl	74472-46-1			
166	166	2,3,4,4’,5,6-hexachlorobiphenyl	41411-63-6			
167	167	2,3’,4,4’,5,5’-hexachlorobiphenyl	52663-72-6	$^{13}C_{12}$-2,3’,4,4’,5,5’-hexachlorobiphenyl	161627-18-5	IDA
168	168	2,3’,4,4’,5’,6-hexachlorobiphenyl	59291-65-5			
169	169	3,3’,4,4’,5,5’-hexachlorobiphenyl	32774-16-6	$^{13}C_{12}$-3,3’,4,4’,5,5’-hexachlorobiphenyl	160901-79-1	IDA
170	170	2,2’,3,3’,4,4’,5-heptachlorobiphenyl	35065-30-6	$^{13}C_{12}$-2,2’,3,3’,4,4’,5-heptachlorobiphenyl	160901-80-4	IDA

PCB Number[1]	BZ/IUPAC Number[2].	PCB Chemical Structure Name[3]	CAS Registry[4] Number	Labeled Analog	CAS Registry[4] Number	Usage
171	171	2,2’,3,3’,4,4’,6-heptachlorobiphenyl	52663-71-5			
172	172	2,2’,3,3’,4,5,5’-heptachlorobiphenyl	52663-74-8			
173	173	2,2’,3,3’,4,5,6-heptachlorobiphenyl	68194-16-1			
174	174	2,2’,3,3’,4,5,6’-heptachlorobiphenyl	38411-25-5			
175	175	2,2’,3,3’,4,5’,6-heptachlorobiphenyl	40186-70-7			
176	176	2,2’,3,3’,4,6,6’-heptachlorobiphenyl	52663-65-7			
177	177	2,2’,3,3’,4’,5,6-heptachlorobiphenyl (2,2’,3,3’,4,5’,6’-heptachlorobiphenyl)	52663-70-4			
178	178	2,2’,3,3’,5,5’,6-heptachlorobiphenyl	52663-67-9	$^{13}C_{12}$-2,2’,3,3’,5,5’,6-heptachlorobiphenyl	160901-81-5	Surrogate Std
179	179	2,2’,3,3’,5,6,6’-heptachlorobiphenyl	52663-64-6			
180	180	2,2’,3,4,4’,5,5’-heptachlorobiphenyl	35065-29-3	$^{13}C_{12}$-2,2’,3,4,4’,5,5’-heptachlorobiphenyl	160901-82-6	Istd
181	181	2,2’,3,4,4’,5,6-heptachlorobiphenyl	74472-47-2			
182	182	2,2’,3,4,4’,5,6’-heptachlorobiphenyl	60145-23-5			
183	183	2,2’,3,4,4’,5’,6-heptachlorobiphenyl	52663-69-1			
184	184	2,2’,3,4,4’,6,6’-heptachlorobiphenyl	74472-48-3			
185	185	2,2’,3,4,5,5’,6-heptachlorobiphenyl	52712-05-7			
186	186	2,2’,3,4,5,6,6’-heptachlorobiphenyl	74472-49-4			
187	187	2,2’,3,4’,5,5’,6-heptachlorobiphenyl	52663-68-0			
188	188	2,2’,3,4’,5,6,6’-heptachlorobiphenyl	74487-85-7	$^{13}C_{12}$-2,2’,3,4’,5,6,6’-heptachlorobiphenyl	234432-91-8	IDA
189	189	2,3,3’,4,4’,5,5’-heptachlorobiphenyl	39635-31-9	$^{13}C_{12}$-2,3,3’,4,4’,5,5’-heptachlorobiphenyl	160901-83-7	IDA
190	190	2,3,3’,4,4’,5,6-heptachlorobiphenyl	41411-64-7			
191	191	2,3,3’,4,4’,5’,6-heptachlorobiphenyl	74472-50-7			
192	192	2,3,3’,4,5,5’,6-heptachlorobiphenyl	74472-51-8			
193	193	2,3,3’,4’,5,5’,6-heptachlorobiphenyl	69782-91-8			
194	194	2,2’,3,3’,4,4’,5,5’-octachlorobiphenyl	35694-08-7	$^{13}C_{12}$-2,2’,3,3’,4,4’,5,5’-octachlorobiphenyl	208263-74-5	Istd
195	195	2,2’,3,3’,4,4’,5,6-octachlorobiphenyl	52663-78-2			
196	196	2,2’,3,3’,4,4’,5,6’-octachlorobiphenyl	42740-50-1			
197	197	2,2’,3,3’,4,4’,6,6’-octachlorobiphenyl	33091-17-7			
198	198	2,2’,3,3’,4,5,5’,6-octachlorobiphenyl	68194-17-2			
199	201/199	2,2’,3,3’,4,5,5’,6’-octachlorobiphenyl	52663-75-9			
200	199/200	2,2’,3,3’,4,5,6,6’-octachlorobiphenyl	52663-73-7			
201	200/201	2,2’,3,3’,4,5’,6,6’-octachlorobiphenyl	40186-71-8			
202	202	2,2’,3,3’,5,5’,6,6’-octachlorobiphenyl	2136-99-4	$^{13}C_{12}$-2,2’,3,3’,5,5’,6,6’-octachlorobiphenyl	105600-26-8	IDA
203	203	2,2’,3,4,4’,5,5’,6-octachlorobiphenyl	52663-76-0			
204	204	2,2’,3,4,4’,5,6,6’-octachlorobiphenyl	74472-52-9			
205	205	2,3,3’,4,4’,5,5’,6-octachlorobiphenyl	74472-53-0	$^{13}C_{12}$-2,3,3’,4,4’,5,5’,6-octachlorobiphenyl	234446-64-1	IDA
206	206	2,2’,3,3’,4,4’,5,5’,6-nonachlorobiphenyl	40186-72-9	$^{13}C_{12}$-2,2’,3,3’,4,4’,5,5’,6-nonachlorobiphenyl	208263-75-6	IDA
207	207	2,2’,3,3’,4,4’,5,6,6’-nonachlorobiphenyl	52663-79-3			
208	208	2,2’,3,3’,4,5,5’,6,6’-nonachlorobiphenyl	52663-77-1	$^{13}C_{12}$-2,2’,3,3’,4,5,5’,6,6’-nonachlorobiphenyl	234432-92-9	IDA
209	209	2,2’,3,3’,4,4’,5,5’,6,6’-decachlorobiphenyl	2051-24-3	$^{13}C_{12}$-decachlorobiphenyl	160901-84-8	IDA

1. The PCB congener number is from Method 1668C and Chemical Abstract Services.
2. The BZ number is from Ballschmiter and Zell (1980). The IUPAC number, when different from the BZ, follows the recommended changes to the BZ number per Schulte and Malisch (1983) and Guitart et al. (1993).
3. The chemical structure names are from Ballschmiter and Zell (1980). IUPAC nomenclature structure names are listed in parenthesis when different from the BZ name (source CAS Registry).
4. Chemical Abstract Service Registry number (source CAS Registry and 1668A Table 1).

Table 2 - RT References, Quantitation References, Retention Times (RTs), and Relative Retention Times (RRTs) for the 209 CB congeners on SPB-Octyl

Cl No[1]	IUPAC No[2,3]	RT Ref[4]	Quantitation Reference[5]	RT Win[6] (sec)
1	1L	9L	9L	30
1	3L	9L	9L	30
1	1	1L	1L	10
1	2	3L	1L/3L	6
1	3	3L	3L	6
2	4L	9L	9L	30
2	9L	9L	9L	25
2	8L	4L	4L/15L	6
2	15L	9L	9L	20
2	4	4L	4L	10
2	10	4L	4L/15L	6
2	9	4L	4L/15L	6
2	7	4L	4L/15L	6
2	6	4L	4L/15L	6
2	5	4L	4L/15L	6
2	8	4L	4L/15L	6
2	14	15L	4L/15L	6
2	11	15L	4L/15L	6
2	13	15L	4L/15L	6
2	12	15L	4L/15L	6
2	15	15L	15L	10
3	19L	32L	32L	30
3	32L	32L	32L	6
3	31L	31L	31L	6
3	28L	31L	31L	20
3	37L	31L	31L	30
3	19	19L	19L	10
3	30	19L	19L	6
3	18	19L	19L	6
3	17	19L	19L	6
3	27	19L	19L	6
3	24	19L	19L	6
3	16	19L	19L	6
3	32	19L	19L	6
3	34	19L	37L	6
3	23	19L	37L	6
3	29	19L	37L	10
3	26	19L	37L	10
3	25	37L	37L	6
3	31	37L	37L	6
3	28	37L	37L	10
3	20	37L	37L	10
3	21	37L	37L	10
3	33	37L	37L	10
3	22	37L	37L	6
3	36	37L	37L	6
3	39	37L	37L	6
3	38	37L	37L	6
3	35	37L	37L	6
3	37	37L	37L	6
4	54L	52L	32L	20
4	52L	52L	52L	25
4	79L	81L	81L/77L	6
4	81L	52L	52L	20
4	77L	52L	52L	20
4	54	54L	54L	10
4	50	54L	81L/77L	10
4	53	54L	81L/77L	10
4	45	54L	81L/77L	10
4	51	54L	81L/77L	10
4	46	54L	81L/77L	6
4	52	54L	81L/77L	6
4	73	54L	81L/77L	6
4	43	54L	81L/77L	6
4	69	54L	81L/77L	10
4	49	54L	81L/77L	10
4	48	54L	81L/77L	6
4	65	54L	81L/77L	10
4	47	54L	81L/77L	10
4	44	54L	81L/77L	10
4	62	54L	81L/77L	10
4	75	54L	81L/77L	10

Cl No[1]	IUPAC No[2,3]	RT Ref[4]	Quantitation Reference[5]	RT Win[6] (sec)
4	59	54L	81L/77L	10
4	42	54L	81L/77L	6
4	41	54L	81L/77L	10
4	71	54L	81L/77L	10
4	40	54L	81L/77L	10
4	64	54L	81L/77L	6
4	72	81L	81L/77L	6
4	68	81L	81L/77L	6
4	57	81L	81L/77L	6
4	58	81L	81L/77L	6
4	67	81L	81L/77L	6
4	63	81L	81L/77L	6
4	61	81L	81L/77L	12
4	70	81L	81L/77L	12
4	76	81L	81L/77L	12
4	74	81L	81L/77L	10
4	66	81L	81L/77L	6
4	55	81L	81L/77L	6
4	56	81L	81L/77L	6
4	60	81L	81L/77L	6
4	80	81L	81L/77L	6
4	79	81L	81L/77L	6
4	78	81L	81L/77L	6
4	81	81L	81L	6
4	77	77L	77L	6
5	104L	101L	101L	20
5	95L	104L	104L	10
5	101L	101L	101L	25
5	111L	101L	101L	20
5	123L	101L	127L	20
5	118L	101L	127L	20
5	114L	101L	127L	20
5	105L	101L	127L	20
5	127L	127L	127L	25
5	126L	101L	127L	20
5	104	104L	104L	10
5	96	104L	104L	10
5	103	104L	104L	6
5	94	104L	104L	6
5	95	104L	104L	10
5	100	104L	104L	10
5	93	104L	104L	10
5	102	104L	104L	10
5	98	104L	104L	10
5	88	104L	104L	12
5	91	104L	104L	10
5	84	104L	104L	6
5	89	104L	104L	6
5	121	104L	104L	6
5	92	123L	104L	6
5	113	104L	104L	10
5	90	104L	104L	10
5	101	104L	104L	10
5	83	104L	104L	12
5	99	104L	104L	10
5	112	104L	104L	6
5	119	104L	104L	16
5	108 (109)	104L	104L	16
5	86	104L	104L	16
5	97	104L	104L	16
5	125	104L	104L	16
5	87	104L	104L	10
5	117	104L	104L	12
5	116	104L	104L	12
5	85	104L	104L	10
5	110	104L	104L	10
5	115	104L	104L	10
5	82	104L	104L	6
5	111	104L	104L	6
5	120	104L	104L	6
5	107 (108)	104L	123L/114L/118L/105L/126L	10
5	124	104L	123L/114L/118L/105L/126L	10
5	109 (107)	104L	123L/114L/118L/105L/126L	6
5	123	123L	123L	6
5	106	123L	123L/114L/118L/105L/126L	6
5	118	118L	118L	6

Cl No[1]	IUPAC No[2,3]	RT Ref[4]	Quantitation Reference[5]	RT Win[6] (sec)
5	122	118L	123L/114L/118L/105L/126L	6
5	114	114L	114L	6
5	105	105L	105L	6
5	127	105L	123L/114L/118L/105L/126L	6
5	126	126L	126L	6
6	155L	138L	101L	20
6	153L	167L	156L/157L/167L/169L	10
6	138L	138L	138L	100
6	167L	138L	138L	20
6	156L	138L	138L	6
6	157L	138L	138L	20
6	169L	138L	138L	6
6	155	155L	155L	10
6	152	155L	155L	6
6	150	155L	155L	6
6	136	155L	155L	6
6	145	155L	155L	6
6	148	155L	155L	6
6	151	155L	155L	10
6	135	155L	155L	10
6	154	155L	155L	10
6	144	155L	155L	6
6	147	155L	156L/157L/167L/169L	10
6	149	155L	156L/157L/167L/169L	10
6	134	155L	156L/157L/167L/169L	10
6	143	155L	156L/157L/167L/169L	10
6	139	155L	156L/157L/167L/169L	10
6	140	155L	156L/157L/167L/169L	10
6	131	155L	156L/157L/167L/169L	6
6	142	155L	156L/157L/167L/169L	6
6	132	155L	156L/157L/167L/169L	10
6	133	155L	156L/157L/167L/169L	6
6	165	167L	156L/157L/167L/169L	6
6	146	167L	156L/157L/167L/169L	6
6	161	167L	156L/157L/167L/169L	6
6	153	167L	156L/157L/167L/169L	10
6	168	167L	156L/157L/167L/169L	10
6	141	167L	156L/157L/167L/169L	6
6	130	167L	156L/157L/167L/169L	6
6	137	167L	156L/157L/167L/169L	6
6	164	167L	156L/157L/167L/169L	6
6	138	167L	156L/157L/167L/169L	14
6	163	167L	156L/157L/167L/169L	14
6	129	167L	156L/157L/167L/169L	14
6	160	167L	156L/157L/167L/169L	10
6	158	167L	156L/157L/167L/169L	6
6	166	167L	156L/157L/167L/169L	10
6	128	167L	156L/157L/167L/169L	10
6	159	167L	156L/157L/167L/169L	6
6	162	167L	156L/157L/167L/169L	6
6	167	167L	167L	6
6	156	156L	156L/157L	6
6	157	157L	156L/157L	10
6	169	169L	169L	6
7	188L	180L	180L	20
7	178L	180L	180L	20
7	180L	180L	180L	100
7	170L	180L	180L	20
7	189L	180L	194L	20
7	188	188L	188L	6
7	179	188L	188L/170L	6
7	184	188L	188L/170L	6
7	176	188L	188L/170L	6
7	186	188L	188L/170L	6
7	178	188L	188L/170L	6
7	175	188L	188L/170L	6
7	187	188L	188L/170L	6
7	182	188L	188L/170L	6
7	183	188L	188L/170L	6
7	185	188L	188L/170L	6
7	174	188L	188L/170L	6
7	177	188L	188L/170L	6
7	181	188L	188L/170L	6
7	171	188L	188L/170L	10
7	173	188L	188L/170L	6
7	172	189L	188L/170L	6

Cl No[1]	IUPAC No[2,3]	RT Ref[4]	Quantitation Reference[5]	RT Win[6] (sec)
7	192	189L	188L/170L	6
7	193	189L	188L/170L	6
7	180	189L	188L/170L	6
7	191	189L	188L/170L	6
7	170	189L	170L	6
7	190	189L	188L/170L	6
7	189	189L	189L	6
8	202L	194L	180L	20
8	194L	194L	194L	25
8	205L	194L	194L	30
8	202	202L	202L	10
8	201	202L	202L	6
8	204	202L	202L	6
8	197	202L	202L	6
8	200	202L	202L	6
8	198	202L	202L	10
8	199	202L	202L	6
8	196	205L	202L	6
8	203	205L	202L	6
8	195	205L	205L	6
8	194	205L	205L	6
8	205	205L	205L	6
9	208L	194L	194L	20
9	206L	194L	194L	30
9	208	208L	208L	6
9	207	208L	208L/206L	6
9	206	206L	206L	6
10	209L	194L	194L	30
10	209	209L	209L	6

1. Number of chlorines on congener.
2. Suffix "L" indicates labeled compound.
3. IUPAC Number per Table 2 of Method 1668A. (Numbers in parentheses are PCB Numbers from 1668C)
4. Retention time reference that is used to locate target congener.
5. Quantitation reference that is used to calculate the concentration of the target congener or labeled standard.
6. RT window width for congener or group of two or more congeners.

Table 3 - Low Calibration Levels (LCLs) Based on Final Extract Volumes

		20 µL Extract Volume	100µL Extract Volume
Analyte	Minimum Cal. Level CS 0.5 (ng/mL)	Water 1L (ng/L)	Solids and Tissues 10g[2] (ng/g)
Monochlorobiphenyls	0.5	0.01[1]	0.005
Dichlorobiphenyls	0.5	0.01[1]	0.005
Trichlorobiphenyls	0.5	0.01	0.005
Tetrachlorobiphenyls	0.5	0.01	0.005
Pentachlorobiphenyls	0.5	0.01	0.005
Hexachlorobiphenyls	0.5	0.01	0.005
Heptachlorobiphenyls	0.5	0.01	0.005
Octachlorobiphenyls	0.5	0.01	0.005
Nonachlorobiphenyls	0.5	0.01	0.005
Decachlorobiphenyl	0.5	0.01	0.005

1. This value reflects the LCL. Reliable detection at this level may not be attained due to evaporative loss in adjusting the extract volume to 20 µL for these homolog groups.

2. The values for solids and tissues reflect the LCLs for Protocol 1 as described in Table 12. If the sample is prepared by another protocol described in that table, the LCLs shown in this table must be adjusted appropriately.

Table 4 - Estimated Minimum Levels EPA 1668A, B & C- Matrix and Concentration

	TestAmerica Knoxville EMLs [1] (1668A, B & C)			1668C Reference Method EMLs [2]		
Parameter	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**
PCB 1	0.040	0.01	1.0	0.02	0.002	1
PCB 2	0.040	0.01	1.0	0.02	0.002	1
PCB 3	0.040	0.01	1.0	0.05	0.005	2.5
PCB 4	0.060	0.02	2.0	0.05	0.005	2.5
PCB 5	0.040	0.01	1.0	0.02	0.002	1
PCB 6	0.040	0.01	1.0	0.02	0.002	1
PCB 7	0.040	0.01	1.0	0.02	0.002	1
PCB 8	0.060	0.02	2.0	0.05	0.005	2.5
PCB 9	0.040	0.01	1.0	0.02	0.002	1
PCB 10	0.040	0.01	1.0	0.05	0.005	2.5
PCB 11	0.060	0.02	2.0	0.10	0.01	5
PCB 12	0.080	0.02	2.0	0.05	0.005	2.5
PCB 14	0.040	0.01	1.0	0.02	0.002	1
PCB 13	0.080	0.02	2.0	0.05	0.005	2.5
PCB 15	0.040	0.01	1.0	0.05	0.005	2.5
PCB 16	0.040	0.01	1.0	0.02	0.002	1
PCB 17	0.040	0.01	1.0	0.02	0.002	1
PCB 18	0.080	0.02	2.0	0.05	0.005	2.5
PCB 30	0.080	0.02	2.0	0.05	0.005	2.5
PCB 19	0.040	0.01	1.0	0.02	0.002	1
PCB 20	0.080	0.02	2.0	0.05	0.005	2.5
PCB 28	0.080	0.02	2.0	0.05	0.005	2.5
PCB 21	0.080	0.02	2.0	0.05	0.005	2.5
PCB 33	0.080	0.02	2.0	0.05	0.005	2.5
PCB 22	0.040	0.01	1.0	0.02	0.002	1
PCB 23	0.040	0.01	1.0	0.02	0.002	1
PCB 24	0.040	0.01	1.0	0.02	0.002	1
PCB 25	0.040	0.01	1.0	0.02	0.002	1
PCB 26	0.080	0.02	2.0	0.05	0.005	2.5
PCB 29	0.080	0.02	2.0	0.05	0.005	2.5
PCB 27	0.040	0.01	1.0	0.02	0.002	1
PCB 31	0.040	0.02	2.0	0.05	0.005	2.5
PCB 32	0.040	0.01	1.0	0.02	0.002	1
PCB 34	0.040	0.01	1.0	0.02	0.002	1
PCB 35	0.040	0.01	1.0	0.02	0.002	1
PCB 36	0.040	0.01	1.0	0.02	0.002	1
PCB 37	0.040	0.01	1.0	0.02	0.002	1
PCB 38	0.040	0.01	1.0	0.02	0.002	1
PCB 39	0.040	0.01	1.0	0.02	0.002	1
PCB 40	0.120	0.03	3.0	0.1	0.01	5
PCB 41	0.120	0.03	3.0	0.1	0.01	5
PCB 71	0.120	0.03	3.0	0.1	0.01	5
PCB 42	0.040	0.01	1.0	0.05	0.005	2.5
PCB 43	0.080	0.02	2.0	0.05	0.005	2.5
PCB 73	0.080	0.02	2.0	0.05	0.005	2.5
PCB 44	0.120	0.03	3.0	0.1	0.01	5
PCB 47	0.120	0.03	3.0	0.1	0.01	5
PCB 65	0.120	0.03	3.0	0.1	0.01	5
PCB 45	0.080	0.02	2.0	0.05	0.005	2.5
PCB 51	0.080	0.02	2.0	0.05	0.005	2.5
PCB 46	0.040	0.01	1.0	0.02	0.002	1
PCB 48	0.040	0.01	1.0	0.05	0.005	2.5
PCB 49	0.080	0.02	2.0	0.1	0.01	5
PCB 69	0.080	0.02	2.0	0.1	0.01	5
PCB 50	0.080	0.02	2.0	0.1	0.01	5
PCB 53	0.080	0.02	2.0	0.1	0.01	5
PCB 52	0.040	0.01	1.0	0.05	0.005	2.5

	TestAmerica Knoxville EMLs [1] (1668A, B & C)			1668C Reference Method EMLs [2]		
Parameter	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**
PCB 54	0.040	0.01	1.0	0.05	0.005	2.5
PCB 55	0.040	0.01	1.0	0.05	0.005	2.5
PCB 56	0.040	0.01	1.0	0.05	0.005	2.5
PCB 57	0.040	0.01	1.0	0.05	0.005	2.5
PCB 58	0.040	0.01	1.0	0.05	0.005	2.5
PCB 59	0.120	0.03	3.0	0.1	0.01	5
PCB 62	0.120	0.03	3.0	0.1	0.01	5
PCB 75	0.120	0.03	3.0	0.1	0.01	5
PCB 60	0.040	0.01	1.0	0.05	0.005	2.5
PCB 61	0.160	0.04	4.0	0.2	0.02	10
PCB 70	0.160	0.04	4.0	0.2	0.02	10
PCB 74	0.160	0.04	4.0	0.2	0.02	10
PCB 76	0.160	0.04	4.0	0.2	0.02	10
PCB 63	0.040	0.01	1.0	0.005	0.05	2.5
PCB 64	0.040	0.01	1.0	0.05	0.005	2.5
PCB 66	0.040	0.01	1.0	0.05	0.005	2.5
PCB 67	0.040	0.01	1.0	0.05	0.005	2.5
PCB 68	0.040	0.01	1.0	0.05	0.005	2.5
PCB 72	0.040	0.01	1.0	0.05	0.005	2.5
PCB 77	0.040	0.01	1.0	0.05	0.005	2.5
PCB 78	0.040	0.01	1.0	0.05	0.005	2.5
PCB 79	0.040	0.01	1.0	0.05	0.005	2.5
PCB 80	0.040	0.01	1.0	0.05	0.005	2.5
PCB 81	0.040	0.01	1.0	0.05	0.005	2.5
PCB 82	0.040	0.01	1.0	0.05	0.005	2.5
PCB 83	0.080	0.02	2.0	0.1	0.01	5
PCB 84	0.040	0.01	1.0	0.02	0.002	1
PCB 85	0.120	0.03	3.0	0.1	0.01	5
PCB 116	0.120	0.03	3.0	0.1	0.01	5
PCB 117	0.120	0.03	3.0	0.1	0.01	5
PCB 86	0.240	0.06	6.0	0.2	0.02	10
PCB 87	0.240	0.06	6.0	0.2	0.02	10
PCB 97	0.240	0.06	6.0	0.2	0.02	10
PCB 109	0.240	0.06	6.0	0.2	0.02	10
PCB 119	0.240	0.06	6.0	0.2	0.02	10
PCB 125	0.240	0.06	6.0	0.2	0.02	10
PCB 88	0.080	0.02	2.0	0.05	0.005	2.5
PCB 91	0.080	0.02	2.0	0.05	0.005	2.5
PCB 89	0.040	0.01	1.0	0.05	0.005	2.5
PCB 90	0.120	0.03	3.0	0.2	0.02	10
PCB 101	0.120	0.03	3.0	0.2	0.02	10
PCB 113	0.120	0.03	3.0	0.2	0.02	10
PCB 92	0.040	0.01	1.0	0.05	0.005	2.5
PCB 93	0.080	0.02	2.0	0.2	0.02	10
PCB 100	0.080	0.02	2.0	0.2	0.02	10
PCB 94	0.040	0.01	1.0	0.05	0.005	2.5
PCB 95	0.040	0.01	1.0	0.2	0.02	10
PCB 96	0.040	0.01	1.0	0.05	0.005	2.5
PCB 98	0.080	0.02	2.0	0.2	0.02	10
PCB 102	0.080	0.02	2.0	0.2	0.02	10
PCB 99	0.080	0.02	2.0	0.1	0.01	5
PCB 112	0.040	0.01	1.0	0.05	0.005	2.5
PCB 103	0.040	0.01	1.0	0.05	0.005	2.5
PCB 104	0.040	0.01	1.0	0.05	0.005	2.5
PCB 105	0.040	0.01	1.0	0.05	0.005	2.5
PCB 106	0.040	0.01	1.0	0.05	0.005	2.5
PCB 107	0.040	0.01	1.0	0.05	0.005	2.5
PCB 108	0.080	0.02	2.0	0.1	0.01	5
PCB 124	0.080	0.02	2.0	0.1	0.01	5

	TestAmerica Knoxville EMLs [1] (1668A, B & C)			1668C Reference Method EMLs [2]		
Parameter	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**
PCB 110	0.080	0.02	2.0	0.1	0.01	5
PCB 115	0.080	0.02	2.0	0.1	0.01	5
PCB 111	0.040	0.01	1.0	0.05	0.005	2.5
PCB 114	0.040	0.01	1.0	0.05	0.005	2.5
PCB 118	0.040	0.01	1.0	0.1	0.01	5
PCB 120	0.040	0.01	1.0	0.05	0.005	2.5
PCB 121	0.040	0.01	1.0	0.05	0.005	2.5
PCB 122	0.040	0.01	1.0	0.05	0.005	2.5
PCB 123	0.040	0.01	1.0	0.05	0.005	2.5
PCB 126	0.040	0.01	1.0	0.05	0.005	2.5
PCB 127	0.040	0.01	1.0	0.05	0.005	2.5
PCB 128	0.080	0.02	2.0	0.1	0.01	5
PCB 166	0.080	0.02	2.0	0.1	0.01	5
PCB 129	0.160	0.04	4.0	0.2	0.02	10
PCB 138	0.160	0.04	4.0	0.2	0.02	10
PCB 163	0.160	0.04	4.0	0.2	0.02	10
PCB 130	0.040	0.01	1.0	0.05	0.005	2.5
PCB 131	0.040	0.01	1.0	0.05	0.005	2.5
PCB 132	0.040	0.01	1.0	0.05	0.005	2.5
PCB 133	0.040	0.01	1.0	0.05	0.005	2.5
PCB 134	0.080	0.02	2.0	0.1	0.01	5
PCB 143	0.080	0.02	2.0	0.1	0.01	5
PCB 135	0.080	0.02	2.0	0.1	0.01	5
PCB 151	0.080	0.02	2.0	0.1	0.01	5
PCB 136	0.040	0.01	1.0	0.05	0.005	2.5
PCB 137	0.040	0.01	1.0	0.05	0.005	2.5
PCB 164	0.040	0.01	1.0	0.05	0.005	2.5
PCB 139	0.080	0.02	2.0	0.1	0.01	5
PCB 140	0.080	0.02	2.0	0.1	0.01	5
PCB 141	0.040	0.01	1.0	0.05	0.005	2.5
PCB 142	0.040	0.01	1.0	0.05	0.005	2.5
PCB 144	0.040	0.01	1.0	0.05	0.005	2.5
PCB 145	0.040	0.01	1.0	0.05	0.005	2.5
PCB 146	0.040	0.01	1.0	0.05	0.005	2.5
PCB 147	0.080	0.02	2.0	0.1	0.01	5
PCB 149	0.080	0.02	2.0	0.1	0.01	5
PCB 148	0.040	0.01	1.0	0.05	0.005	2.5
PCB 150	0.040	0.01	1.0	0.05	0.005	2.5
PCB 152	0.040	0.01	1.0	0.05	0.005	2.5
PCB 153	0.080	0.02	2.0	0.1	0.01	5
PCB 168	0.080	0.02	2.0	0.1	0.01	5
PCB 154	0.040	0.01	1.0	0.1	0.01	5
PCB 155	0.040	0.01	1.0	0.05	0.005	2.5
PCB 156	0.080	0.02	2.0	0.1	0.01	5
PCB 157	0.080	0.02	2.0	0.1	0.01	5
PCB 158	0.040	0.01	1.0	0.05	0.005	2.5
PCB 159	0.040	0.01	1.0	0.05	0.005	2.5
PCB 160	0.160	0.04	4.0	0.2	0.02	10
PCB 161	0.040	0.01	1.0	0.05	0.005	2.5
PCB 162	0.040	0.01	1.0	0.05	0.005	2.5
PCB 165	0.040	0.01	1.0	0.05	0.005	2.5
PCB 167	0.040	0.01	1.0	0.05	0.005	2.5
PCB 169	0.040	0.01	1.0	0.05	0.005	2.5
PCB 170	0.040	0.01	1.0	0.05	0.005	2.5
PCB 171	0.080	0.02	2.0	0.1	0.01	5
PCB 173	0.080	0.02	2.0	0.1	0.01	5
PCB 172	0.040	0.01	1.0	0.05	0.005	2.5
PCB 174	0.040	0.01	1.0	0.05	0.005	2.5
PCB 175	0.040	0.01	1.0	0.05	0.005	2.5

	TestAmerica Knoxville EMLs [1] (1668A, B & C)			1668C Reference Method EMLs [2]		
Parameter	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**	**Water ng/L**	**Other [3] ng/g**	**Extract ng/mL**
PCB 176	0.040	0.01	1.0	0.05	0.005	2.5
PCB 177	0.040	0.01	1.0	0.05	0.005	2.5
PCB 178	0.040	0.01	1.0	0.05	0.005	2.5
PCB 179	0.040	0.01	1.0	0.05	0.005	2.5
PCB 180	0.080	0.02	2.0	0.1	0.01	5
PCB 193	0.080	0.02	2.0	0.1	0.01	5
PCB 181	0.040	0.01	1.0	0.05	0.005	2.5
PCB 182	0.040	0.01	1.0	0.05	0.005	2.5
PCB 183	0.080	0.02	2.0	0.1	0.01	5
PCB 185	0.080	0.02	2.0	0.1	0.01	5
PCB 184	0.040	0.01	1.0	0.05	0.005	2.5
PCB 186	0.040	0.01	1.0	0.05	0.005	2.5
PCB 187	0.040	0.01	1.0	0.05	0.005	2.5
PCB 188	0.040	0.01	1.0	0.05	0.005	2.5
PCB 189	0.040	0.01	1.0	0.05	0.005	2.5
PCB 190	0.040	0.01	1.0	0.05	0.005	2.5
PCB 191	0.040	0.01	1.0	0.05	0.005	2.5
PCB 192	0.040	0.01	1.0	0.05	0.005	2.5
PCB 194	0.040	0.01	1.0	0.05	0.005	2.5
PCB 195	0.040	0.01	1.0	0.05	0.005	2.5
PCB 196	0.040	0.01	1.0	0.05	0.005	2.5
PCB 197	0.040	0.01	1.0	0.1	0.01	5
PCB 200	0.040	0.01	1.0	0.1	0.01	5
PCB 198	0.080	0.02	2.0	0.1	0.01	5
PCB 199	0.080	0.02	2.0	0.1	0.01	5
PCB 201	0.040	0.01	1.0	0.05	0.005	2.5
PCB 202	0.040	0.01	1.0	0.1	0.01	5
PCB 203	0.040	0.01	1.0	0.05	0.005	2.5
PCB 204	0.040	0.01	1.0	0.05	0.005	2.5
PCB 205	0.040	0.01	1.0	0.05	0.005	2.5
PCB 206	0.040	0.01	1.0	0.05	0.005	2.5
PCB 207	0.040	0.01	1.0	0.05	0.005	2.5
PCB 208	0.040	0.01	1.0	0.05	0.005	2.5
PCB 209	0.040	0.01	1.0	0.05	0.005	2.5

[1] The estimated minimum level (EML) is defined as the lowest concentration at which an analyte can be measured reliably with common laboratory interferences present assuming a sample is extracted at the recommended weight or volume and is carried through all normal extraction and analysis procedures The values for other matrices (solids, tissues and solid wastes) reflect the EMLs for Protocol 1 as described in Table 12. If the sample is prepared by another protocol described in that section, the EMLs shown in this table must be adjusted appropriately. The EMLs are based on the mean plus 2 standard deviations for matrix-pooled historical blank data and calibration data obtained while performing EPA 1668A. The survey period was fourteen months, ending in February 2004. Individual EMLs may be adjusted to reflect more recent data.

[2] For reference purposes only, not currently used by TestAmerica Knoxville

[3] Other matrices include solids, tissues and solid wastes

Table 5a- Concentration of Target PCB Congener Stock and Spiking Solutions

Target PCB Congener	PCB	Standard Source	Catalog Number	Vendor Conc (ng/mL)	LCS Spiking Solution Conc (ng/mL)
2-MoCB	1	[redacted]		4000	5.0
4-MoCB	3			4000	5.0
2,2'-DiCB	4			4000	5.0
4,4'-DiCB	15			4000	5.0
2,2',6-TrCB	19			4000	5.0
3,4,4'-TrCB	37			4000	5.0
2,2',6,6'-TeCB	54			4000	5.0
3,3',4,4'-TeCB	77			4000	5.0
3,4,4',5-TeCB	81			4000	5.0
2,2',4,6,6'-PeCB	104			4000	5.0
2,3,3',4,4'-PeCB	105			4000	5.0
2,3,4,4',5-PeCB	114			4000	5.0
2,3',4,4',5-PeCB	118			4000	5.0
2',3,4,4',5-PeCB	123			4000	5.0
3,3',4,4',5-PeCB	126			4000	5.0
2,2',4,4',6,6'-HxCB	155			4000	5.0
2,3,3',4,4',5-HxCB	156			4000	5.0
2,3,3',4,4',5'-HxCB	157			4000	5.0
2,3',4,4',5,5'-HxCB	167			4000	5.0
3,3',4,4',5,5'-HxCB	169			4000	5.0
2,2',3,4',5,6,6'-HpCB	188			4000	5.0
2,3,3',4,4',5,5'-HpCB	189			4000	5.0
2,2',3,3',5,5',6,6'-OcCB	202			4000	5.0
2,3,3',4,4',5,5',6-OcCB	205			4000	5.0
2,2',3,3',4,4',5,5',6-NoCB	206			4000	5.0
2,2',3,3',4',5,5',6,6'-NoCB	208			4000	5.0
DeCB	209			4000	5.0
All other CB congeners	NA			4000	5.0

Table 5b: Concentration of $^{13}C_{12}$ Labeled PCB Congener Stock and Spiking Solutions

Labeled PCB Congener	**PCB**	**Standard Source**	**Catalog Number**	**Vendor Conc (ng/mL)**	Stock Conc (ng/mL)	Spiking Solution Conc (ng/mL)
IDA						
$^{13}C_{12}$-2-chlorobiphenyl	1L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-4-chlorobiphenyl	3L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2'-dichlorobiphenyl	4L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-4,4'-dichlorobiphenyl	15L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',6-trichlorobiphenyl	19L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-3,4,4'-trichlorobiphenyl	37L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',6,6'-tetrachlorobiphenyl	54L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-3,3',4,4'-tetrachlorobiphenyl	77L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-3,4,4',5-tetrachlorobiphenyl	81L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',4,6,6'-pentachlorobiphenyl	104L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3,3',4,4'-pentachlorobiphenyl	105L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$2,3,4,4',5-pentachlorobiphenyl -	114L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3',4,4',5-pentachlorobiphenyl	118L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2',3,4,4',5-pentachlorobiphenyl	123L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-3,3',4,4',5-pentachlorobiphenyl	126L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',4,4',6,6'-hexachlorobiphenyl	155L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3,3',4,4',5-hexachlorobiphenyl	156L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3,3',4,4',5'-hexachlorobiphenyl	157L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3',4,4',5,5'-hexachlorobiphenyl	167L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-3,3',4,4',5,5'-hexachlorobiphenyl	169L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',3,3',4,4',5-heptachlorobiphenyl	170L	[redacted]	[redacted]	40,000	1000	10
$^{13}C_{12}$-2,2',3,4',5,6,6'-heptachlorobiphenyl	188L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3,3',4,4',5,5'-heptachlorobiphenyl	189L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-octachlorobiphenyl	202L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,3,3',4,4',5,5',6-octachlorobiphenyl	205L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	206L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	208L	[redacted]	[redacted]	1,000	1000	10
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	209L	[redacted]	[redacted]	1,000	1000	10
Istd		[redacted]	[redacted]			
$^{13}C_{12}$-2,5-dichlorobiphenyl	9L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,4',5-trichlorobiphenyl	31L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,4',6-trichlorobiphenyl	32L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,2',5,5'-tetrachlorobiphenyl	52L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,2',4,5,5'-pentachlorobiphenyl	101L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-3,3',4,5,5'-pentachlorobiphenyl	127L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,2',3,4,4',5'-hexachlorobiphenyl	138L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,2',3,4,4',5,5'-heptachlorobiphenyl	180L	[redacted]	[redacted]	1,000	1000	100
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-octachlorobiphenyl	194L	[redacted]	[redacted]	1,000	1000	100
Surrogates		[redacted]	[redacted]			
$^{13}C_{12}$-2,4,4'-trichlorobiphenyl	28L	[redacted]	[redacted]	5,000	5000	10
$^{13}C_{12}$-2,3,3',5,5'-pentachlorobiphenyl	111L	[redacted]	[redacted]	5,000	5000	10
$^{13}C_{12}$-2,2',3,3',5,5',6-heptachlorobiphenyl	178L	[redacted]	[redacted]	5,000	5000	10
Air Surrogate Standards		[redacted]	[redacted]			
$^{13}C_{12}$-2,4'-dichlorobiphenyl	8L	[redacted]	[redacted]	5,000	5000	50
$^{13}C_{12}$-3,3',4,5'-tetrachlorobiphenyl	79L	[redacted]	[redacted]	5,000	5000	50
$^{13}C_{12}$-2,2',3,5',6-pentachlorobiphenyl	95L	[redacted]	[redacted]	50,000	5000	50
$^{13}C_{12}$-2,2',4,4',5,5'-hexachlorobiphenyl	153L	[redacted]	[redacted]	5,000	5000	50

Table 6a - Concentration of PCBs in Calibration Solutions

Analyte Type	PCB[1]	CS 0.5 ng/mL	CS 1 ng/mL	CS 2 ng/mL	CS 3[2] ng/mL	CS 4 ng/mL	CS 5 ng/mL
Congeners							
2-MoCB	1	0.5	1.0	5.0	50	400	2000
4-MoCB	3	0.5	1.0	5.0	50	400	2000
2,2'-DiCB	4	0.5	1.0	5.0	50	400	2000
4,4'-DiCB	15	0.5	1.0	5.0	50	400	2000
2,2',6'-TrCB	19	0.5	1.0	5.0	50	400	2000
3,4,4'-TrCB	37	0.5	1.0	5.0	50	400	2000
2,2',6,6'-TeCB	54	0.5	1.0	5.0	50	400	2000
3,3',4,4'-TeCB	77	0.5	1.0	5.0	50	400	2000
3,4,4',5-TeCB	81	0.5	1.0	5.0	50	400	2000
2,2',4,6,6'-PeCB	104	0.5	1.0	5.0	50	400	2000
2,3,3',4,4'-PeCB	105	0.5	1.0	5.0	50	400	2000
2,3,4,4',5-PeCB	114	0.5	1.0	5.0	50	400	2000
2,3',4,4',5-PeCB	118	0.5	1.0	5.0	50	400	2000
2',3,4,4',5-PeCB	123	0.5	1.0	5.0	50	400	2000
3,3',4,4',5-PeCB	126	0.5	1.0	5.0	50	400	2000
2,2',4,4',6,6'-HxCB	155	0.5	1.0	5.0	50	400	2000
2,3,3',4,4',5-HxCB	156	0.5	1.0	5.0	50	400	2000
2,3,3',4,4',5'-HxCB	157	0.5	1.0	5.0	50	400	2000
2,3',4,4',5,5'-HxCB	167	0.5	1.0	5.0	50	400	2000
3,3',4,4',5,5'-HxCB	169	0.5	1.0	5.0	50	400	2000
2,2',3,4',5,6,6'-HpCB	188	0.5	1.0	5.0	50	400	2000
2,3,3',4,4',5,5'-HpCB	189	0.5	1.0	5.0	50	400	2000
2,2',3,3',5,5',6,6'-OcCB	202	0.5	1.0	5.0	50	400	2000
2,3,3',4,4',5,5',6-OcCB	205	0.5	1.0	5.0	50	400	2000
2,2',3,3',4,4',5,5',6-NoCB	206	0.5	1.0	5.0	50	400	2000
2,2',3,3',4',5,5',6,6'-NoCB	208	0.5	1.0	5.0	50	400	2000
DeCB	209	0.5	1.0	5.0	50	400	2000
All other CB congeners		0.5	1.0	5.0	50	400	2000
Labeled Congeners							
$^{13}C_{12}$-2-MoCB	1L	100	100	100	100	100	100
$^{13}C_{12}$-4-MoCB	3L	100	100	100	100	100	100
$^{13}C_{12}$-2,2'-DiCB	4L	100	100	100	100	100	100
$^{13}C_{12}$-4,4'-DiCB	15L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',6-TrCB	19L	100	100	100	100	100	100
$^{13}C_{12}$-3,4,4'-TrCB	37L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',6,6'-TeCB	54L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,4'-TeCB	77L	100	100	100	100	100	100
$^{13}C_{12}$-3,4,4’,5-TeCB	81L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',4,6,6'-PeCB	104L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4'-PeCB	105L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,4,4',5-PeCB	114L	100	100	100	100	100	100
$^{13}C_{12}$-2,3',4,4',5-PeCB	118L	100	100	100	100	100	100
$^{13}C_{12}$-2',3,4,4',5-PeCB	123L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,4',5-PeCB	126L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',4,4',6,6'-HxCB	155L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5-HxCB	156L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5'-HxCB	157L	100	100	100	100	100	100
$^{13}C_{12}$-2,3',4,4',5,5'-HxCB	167L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,4',5,5'-HxCB	169L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4,4',5-HpCB	170L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,4',5,6,6'-HpCB	188L	100	100	100	100	100	100
$^{13}C_{12}$-2,3,3',4,4',5,5'-HpCB	189L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',5,5',6,6'-OcCB	202L	100	100	100	100	100	100

Analyte Type	PCB[1]	CS 0.5 ng/mL	CS 1 ng/mL	CS 2 ng/mL	CS 3[2] ng/mL	CS 4 ng/mL	CS 5 ng/mL
$^{13}C_{12}$-2,3,3',4,4',5,5',6-OcCB	205L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-NoCB	206L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4',5,5',6,6'-NoCB	208L	100	100	100	100	100	100
$^{13}C_{12}$-DeCB	209L	100	100	100	100	100	100
Surrogate Standards							
$^{13}C_{12}$-2,4,4'-TriCB	28L			5.0	50	400	--
$^{13}C_{12}$-2,3,3',5,5'-PeCB	111L			5.0	50	400	--
$^{13}C_{12}$-2,2',3,3',5,5',6-HpCB	178L			5.0	50	400	--
Istd							
$^{13}C_{12}$-2,5-DiCB	9L	100	100	100	100	100	100
$^{13}C_{12}$-2,4',5-TriCB	31L	100	100	100	100	100	100
$^{13}C_{12}$-2,4',6-TriCB	32L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',5,5'-TeCB	52L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',4',5,5'-PeCB	101L	100	100	100	100	100	100
$^{13}C_{12}$-3,3',4,5,5'-PeCB	127L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3',4,4',5'-HxCB	138L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,4,4',5,5'-HpCB	180L	100	100	100	100	100	100
$^{13}C_{12}$-2,2',3,3',4,4',5,5'-OcCB	194L	100	100	100	100	100	100
Labeled Air Surrogates							
$^{13}C_{12}$-2,4'-DiCB	8L			5.0	50	400	--
$^{13}C_{12}$-3,3',4,5'-TeCB	79L			5.0	50	400	--
$^{13}C_{12}$-2,2',3,5',6-PeCB	95L			5.0	50	400	--
$^{13}C_{12}$-2,2',4,4',5,5'-HxCB	153L			5.0	50	400	--

Notes:

1. Suffix “L” indicates labeled compound.

2. The CS 3 standard is also used as the calibration verification solution.

Table 6b – Preparation of Calibration Solutions

Calibration Standard ID	Parent Standards	Parent Conc. (ng/mL)	Volume Added (mL)	Final Volume (mL)	Final Conc (ng/mL)
CS 0.5	Target PCB Congener Stock Solution	40	0.0125	1.0	0.50
	IDA Stock Solution	1000	0.1000		100
	Istd Stock Solution	1000	0.1000		100
CS 1	Target PCB Congener Stock Solution	40	0.0250	1.0	1.0
	IDA Stock Solution	1000	0.1000		100
	Istd Stock Solution	1000	0.1000		100
CS 2	Target PCB Congener Stock Solution	40	0.1250	1.0	5.0
	IDA Stock Solution	1000	0.1000		100
	Istd Stock Solution	1000	0.1000		100
	Surrogate Stock Solution	5000	0.0010		5.0
	Air Surrogate Stock Solution	5000	0.0010		5.0
CS 3	Target PCB Congener Standard Mix	4000	0.0375	3.0	50
	IDA Stock Solution	1000	0.3000		100
	Istd Stock Solution	1000	0.3000		100
	Surrogate Stock Solution	5000	0.0300		50
	Air Surrogate Stock Solution	5000	0.0300		50
CS 4	Target PCB Congener Standard Mix	4000	0.1000	1.0	400
	IDA Stock Solution	1000	0.1000		100
	Istd Stock Solution	1000	0.1000		100
	Surrogate Stock Solution	5000	0.0800		400
	Air Surrogate Stock Solution	5000	0.0800		400
CS 5	Target PCB Congener Standard Mix	4000	0.5000	1.0	2000
	IDA Stock Solution	1000	0.1000		100
	Istd Stock Solution	1000	0.1000		100

Table 7 - GC Window Defining Mixture and SPB –Octyl Resolution Test Compounds

SPB-Octyl

Congener Group	First Eluted		Last Eluted	
Mono	1	2-	3	4-
Di	4	2,2’-	15	4,4’-
Tri	19	2,2’,6-	37	3,4,4’-
Tetra	54	2,2’,6,6’-	77	3,3’,4,4’-
Penta	104	2,2’,4,6,6’-	126	3,3’,4,4’,5-
Hexa	155	2,2’,4,4’,6,6’-	169	3,3’,4,4’,5,5’-
Hepta	188	2,2’,3,4’,5,6,6’-	189	2,3,3’,4,4’,5,5’-
Octa	202	2,2’,3,3’,5,5’,6,6’-	205	2,3,3’,4,4’,5,5’,6-
Nona	208	2,2’,3,3’,4,5,5’,6,6’-	206	2,2’,3,3’,4,4’,5,5’,6-
Deca	209	2,2’,3,3’,4,4’,5,5’,6,6’-	209	2,2’,3,3’,4,4’,5,5’,6,6’-

SPB-Octyl Resolution Test Compounds

23	2,3,5-trichlorobiphenyl
34	2’,3,5-trichlorobiphenyl (2,3’,5’-trichlorobiphenyl)
182	2,2’,3,4,4’,5,6’-heptachlorobiphenyl
187	2,2’,3,4’,5,5’,6-heptachlorobiphenyl

Table 8 - Ions Monitored for HRGC/HRMS Analysis of PCBs

Descriptor	Accurate Mass	Ion ID	Elemental Composition	Analyte
1	168.9833	Lock	C_4F_7 ($C_3F_7^+$)	FC43
	188.0393	M	$C_{12}H_9{}^{35}Cl$	Mono
	190.0363	M+2	$C_{12}H_9{}^{37}Cl$	Mono
	200.0795	M	$^{13}C_{12}H_9{}^{35}Cl$	Mono-13C12
	202.0766	M+2	$^{13}C_{12}H_9{}^{37}Cl$	Mono-13C12
	222.0003	M	$C_{12}H_8{}^{35}Cl_2$	Di
	223.9974	M+2	$C_{12}H_8{}^{35}Cl^{37}Cl$	Di
	234.0406	M	$^{13}C_{12}H_8{}^{35}Cl_2$	Di-13C
	236.0376	M+2	$^{13}C_{12}H_8{}^{35}Cl^{37}Cl$	Di-13C
	255.9613	M	$C_{12}H_7{}^{35}Cl_3$	Tri
	257.9584	M+2	$C_{12}H_7{}^{35}Cl_2{}^{37}Cl$	Tri
	268.0016	M	$^{13}C_{12}H_7{}^{35}Cl_3$	Tri-13C
	269.9986	M+2	$^{13}C_{12}H_7{}^{35}Cl_2{}^{37}Cl$	Tri-13C
	263.9866	QC	C_6F_{11} ($C_5NF_{10}^+$)	FC43
	289.9224	M	$C_{12}H_6{}^{35}Cl_4$	Tetra
	291.9194	M+2	$C_{12}H_6{}^{35}Cl_3{}^{37}Cl$	Tetra
	301.9626	M	$^{13}C_{12}H_6{}^{35}Cl_4$	Tetra-13C
	303.9597	M+2	$^{13}C_{12}H_6{}^{35}Cl_3{}^{37}Cl$	Tetra-13C
2	255.9613	M	$C_{12}H_7{}^{35}Cl_3$	Tri
	257.9584	M+2	$C_{12}H_7{}^{35}Cl_2{}^{37}Cl$	Tri
	268.0016	M	$^{13}C_{12}H_7{}^{35}Cl_3$	Tri-13C
	263.9866	Lock	C_5F_{11}($C_5NF_{10}^+$)	FC43
	269.9986	M+2	$^{13}C_{12}H_7{}^{35}Cl_2{}^{37}Cl$	Tri-13C
	289.9224	M	$C_{12}H_6{}^{35}Cl_4$	Tetra
	291.9194	M+2	$C_{12}H_6{}^{35}Cl_3{}^{37}Cl$	Tetra
	301.9626	M	$^{13}C_{12}H_6{}^{35}Cl_4$	Tetra-13C
	303.9597	M+2	$^{13}C_{12}H_6{}^{35}Cl_3{}^{37}Cl$	Tetra-13C
	325.8804	M+2	$C_{12}H_5{}^{35}Cl_4{}^{37}Cl$	Penta
	327.8775	M+4	$C_{12}H_5{}^{35}Cl_3{}^{37}Cl_2$	Penta
	337.9207	M+2	$^{13}C_{12}H_5{}^{35}Cl_4{}^{37}Cl$	Penta-13C
	339.9178	M+4	$^{13}C_{12}H_5{}^{35}Cl_3{}^{37}Cl_2$	Penta-13C
	359.8415	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}Cl$	Hexa
	361.8385	M+4	$C_{12}H_4{}^{35}Cl_4{}^{37}Cl_2$	Hexa
	371.8817	M+2	$^{13}C_{12}H_4{}^{35}Cl_5{}^{37}Cl$	Hexa-13C
	373.8788	M+4	$^{13}C_{12}H_4{}^{35}Cl_4{}^{37}Cl_2$	Hexa-13C
	375.9802	QC	$C_{10}F_{14}$ ($C_8NF_{14}^+$)	FC43

Table 8 - Ions Monitored for HRGC/HRMS Analysis of PCBs (continued)

Descriptor	Accurate Mass	Ion ID	Elemental Composition	Analyte
3	325.8804	M+2	$C_{12}H_5{}^{35}Cl_4{}^{37}Cl$	Penta
	327.8775	M+4	$C_{12}H_5{}^{35}Cl_3{}^{37}Cl_2$	Penta
	337.9207	M+2	$^{13}C_{12}H_5{}^{35}Cl_4{}^{37}Cl$	Penta-13C
	339.9178	M+4	$^{13}C_{12}H_5{}^{35}Cl_3{}^{37}Cl_2$	Penta-13C
	313.9834	Lock	C_8F_{13} ($C_6NF_{12}{}^+$)	FC43
	359.8415	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}Cl$	Hexa
	361.8385	M+4	$C_{12}H_4{}^{35}Cl_4{}^{37}Cl_2$	Hexa
	371.8817	M+2	$^{13}C_{12}H_4{}^{35}Cl_5{}^{37}Cl$	Hexa-13C
	373.8788	M+4	$^{13}C_{12}H_4{}^{35}Cl_4{}^{37}Cl_2$	Hexa-13C
	393.8025	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}Cl$	Hepta
	395.7995	M+4	$C_{12}H_3{}^{35}Cl_5{}^{37}Cl_2$	Hepta
	405.8428	M+2	$^{13}C_{12}H_3{}^{35}Cl_6{}^{37}Cl$	Hepta-13C
	407.8398	M+4	$^{13}C_{12}H_3{}^{35}Cl_5{}^{37}Cl_2$	Hepta-13C
	427.7635	M+2	$C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	Octa
	429.7606	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	Octa
	413.9770	QC	C_9F_{17} ($C_8NF_{16}{}^+$)	FC43
	439.8038	M+2	$^{13}C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	Octa-13C
	441.8008	M+4	$^{13}C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	Octa-13C
4	393.8025	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}Cl$	Hepta
	395.7995	M+4	$C_{12}H_3{}^{35}Cl_5{}^{37}Cl_2$	Hepta
	413.9770	Lock	$C_{10}F_{15}$ ($C_8NF_{16}{}^+$)	FC43
	405.8428	M+2	$^{13}C_{12}H_3{}^{35}Cl_6{}^{37}Cl$	Hepta-13C
	407.8398	M+4	$^{13}C_{12}H_3{}^{35}Cl_5{}^{37}Cl_2$	Hepta-13C
	427.7635	M+2	$C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	Octa
	429.7606	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	Octa
	439.8038	M+2	$^{13}C_{12}H_2{}^{35}Cl_7{}^{37}Cl$	Octa-13C
	441.8008	M+4	$^{13}C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2$	Octa-13C
	461.7246	M+2	$C_{12}H^{35}Cl_7{}^{37}Cl_2$	Nona
	463.7216	M+4	$C_{12}H^{35}Cl_6{}^{37}Cl_3$	Nona
	473.7648	M+2	$^{13}C_{12}H^{35}Cl_7{}^{37}Cl_2$	Nona-13C
	475.7619	M+4	$^{13}C_{12}H^{35}Cl_6{}^{37}Cl_3$	Nona-13C
	495.6856	M+2	$C_{12}{}^{35}Cl_8{}^{37}Cl_2$	Deca
	497.6826	M+4	$C_{12}{}^{35}Cl_7{}^{37}Cl_3$	Deca
	501.9706	QC	$C_{12}F_{19}$ ($C_9NF_{20}{}^+$)	FC43
	507.7258	M+2	$^{13}C_{12}{}^{35}Cl_8{}^{37}Cl_2$	Deca-13C
	509.7229	M+4	$^{13}C_{12}{}^{35}Cl_7{}^{37}Cl_3$	Deca-13C

1. Nuclidic masses used: H = 1.007825 C = 12.00000 ^{13}C = 13.003355 F = 18.9984

O = 15.994915 ^{35}Cl = 34.968853 ^{37}Cl = 36.965903

Table 9 - Theoretical Ion Abundance Ratios and Control Limits for PCBs

Chlorine Atoms	mass's Forming Ratios	Theoretical Ratio	Lower QC Limit	Upper QC Limit
1	m/m+2	3.13	2.66	3.60
2	m/m+2	1.56	1.33	1.79
3	m/m+2	1.04	0.88	1.20
4	m/m+2	0.77	0.65	0.89
5	m+2/m+4	1.55	1.32	1.78
6	m+2/m+4	1.24	1.05	1.43
7	m+2/m+4	1.05	0.89	1.21
8	m+2/m+4	0.89	0.76	1.02
9	m+2/m+4	0.77	0.65	0.89
10	m+2/m+4	0.69	0.59	0.79

Table 10A - Acceptance Criteria for Performance Tests (1668A & B)

			IPR (IDOC)			
Toxic & LOC Congeners	**PCB**	**Test Conc (ng/mL) [1]**	**%RSD**	**%R**	**VER %R**	**LCS %R**
2-chlorobiphenyl	1	50	40	60-140	70-130	50-150
4-chlorobiphenyl	3	50	40	60-140	70-130	50-150
2,2’-dichlorobiphenyl	4	50	40	60-140	70-130	50-150
4,4’-dichlorobiphenyl	15	50	40	60-140	70-130	50-150
2,2’,6-trichlorobiphenyl	19	50	40	60-140	70-130	50-150
3,4,4’-trichlorobiphenyl	37	50	40	60-140	70-130	50-150
2,2’,6,6’-tetrachlorobiphenyl	54	50	40	60-140	70-130	50-150
3,3’,4,4’-tetrachlorobiphenyl	77	50	40	60-140	70-130	50-150
3,4,4’,5-tetrachlorobiphenyl	81	50	40	60-140	70-130	50-150
2,2’4,6,6’-pentachlorobiphenyl	104	50	40	60-140	70-130	50-150
2,3,3’,4,4’-pentachlorobiphenyl	105	50	40	60-140	70-130	50-150
2,3,4,4’,5-pentachlorobiphenyl	114	50	40	60-140	70-130	50-150
2,3’,4,4’,5-pentachlorobiphenyl	118	50	40	60-140	70-130	50-150
2’,3’,4,4’,5-pentachlorobiphenyl	123	50	40	60-140	70-130	50-150
3,3’,4,4’,5-pentachlorobiphenyl	126	50	40	60-140	70-130	50-150
2,2’,4,4’,6,6’-hexachlorobiphenyl	155	50	40	60-140	70-130	50-150
2,3,3’,4,4’,5-hexachlorobiphenyl	156	50	40	60-140	70-130	50-150
2,3’,4,4’,5,5’-hexachlorobiphenyl	157	50	40	60-140	70-130	50-150
2,3,3’,4,4’,5’-hexachlorobiphenyl	167	50	40	60-140	70-130	50-150
3,3’,4,4’,5,5’-hexachlorobiphenyl	169	50	40	60-140	70-130	50-150
2,2’,3,4’5,6,6’-heptachlorobiphenyl	188	50	40	60-140	70-130	50-150
2,3,3’,4,4’,5,5’-heptachlorobiphenyl	189	50	40	60-140	70-130	50-150
2,2’,3,3',5,5',6,6’-octachlorobiphenyl	202	50	40	60-140	70-130	50-150
2,3,3',4,4',5,5',6-octachlorobiphenyl	205	50	40	60-140	70-130	50-150
2,2’,3,3’,4,4’,5,5’,6-nonachlorobiphenyl	206	50	40	60-140	70-130	50-150
2,2’,3,3’,4,5,5’,6,6’-nonachlorobiphenyl	208	50	40	60-140	70-130	50-150
2,2’,3,3’,4,4’,5,5’,6,6’-decachlorobiphenyl	209	50	40	60-140	70-130	50-150
IDAs						
$^{13}C_{12}$-2-chlorobiphenyl	1L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-4-chlorobiphenyl	3L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’-dichlorobiphenyl	4L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-4,4’-dichlorobiphenyl	15L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’,6-trichlorobiphenyl	19L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-3,4,4’-trichlorobiphenyl	37L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’,6,6’-tetrachlorobiphenyl	54L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-3,3’,4,4’-tetrachlorobiphenyl	77L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-3,4,4’,5-tetrachlorobiphenyl	81L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’,4,6,6’-pentachlorobiphenyl	104L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3,3’,4,4’-pentachlorobiphenyl	105L	100	50	35-135	50-150	30-140
$^{13}C_{12}$2,3,4,4’,5-pentachlorobiphenyl -	114L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3’,4,4’,5-pentachlorobiphenyl	118L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2’,3,4,4’,5-pentachlorobiphenyl	123L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-3,3’,4,4’,5-pentachlorobiphenyl	126L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’,4,4’,6,6’-hexachlorobiphenyl	155L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3,3’,4,4’,5-hexachlorobiphenyl	156L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3,3’,4,4’,5’-hexachlorobiphenyl	157L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3’,4,4’,5,5’-hexachlorobiphenyl	167L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-3,3’,4,4’,5,5’-hexachlorobiphenyl	169L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2',3,3',4,4',5-heptachlorobiphenyl	170L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’,3,4’,5,6,6’-heptachlorobiphenyl	188L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3,3’,4,4’,5,5’-heptachlorobiphenyl	189L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2’,3,3’,5,5’,6,6’-octachlorobiphenyl	202L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,3,3’,4,4’,5,5’,6-octachlorobiphenyl	205L	100	50	35-135	50-150	30-140

			IPR (IDOC)			
Toxic & LOC Congeners	**PCB**	**Test Conc (ng/mL)** [1]	**%RSD**	**%R**	**VER %R**	**LCS %R**
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	206L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	208L	100	50	35-135	50-150	30-140
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	209L	100	50	35-135	50-150	30-140
Surrogate Standards						
$^{13}C_{12}$-2,4,4'-trichlorobiphenyl	28L	50	45	45-120	60-130	40-125
$^{13}C_{12}$-2,3,3',5,5'-pentachlorobiphenyl	111L	50	45	45-120	60-130	40-125
$^{13}C_{12}$-2,2',3,3',5,5',6-heptachlorobiphenyl	178L	50	45	45-120	60-130	40-125
Air Surrogate Standards						
$^{13}C_{12}$-2,4'-dichlorobiphenyl	8L	50			50-150	50-150
$^{13}C_{12}$-3,3',4,5'-tetrachlorobiphenyl	79L	50			50-150	50-150
$^{13}C_{12}$-2,2',3,5',6-pentachlorobiphenyl	95L	50			50-150	50-150
$^{13}C_{12}$-2,2',4,4',5,5'-hexachlorobiphenyl	153L	50			50-150	50-150

[1] - Test concentrations are based on ng/mL in the sample extract or standard solution.

Table 10B - Acceptance Criteria for Performance Tests (1668C)

			IPR (IDOC)				
Toxic & LOC Congeners	**PCB**	**Test Conc (ng/mL) [1]**	**%RSD**	**Mean %R**	**VER %R**	**OPR (LCS) %R**	**Labeled Compound %R in Samples**
2-chlorobiphenyl	1	50	25	70-130	75-125	60-135	
4-chlorobiphenyl	3	50	25	70-130	75-125	60-135	
2,2’-dichlorobiphenyl	4	50	25	70-130	75-125	60-135	
4,4’-dichlorobiphenyl	15	50	25	70-130	75-125	60-135	
2,2’,6-trichlorobiphenyl	19	50	25	70-130	75-125	60-135	
3,4,4’-trichlorobiphenyl	37	50	25	70-130	75-125	60-135	
2,2’,6,6’-tetrachlorobiphenyl	54	50	25	70-130	75-125	60-135	
3,3’,4,4’-tetrachlorobiphenyl	77	50	25	70-130	75-125	60-135	
3,4,4’,5-tetrachlorobiphenyl	81	50	25	70-130	75-125	60-135	
2,2’4,6,6’-pentachlorobiphenyl	104	50	25	70-130	75-125	60-135	
2,3,3’,4,4’-pentachlorobiphenyl	105	50	25	70-130	75-125	60-135	
2,3,4,4’,5-pentachlorobiphenyl	114	50	25	70-130	75-125	60-135	
2,3’,4,4’,5-pentachlorobiphenyl	118	50	25	70-130	75-125	60-135	
2’,3’,4,4’,5-pentachlorobiphenyl	123	50	25	70-130	75-125	60-135	
3,3’,4,4’,5-pentachlorobiphenyl	126	50	25	70-130	75-125	60-135	
2,2’,4,4’,6,6’-hexachlorobiphenyl	155	50	25	70-130	75-125	60-135	
2,3,3’,4,4’,5-hexachlorobiphenyl	156	50	25	70-130	75-125	60-135	
2,3’,4,4’,5,5’-hexachlorobiphenyl	157	50	25	70-130	75-125	60-135	
2,3,3’,4,4’,5’-hexachlorobiphenyl	167	50	25	70-130	75-125	60-135	
3,3’,4,4’,5,5’-hexachlorobiphenyl	169	50	25	70-130	75-125	60-135	
2,2’,3,4’5,6,6’-heptachlorobiphenyl	188	50	25	70-130	75-125	60-135	
2,3,3’,4,4’,5,5’-heptachlorobiphenyl	189	50	25	70-130	75-125	60-135	
2,2’,3,3',5,5',6,6’-octachlorobiphenyl	202	50	25	70-130	75-125	60-135	
2,3,3',4,4',5,5',6-octachlorobiphenyl	205	50	25	70-130	75-125	60-135	
2,2’,3,3’,4,4’,5,5’,6-nonachlorobiphenyl	206	50	25	70-130	75-125	60-135	
2,2’,3,3’,4,5,5’,6,6’-nonachlorobiphenyl	208	50	25	70-130	75-125	60-135	
2,2’,3,3’,4,4’,5,5’,6,6’-decachlorobiphenyl	209	50	25	70-130	75-125	60-135	
IDAs							
$^{13}C_{12}$-2-chlorobiphenyl	1L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-4-chlorobiphenyl	3L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-2,2’-dichlorobiphenyl	4L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-4,4’-dichlorobiphenyl	15L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-2,2’,6-trichlorobiphenyl	19L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-3,4,4’-trichlorobiphenyl	37L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-2,2’,6,6’-tetrachlorobiphenyl	54L	100	70	20-135	50-145	15-145	5-145
$^{13}C_{12}$-3,3’,4,4’-tetrachlorobiphenyl	77L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-3,4,4’,5-tetrachlorobiphenyl	81L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2’,4,6,6’-pentachlorobiphenyl	104L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,3,3’,4,4’-pentachlorobiphenyl	105L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$2,3,4,4’,5-pentachlorobiphenyl -	114L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,3’,4,4’,5-pentachlorobiphenyl	118L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2’,3,4,4’,5-pentachlorobiphenyl	123L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-3,3’,4,4’,5-pentachlorobiphenyl	126L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2’,4,4’,6,6’-hexachlorobiphenyl	155L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,3,3’,4,4’,5-hexachlorobiphenyl	156L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,3,3’,4,4’,5’-hexachlorobiphenyl	157L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,3’,4,4’,5,5’-hexachlorobiphenyl	167L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-3,3’,4,4’,5,5’-hexachlorobiphenyl	169L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2',3,3',4,4',5-heptachlorobiphenyl	170L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2’,3,4’,5,6,6’-heptachlorobiphenyl	188L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,3,3’,4,4’,5,5’-heptachlorobiphenyl	189L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2’,3,3’,5,5’,6,6’-octachlorobiphenyl	202L	100	50	45-135	50-145	40-145	10-145

			IPR (IDOC)				
Toxic & LOC Congeners	**PCB**	**Test Conc (ng/mL)** [1]	**%RSD**	**Mean %R**	**VER %R**	**OPR (LCS) %R**	**Labeled Compound %R in Samples**
$^{13}C_{12}$-2,3,3',4,4',5,5',6-octachlorobiphenyl	205L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6-nonachlorobiphenyl	206L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2',3,3',4,5,5',6,6'-nonachlorobiphenyl	208L	100	50	45-135	50-145	40-145	10-145
$^{13}C_{12}$-2,2',3,3',4,4',5,5',6,6'-decachlorobiphenyl	209L	100	50	45-135	50-145	40-145	10-145
Surrogate Standards							
$^{13}C_{12}$-2,4,4'-trichlorobiphenyl	28L	50	70	20-135	65-135	15-145	5-145
$^{13}C_{12}$-2,3,3',5,5'-pentachlorobiphenyl	111L	50	50	45-135	75-125	40-145	10-145
$^{13}C_{12}$-2,2',3,3',5,5',6-heptachlorobiphenyl	178L	50	50	45-135	75-125	40-145	10-145
Air Surrogate Standards							
$^{13}C_{12}$-2,4'-dichlorobiphenyl	8L	50			50-150	50-150	50-150
$^{13}C_{12}$-3,3',4,5'-tetrachlorobiphenyl	79L	50			50-150	50-150	50-150
$^{13}C_{12}$-2,2',3,5',6-pentachlorobiphenyl	95L	50			50-150	50-150	50-150
$^{13}C_{12}$-2,2',4,4',5,5'-hexachlorobiphenyl	153L	50			50-150	50-150	50-150

[1] - Test concentrations are based on ng/mL in the sample extract or standard solution.

Table 11 - Retention Times of Isomers on the SPB-Octyl Column for the PCB Standard Mixes[1]

PCB Congener Mix 1 (AccustandardM-1668-1)

Cl Level	BZ No.[2]	Cl Level	BZ No.[2]	Cl Level	BZ No.[2]
1	2	4	78	6	161
2	10	4	81	6	153
2	9	5	96	6	130
2	6	5	103	6	129
2	8	5	95	6	166
2	14	5	88	6	159
2	11	5	89	6	167
3	30	5	92	6	156
3	27	5	113	7	179
3	32	5	83	7	176
3	34	5	119	7	178
3	26	5	87	7	175
3	31	5	85	7	183
3	33	5	82	7	177
3	36	5	120	7	171
3	38	5	124	7	172
3	35	5	106	7	191
4	50	5	122	7	170
4	45	5	105	7	190
4	52	5	127	8	200/201
4	49	6	152	8	204
4	75	6	136	8	199/200
4	41	6	148	8	198
4	72	6	151	8	196
4	57	6	144	8	195
4	63	6	143	8	194
4	66	6	142	9	207
4	79	6	133		

PCB Congener Mix 2 (Accustandard M-1668-2)

Cl Level	BZ No.[2]	Cl Level	BZ No.[2]	Cl Level	BZ No.[2]
2	7	4	55	6	139
2	5	4	60	6	132
2	12	5	94	6	165
3	18	5	100	6	168
3	24	5	91	6	137
3	23	5	121	6	160
3	28	5	90	6	128
3	22	5	99	6	162
3	39	5	109/108	6	157
4	53	5	117	7	184
4	51	5	111	7	186
4	73	5	108/107	7	187
4	48	5	118	7	185
4	62	5	114	7	181
4	71	6	150	7	192
4	68	6	145	8	197
4	58	6	135	8	201/199
4	61	6	149	8	203

Table 11 - Retention Times of Isomers on the SPB-Octyl Column for the PCB Standard Mixes[1] (Continued)

PCB Congener Mix 3 (Accustandard M-1668-3)

Cl Level	BZ No.[2]	Cl Level	BZ No.[2]	Cl Level	BZ No.[2]
2	13	4	80	6	140
3	17	5	93	6	146
3	29	5	84	6	141
3	20	5	101	6	164
4	46	5	112	6	158
4	65	5	86	7	182
4	59	5	116	7	174
4	40	5	107/109	7	173
4	67	6	154	7	193
4	76	6	147		

PCB Congener Mix 4 (Accustandard M-1668-4)

Cl Level	BZ No.[2]	Cl Level	BZ No.[2]	Cl Level	BZ No.[2]
3	25	4	64	5	123
3	21	4	70	6	134
4	69	5	102	6	131
4	47	5	97	6	163
4	42	5	115	7	180

PCB Congener Mix 5 (AccustandardM-1668-5)

Cl Level	BZ No.[2]	Cl Level	BZ No.[2]	Cl Level	BZ No.[2]
1	1	4	74	6	169
1	3	4	56	7	188
2	4	4	77	7	189
2	15	5	104	8	202
3	19	5	98	8	205
3	16	5	125	9	208
3	37	5	110	9	206
4	54	5	126	10	209
4	43	6	155		
4	44	6	138		

Notes:

1 Each congener mix is analyzed in triplicate to establish the retention times of the PCB isomers in the absence of co-eluting isomers. The elution order listed here is used to assign peak identifications in the separate mixture analysis. The average retention time established in the analysis of the separate mixtures is then used to establish relative retention times. (See sections 10.2.3)

2 BZ/IUPAC Number, if different.

Table 12: Assignment of Sample Preparation Protocols

[redacted]

Figure 1 - Recommended GC Operating Conditions

[redacted]

Figure 2 - Recommended MID Descriptors

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 2 - Recommended MID Descriptors (Continued)

[redacted]

Figure 3 - Example Data Review Checklist

Eurofins Knoxville Specialty Organics Group GC/MS Initial Calibration Data Review Checklist
Method 1668 or SOP Number: KNOX-ID-0013 Revision 21

Mass Res Date/Time:		**Inst:**		**ICal Event #'s**	
Chrom WL #:		**ADII Batch #"s**		**2nd Source Filename**	

Review Items	N/A	Yes	No	If No, why is data reportable?	2nd √
1. Was the mass resolution documented before beginning the initial calibration?					
2. Was the instrument resolution ≥8,000 throughout (≥ 10,000 for m/z 342.9792, PFK) and ≥10,000 in the center of each m/z range for the PFK masses or FC43 masses?					
3. Were the measured exact masses listed above within 5 ppm at reduced accelerating voltage?					
4. Have PCB Mixes 1 - 5 been analyzed using the installed column to assign congener retention times, method retention times, and MID switch points?					
5. Were the calibration standard solutions, at the number and concentrations specified in the SOP, analyzed?					
6. Was date/time of analysis verified as correct?					
7. Was the valley height less than 40% of the height of the shorter of the two peaks for the pair PCB 23 and PCB 34, and the pair PCB 182 and PCB 187 in the CS3 standard?					
8. Did the PCB co-elution 156/157 co-max within 2 seconds at peak maximum on the SPB-octyl?					
9. Was the absolute retention time of PCB 209 greater than 55 minutes in the CS3 standard?					
10. Were the response factors calculated for each labeled standard and unlabeled native analyte using the SOP specified reference compound (Table 2), quantitation ions (Table 8), and formula (10.3.4.2)?					
11. Is the %RSD acceptable for all native analytes (within ± 20% calculated by IDAs, and within ± 35% when not calculated by IDAs)?					
12. Is the %RSD acceptable (within ± 35%) for all labeled standards?					
13. Are all S/N ratios ≥10 for the GC signals in each EICP (extracted ion chromatographic profile) including IDAs? (Exception: Secondary native dichloro biphenyl channel m/z 223.9974, PFK)					
14. Are the ion abundance ratios for all native Toxics/LOCs and all labeled compounds within the control limits specified? (Exception: Native dichlorobiphenyls, PFK) (Table 9)					
15. Were all toxic congeners uniquely resolved from non-toxic congeners?					
16. Was an ICV analyzed and calculated according to Section 10.3.5 of the SOP?				< 5 outliers, none more than ±50% D.	
17. If manual integrations were performed, are the analyst's name, reason and date noted in AD II?					
18. If criteria were not met, was a NCM generated?					
19. Do the ICAL AD II batches contain a completed checklist for this work list?					
20. Verify the limit groups are picked correctly in the WL.					
21. Are the reagents correct in the reagent tab?					
22. First level "unlock/ clear" or "unlock clear by sublist" as appropriate?					
23. All standards injected within 12 hours of the mass resolution check?					
24. High point checked for saturation and low point at or below RL?					
25. ICAL start/end dates correct on summary?					
26. Final TALS review: Grapics uploaded, all points in the most recent active calibration event#, approved calibrations in TALs, ICV uploaded and included in all limit group batches?					

Analyst:	**Date:**
Comments:	
2nd Level Reviewer :	**Date:**
Comments:	

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Figure 3- Example Data Review Checklist (Continued)

Eurofins Knoxville Specialty Organics Group GC/MS Continuing Calibration Data Review Checklist
Method 1668 or SOP Number: KNOX-ID-0013 Revision 21

Start Mass Res:		WL #:		CS3 Filename:		Inst/ Date:		
End Mass Res:		AD II Batches:				ICAL event /ADII Batch		

Review Items	N/A	Yes	No	If No, why is data reportable?	2nd Level
1. Was the mass resolution documented at both the beginning and end of the 12 hour shift and is data verified as within the 12 hour clock?					
2. Were all graphics uploaded to AD II?					
3. Was the mass resolution scanned and attached to the corresponding WDMCCV?					
4. Was the instrument resolution ≥8,000 throughout (≥ 10,000 for m/z 342.9792) and ≥10,000 in the center of each m/z range for the PFK masses as listed in the SOP or ≥10,000 in the center of each m/z range for the FC43 masses as listed in the SOP.					
5. Were the measured exact masses listed above within 5 ppm at reduced accelerating voltage?					
6. Were the date and time of analysis verified as correct?					
7. Were the MID switch points set to encompass the retention time windows of each congener group?					
8. Was the valley height less than 40% of the height of the shorter of the two peaks for the pair PCB 23 and PCB 34, and the pair PCB 182 and PCB 187?					
9. Did the PCB co-elution 156/157 co-max within 2 sec at peak max on the SPB-octyl?					
10. Was the continuing calibration performed at the beginning of the 12 hour period after successful mass resolution and GC resolution performance check?					
11. Was the %D for all Toxic analytes within ± 30% for 1668A/B and ± 25% for 1668C? (PCB 81, 77, 123, 118, 114, 105, 126, 167, 156, 157, 169, 189) Was the %D for all LOC analytes within ± 30% for 1668A/B and ± 25% for 1668C? (PCB 1, 3, 4, 15, 19, 37, 54, 104, 155, 188, 202, 205, 206, 208, 209)					
12. Was the %D for all non-toxic/non-LOC analytes within ± 30% (for all versions of 1668)?					
13. Were the response factors calculated for each labeled standard and unlabeled target analyte using the SOP specified reference compound (Table 2), quantitation ions (Table 8), and formula (10.3.4.2)?					
14. Were the absolute retention times of all labeled IDAs within ± 15 seconds of the retention times obtained during initial calibration?					
15. Are %D within ± 50% for all labeled IDAs (for 1668A/B) or -50/+45% (for 1668C) in the calibration?					
16. Are the %D within ± 50% for all labeled field surrogates (for all versions of 1668) in the calibration?					
17. Are the %D within -40/+30% (for 1668A/B) or ± 25% (for 1668C) for all labeled surrogates in the calibration? **Note: for 1668C, PCB28L's lower limit can extend to -35%D.**					
18. Are all S/N ratios ≥10 for the GC signals in each EICP (extracted ion chromatographic profile) including internal standards?					
19. Are RRTs of all unlabled toxic/LOC analytes within their respective RRT limits?					
20. If manual integrations were performed, are they clearly identified in the AD II batch with the analyst, date and reason?					
21. If criteria were not met, was a NCM generated?					
22. Do the AD II batches contain a completed checklist for this work list?					

Analyst:	**Date:**
Comments:	
2nd Level Reviewer :	**Date:**
Comments:	

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Figure 3 - Example Data Review Checklist (Continued)

Eurofins Knoxville PCB Batch Data Review Checklist
Method 1668 - KNOX-ID-0013-R21

WL #:_____
ADII Batch #(s): _____

Review Items	N/A	Yes	No	Why is data reportable?	2nd √
1. Was the correct ICAL used for quantitation? (Check the ICAL event number in every sample and CCV.)					
2. Have the appropriate checklists been completed for the Work List?					
3. Were all special project requirements met (checked in backlog report and in AD II)?					
4. DoD requirements met?				☐ NCM#140-11724: Add to Case Narrative if Manual Integrations Performed ☐ Narrate reasons for multiple analyses of samples	
5. Were the prep factors and dilution factors verified in AD II?				☐ **Dilution-Respike IDA** (NCM#_____)	
6. Sample analyses done within preparation and analytical holding time (Check for H-flag in sample result in AD II)?				☐ **Holding Time-Initial Analysis** (NCM#_____) ☐ **Holding Time-Reanalysis** (NCM#_____)	
7. Are IDAs, surrogates and field surrogates (if applicable) within QC limits?				☐ **IDA-Low-S/N 10:1** (NCM#_____) ☐ **IDA-High-Isotope Dilution** (NCM#_____)	
8. Are IDAs, surrogates and field surrogate (if applicable) ion abundance ratios within limits?				☐ (NCM#_____)	
9. Were peaks ≥2.5 S/N, which did not meet one or more of the criteria listed in section 12.1 of the SOP calculated and reported as EMPCs?					
10. Are positive results within calibration range?				☐ **ICAL-Range Exceed;No Sat.** (NCM#_____)	
11. Are all non-detects that are G-qualified narrated?				☐ (NCM#_____)	
12. Are all manual integrations documented with analyst ID, reason and date in AD II?					
13. Are all graphics uploaded to AD II?					
14. Final report acceptable (1. Job Data Review was checked and all CCV's, QC, and samples are turned to 2nd level, 2. The narrative was checked in Supervisor Desktop for all deviations and grammar errors, and 3. All QC links were verified and at least one sample from every job is linked to the ICAL)?					
15. LCS done per prep batch and all LCS/LCSD recoveries and RPDs within QC limits?				☐ **LCS/LCSD-%R High** (NCM#_____) ☐ **LCS/LCSD-Insuff. Sample** (NCM#_____)	
16. Method blank done per prep batch and method blank or instrument blank analyzed with each sequence?					
17. Are all analytes present in the method blank ≤ EML or within the specific program requirements?				☐ **Method Blank-Report, 10X** (NCM#_____) ☐ **Method Blank-Report ND** (NCM#_____) ☐ **Method Blank-Insuff. Sample** NCM#_____)	

1st Level Reviewed by:	**Date:**
Comments:	
2nd Level Reviewed by:	**Date:**
Comments:	

Appendix I - SPB-Octyl Guard Column Installation and Conditioning

1. Guard column installation on SPB-Octyl

- SPB-Octyl is 30M x 0.25mm ID x 0.25 uM film thickness (Supelco # 24218-U)

- Guard column is 10M non-polar fused silica, 0.25mm ID. This can be purchased in a 60M length and cut down to 10M as needed (Supelco # 25783). The measuring/cutting process is a chore and usually requires an assistant. Supelco does not offer 0.25mm ID non polar fused silica in a 10M length. Restek also does not offer a 10M pre-cut length.

- Butt connector with ferrule – Supelco # 23796
- Butt connector ferrules – Supelco # 23797 (pack of 2)

- The attachment of the guard column to the column via the butt connector and ferrule is a bit delicate. It can be learned by reading the instructions or it can be demonstrated. Upon GC installation, the butt connector threading usually loosens up a bit. This generally should not cause the ferrule to leak, but it is a good idea to snug up the threads a couple times until the threads no longer come loose.

2. SPB-Octyl column conditioning

- As purchased, the SPB-Octyl is unsuitable for installation into an ion source. The column requires an extensive conditioning before use. Even with the conditioning, at our upper run temperature of 270°C, a new column will bleed extensively on the back end of the mass 181 tuning peak, but this bleed will decrease over time.

- To condition an SPB-Octyl column, it should be installed in a GC at ambient temperature with gas flowing to allow sufficient time (about 1 hour) for oxygen to purge from the system. It is then heated to 270°C for at least 18 hours with the column flowing into the oven to avoid trashing the source. **24 hours is preferable.** Set the GC mode to splitless, constant flow. Enter the column dimensions as follows: Length: 60m, ID=250nm, film thickness=0.250um. Flow rate should be 1.5mL/min (in an HP6890 GC, with a 10m guard column and a 30m spb-octyl, this should give a head pressure reading of ~ 47psi when the oven has reached 270 C). Check that you have flow through the column by immersing the source end into a beaker of methanol and watch for bubbles. They should come out of the source end very rapidly if you have installed everything correctly. This conditioning time will bring the SPB-Octyl column to a state where the operator can install it into a source and starting making test runs to establish the GC length configuration that will elute decachlorobiphenyl at 56:00 minutes.

EUROFINS STANDARD OPERATING PROCEDURE

DIOXINS/FURANS BY METHOD 8290/8290A/1613B/23/0023A/TO-9A

STANDARD OPERATING PROCEDURE

TITLE: Analysis of Polychlorinated Dioxins/Furans by High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS) Based on Methods 8290, 8290A, 1613B, 23, 0023A, and TO-9A

(SUPERSEDES: KNOX-ID-0004, Rev. 23)

Approvals (Signature/Date):

Katie Lay 1-24-23 Katie Lay — Date Prepared by:	
1-24-23 Linda McWhirter — Date Technical Specialist	1-25-23 Lewis Osborne — Date Health & Safety Manager / Coordinator
Kevin McGee 1/25/2023 Kevin McGee — Date Quality Assurance Manager	1/25/23 Ray Martrano — Date Laboratory Manager

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1. Scope and Application

1.1 This procedure is used for the determination of tetra- through octa- chlorinated dibenzo-p-dioxins (PCDDs) and dibenzofurans (PCDFs) in water, soils, solids, sediments, wipes, biological samples, fly ash, XAD resin, filters, still bottoms, waste oils, and other sample matrices by high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). This procedure is designed to meet analytical program requirements where US EPA Method 8290, 8290A, 1613B, 23, 0023A, or TO-9A is specified.

1.2 The seventeen 2, 3,7,8-substituted and total tetra-hepta PCDDs/PCDFs listed in Table 1 can be determined by this procedure. Specifications are also provided for separate determination of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD) and 2,3,7,8-tetrachlorodibenzofuran (2,3,7,8-TCDF). In addition, total homologs (i.e., total TCDD, total TCDF, etc.) can be identified by this method.

1.3 The detection limits and quantitation levels in this method are usually dependent on the level of interferences rather than instrumental limitations. The minimum levels (MLs) in Table 2 are the levels at which the PCDDs/PCDFs can be quantitated with no interferences present.

1.4 This procedure is designed for use by analysts who are experienced with residue analysis and skilled in HRGC/HRMS. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.5 Because of the extreme toxicity of many of these compounds, the analyst must take the necessary precautions to prevent exposure to materials known or believed to contain PCDDs or PCDFs. It is the responsibility of the laboratory personnel to ensure that safe handling procedures are employed. Section 5 of this procedure discusses safety procedures.

2. Summary of Method

2.1 This procedure uses high resolution capillary column gas chromatography/high resolution mass spectrometry (HRGC/HRMS) techniques. Refer to SOPs KNOX-OP-0001, current revision and KNOX-OP-0010, current revision for the procedures used for sample extraction and cleanup.

2.2 Samples are spiked with a solution of known amounts of the isotopically labeled isotope dilution analytes (IDA) listed in Table 13 and Table 15. The samples are then extracted using matrix specific extraction procedures.

2.2.1 Water samples are extracted using separatory funnel techniques with methylene chloride as the extraction solvent.

2.2.2 Solid samples are extracted by Soxhlet extraction with toluene as the extraction solvent.

2.2.3 Tissue samples are extracted by Soxhlet extraction with methylene chloride as the extraction solvent

2.2.4 Organic liquid waste samples are diluted in solvent.

2.3 After extraction, the sample is concentrated and solvent exchanged to hexane. The extract is then subjected to one or more optional cleanup steps to remove the sample of interferences. The final extract is prepared by adding a known amount of the labeled internal standards (IS) [redacted] and concentrating to the final volume.

2.4 The acid-base cleanup of the sample is used before column chromatography for samples that contain large amounts of basic and acidic coextractable compounds. If such interferences are not removed before column chromatography, they can cause a shift in the predicted elution pattern. Conditions which can indicate the need for this procedure are as follows: Samples which are highly colored, samples which contain lipids or other oxidizable compounds or samples which contain known large amounts of polar organics.

2.5 Dual Column Cleanup: Silica gel is effective in removing chlorophenoxy herbicide residues, while alumina partitions PCBs, 2,4,5-trichlorophenol and hexachlorophene.

2.6 When the above cleanup techniques do not completely remove interferences, an activated carbon cleanup is used to remove interferences.

2.7 An aliquot of the extract is injected into the gas chromatograph. The analytes are separated by the GC and detected by a high resolution ($\geq$10,000 resolution) mass spectrometer (HRMS). Two exact m/z's are monitored for each analyte.

2.8 The identification of the target 2,3,7,8 substituted isomers is based on their retention time relative to the labeled IDAs as established during routine calibration and the simultaneous detection of the two most abundant ions in the molecular ion region. All other PCDD/PCDF congeners are identified by their retention times falling within retention time windows as established during routine calibration, and the simultaneous detection of the two most abundant ions in the molecular ion region. Confirmation of identification is based on comparing the calculated ion ratios with the theoretical ion abundances. The identification of 2,3,7,8-TCDF is confirmed on an isomer specific (DB-225) GC column.

2.9 Quantitation of the 2,3,7,8-substituted PCDD/PCDF isomers, total PCDDs, and total PCDFs is based on their relative response to the IDAs. A multipoint calibration is performed to establish mean response factors for the target analytes. The instrument performance is routinely checked by the analysis of continuing calibration standards. Method performance is demonstrated by the analysis of method blanks, initial precision and recovery samples, and ongoing precision and recovery samples.

3. Definitions

3.1 Analyte: A PCDD or PCDF tested for by this method. The analytes are listed in Table 1.

3.2 Calibration Standard: A solution prepared from a secondary standard and/or stock solution and used to calibrate the response of the instrument with respect to analyte concentration.

3.3 Calibration Verification Standard (CCV): The mid-point calibration standard (CS3) that is used to verify calibration. See Table 5 and Table 6.

3.4 Cleanup Surrogate Standard (SU): Solution containing [redacted] that is added to the calibration solutions and to every 1613B sample, blank, and quality control spike sample. It is added after extraction but prior to extract cleanup, and the analysis results are used to judge the efficiency of the cleanup procedures.

3.5 Field Surrogate Standard (SU): Isotopically labeled compounds that are added to the XAD-2® resin by the laboratory before sampling train XAD-2® resin traps are shipped to the sampling site.

3.6 Column Performance Solution Mixture (CPS/WDM): A mixture of TCDD or TCDF isomers (including the 2,3,7,8-TCDD or 2,3,7,8-TCDF isomer) known to elute close to the retention time of 2,3,7,8-TCDD or 2,3,7,8-TCDF on the analytical column being used. It is used to demonstrate acceptable resolution between the 2,3,7,8-TCDD or 2,3,7,8-TCDF isomer and all other TCDD or TCDF isomers on analytical column (percent valley ≤ 25%).

3.7 Congener: Any member of a particular homologous series, for example, 1,2,3,7,8-pentachlorodibenzofuran.

3.8 CS1, CS2, CS3, CS4, CS5: See Calibration Standard and Table 5 and Table 6.

3.9 Estimated Detection Limit (EDL): The sample specific estimated detection limit (EDL) is the concentration of a given analyte required to produce a signal with a peak height of at least 2.5 times the background signal level.

3.10 Estimated Maximum Possible Concentration (EMPC): The calculated concentration of a signal in the same retention time region as a target analyte but which does not meet one or more of the other qualitative identification criteria defined in the procedure.

3.11 GC: Gas chromatograph or gas chromatography

3.12 Homologous Series: A series of compounds in which each member contains the same number of chlorine atoms.

3.13 HRGC: High Resolution GC

3.14 HRMS: High Resolution MS

3.15 Initial Calibration Verification Standard (ICV): A calibration standard from a second source, traceable to a national standard if possible. The ICV is analyzed after the initial calibration to verify the concentration of the Initial Calibration Standards.

3.16 Isotope Dilution Analytes (IDA): Isotopically labeled analogs of the target analytes that are added to every sample, blank, quality control spike sample, and calibration solution. They are added to the sample before extraction and are used to calculate the concentration of the target analytes and EDL.

3.17 Initial Precision and Recovery (IPR): See Initial Demonstration of Capability in Sections 9.1 and 14.2.

3.18 Isomer: Chemical compounds that contain the same number of atoms of the same elements, but differ in structural arrangement and properties. For example, 1,2,3,4-TCDD and 2,3,7,8-TCDD are structural isomers.

3.19 Laboratory Blank: See Method Blank.

3.20 Laboratory Control Sample (LCS): A laboratory blank spiked with known quantities of target analytes. The LCS is analyzed exactly like a sample. Its purpose is to assure that the results produced by the laboratory remain within the limits specified in this method for precision and recovery.

3.21 Maximum Level (MaxL): The concentration or mass of analyte in the sample that corresponds to the highest calibration level in the initial calibration. Also referred to as the upper method calibration limit (UMCL). It is equivalent to the concentration of the highest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed.

3.22 Method Blank: An aliquot of reagent water, sodium sulfate, or other representative matrix, free of the targets of interest and interferences, that is extracted and analyzed along with the samples to monitor for laboratory contamination.

3.23 Minimum Level (ML): The level at which the entire analytical system must give a recognizable signal and acceptable calibration point for the analyte. Also referred to as the lower method calibration limit (LMCL). It is equivalent to the concentration of the lowest calibration standard assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed.

3.24 MS: Mass spectrometer or mass spectrometry.

3.25 Multiple Ion Detection (MID): A MS operational mode in which only selected ions are monitored rather than scanning the instrument to obtain a complete mass spectrum.

3.26 Ongoing precision and recovery (OPR): See Laboratory Control Sample.

3.27 PCDD: Polychlorinated dibenzo-p-dioxins.

3.28 PCDF: Polychlorinated dibenzofurans.

3.29 FC-43 (PFTBA): Perfluorotributylamine; used to calibrate the extract m/z scale in the HRMS.

3.30 Internal Standard (IS): Solution containing $^{13}C_{12}$-1,2,3,4-TCDD and $^{13}C_{12}$-1,2,3,7,8,9-HxCDD that is added to every sample, blank, and quality control spike sample extract prior to analysis. The results are used to measure the recovery of the IDAs and the surrogate standard.

3.31 Percent Difference (%D): A measure of the difference between two values normalized to one of the values. It is used to determine the accuracy of the concentration measurements of second source verification standards.

3.32 Relative Response Factor (RRF): The ratio of the response of the mass spectrometer to a known amount of a compound relative to that of a known amount of a reference standard as measured in the initial and continuing calibrations. It is used to determine instrument performance and it is used to calculate the concentration of target analytes, IDA recoveries, or detection limits in samples, blanks, and quality control samples.

3.33 Signal to Noise Ratio: The ratio of the mass spectrometer response of a GC peak to the background noise signal.

3.34 Split Ratio (S): The decimal expression of the proportion of extract used from splits taken after the addition of IDAs and before the addition of IS.

3.35 Window Defining Mix: A solution which contains the first and last eluting isomers of each homologue group and is used to verify that the switching times between the MID descriptors have been appropriately set.

3.36 Additional definitions can be found in the Eurofins TestAmerica Knoxville QAM.

4. Interferences

4.1 Solvents, reagents, glassware and other sample processing hardware can yield discrete artifacts or elevated baselines that can cause misinterpretation of the chromatographic data. All of these materials must be demonstrated to be free from interferences under the conditions of analysis by performing laboratory method blanks. Analysts must not use PVC gloves, powdered gloves, or gloves with levels of phthalates which cause interference.

4.2 The use of high purity reagents and solvents (pesticide grade) helps minimize interference problems. Where necessary, reagents are cleaned by extraction or solvent rinse.

4.3 Interferences coextracted from the samples can vary considerably from matrix to matrix. PCDDs and PCDFs are often associated with other interfering chlorinated substances such as polychlorinated biphenyls (PCBs), polychlorinated diphenyl ethers (PCDPEs), polychlorinated naphthalenes, and polychlorinated alkyldibenzofurans that can be found at concentrations several orders of magnitude higher than the analytes of interest. Retention times of target analytes must be verified using reference standards. While certain cleanup techniques are provided as part of this method, unique samples can require additional cleanup steps to achieve lower detection limits.

5. Safety

5.1 Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.2 Eye protection that satisfies ANSI Z87.1 (as per the Corporate Safety Manual), laboratory coat and appropriate gloves must be worn while samples, standards, solvents and reagents are being handled. Disposable gloves that have become contaminated must be removed and discarded, other gloves must be cleaned immediately.

5.2.1 Latex and vinyl gloves provide no protection against most of the organic solvents used in this method. For the operations described herein, Nitrile gloves are to be worn. For operations using solvents that may splash, SilverShield® gloves are recommended. SilverShield® gloves protect against breakthrough for most of the solvents used in this procedure.

5.3 The effluents of sample splitters for the gas chromatograph and roughing pumps on the mass spectrometer must be vented to the laboratory hood exhaust system or must pass through an activated charcoal filter.

5.4 The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them or use thermal protection when working on them while they are above room temperature.

5.5 The mass spectrometer is under high vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source. Alternatively, the ion volume can be removed from the vacuum manifold through a vacuum interlock.

5.6 There are areas of high voltage in both the gas chromatograph and the mass spectrometer. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power. If the work involved requires measurement of voltage supplies, the instrument can be left on.

5.7 Primary Materials Used: The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material	**Hazards**	**Exposure Limit (2)**	**Signs and symptoms of exposure**
Methylene chloride	Carcinogen, Irritant	25 ppm-TWA, 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. Can be absorbed through skin.
Hexane	Flammable, Irritant	500 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Overexposure can cause lightheadedness, nausea, headache, and blurred vision. Vapors can cause irritation to the skin and eyes.
Methanol	Flammable, Poison, Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure can include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and can cause skin to become dry and cracked. Skin absorption can occur; symptoms can parallel inhalation exposure. Irritant to the eyes.
Toluene	Flammable, Poison, Irritant	200 ppm-TWA 300 ppm-Ceiling	Inhalation can cause irritation of the upper respiratory tract. Symptoms of overexposure can include fatigue, confusion, headache, dizziness and drowsiness. Peculiar skin sensations (e. g. pins and needles) or numbness can be produced. Causes severe eye and skin irritation with redness and pain. Can be absorbed through the skin.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. Can cause coughing, dizziness, dullness, and headache.
Cyclohexane	Flammable, Irritant	300 ppm TWA	Inhalation of vapors causes irritation to the respiratory tract. Symptoms can include coughing, shortness of breath. High concentrations have a narcotic effect.
Tetradecane	Irritant	None established	Inhalation of vapors can cause difficulty breathing, headache, intoxication and central nervous system damage.
Benzene	Flammable, Toxic, Carcinogen	PEL: 1 ppm TWA ; 5 ppm, 15 min. STEL	Causes skin irritation. Toxic if absorbed through skin. Causes severe eye irritation. Toxic if inhaled. Vapor or mist causes irritation to mucous membranes and upper respiratory tract. Exposure can cause narcotic effect. Inhalation at high concentrations can have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness or fatigue. Victim can experience tightness in the chest, breathlessness, and loss of consciousness.
Nonane	Flammable	None established	Harmful if inhaled/swallowed. Vapor/mist is irritating to eyes, mucous membranes and upper respiratory tract. Causes skin irritation.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

5.7.1 Chemicals that have been classified as carcinogens, or potential carcinogens, under OSHA regulations include benzene and methylene chloride, 2,3,7,8-TCDD and all other 2,3,7,8- substituted PCDD or PCDF isomers.

NOTE: The 2,3,7,8-TCDD isomer has been found to be acnegenic, carcinogenic, and teratogenic in laboratory animal studies. Other PCDDs and PCDFs containing chlorine atoms in positions 2,3,7,8 are known to have toxicities comparable to that of 2,3,7,8-TCDD. The toxicity or carcinogenicity of each reagent used in this method is not precisely defined; however, each chemical compound must be treated as a potential health hazard. From this viewpoint, exposure to these chemicals must be kept to a minimum.

5.8 Exposure to chemicals must be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples must be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers must be kept closed unless transfers are being made.

5.9 All procedures that involve solvents such as acetone, toluene, methylene chloride, and hexane (e.g., glassware cleaning and the preparation of standards and reagents) must be conducted in a fume hood with the sash closed as far as the operations permit.

5.10 All work must be stopped in the event of a known or potential compromise to the health or safety of an associate. The situation must be reported immediately to a laboratory supervisor.

6. Equipment and Supplies

6.1 Sample Analysis Equipment.

6.1.1 Gas Chromatograph – Must have splitless or on-column injection port for capillary column, temperature program with isothermal hold, and must meet all of the performance specifications in Section 10.

6.1.1.1 GC column for PCDDs/PCDFs and for isomer specificity for 2,3,7,8-TCDD – 60m x 0.32mm ID x 0.25µm film thickness DB-5 or RTX-5 fused silica capillary column (J&W, Restek or IntegraGuard) or equivalent is required.

6.1.1.2 GC column for isomer specificity for 2,3,7,8-TCDF – 30m x 0.25mm ID x 0.25µm film thickness DB-225 or RTX-225 fused silica capillary column (J&W or Restek) or equivalent is required.

6.1.2 Mass Spectrometer – Electron impact ionization with the filament electron volts (eV) optimized for best instrument sensitivity, stability and signal to noise ratio. Must be capable of repetitively selectively monitoring 12 exact m/z's minimum at

high resolution (≥10,000) during a period of approximately 1 second and must meet all of the performance specifications in Section 10.

6.1.3 GC/MS Interface – The mass spectrometer (MS) must be interfaced to the GC such that the end of the capillary column terminates within 1 cm of the ion source but does not intercept the electron or ion beam.

6.1.4 Data System – Capable of collecting, recording, and storing MS data.

7. Reagents and Standards

7.1 Standards and Calibration Solutions: [redacted] If the chemical purity is 98% or greater, the weight can be used without correction to compute the concentration of the standard. When not being used, standards are stored in the dark at room temperature in screw-capped vials with PTFE lined caps. Standards are used as received after being sonicated and transferred to 2.0 mL amber glass vials with PTFE lined caps.

7.1.1 Stability of Solutions: Standards have an expiration of ten (10) years from date of receipt unless otherwise specified by the manufacturer. Standard solutions used for quantitative purposes must be analyzed periodically, and must be assayed against reference standards before use.

7.2 Initial Calibration Standards

7.2.1 1613B/8290/8290A: [redacted]

7.2.2 23/0023A/TO-9A: [redacted] (See Table 6.)

7.3 Initial Calibration Verification Standards

7.3.1 1613B/8290/8290A: [redacted]

7.3.2 23/0023A/TO-9A: [redacted]

7.4 Daily Calibration Verification Standards

7.4.1 1613B/8290/8290A: [redacted] (See Table 7.)

7.4.2 1613B/8290/8290A: [redacted] (See Table 7.)

NOTE: This standard can be used as both the Continuing Calibration Standard and the DB/RTX-5 GC Window Defining Mix/Column Performance Check Solution.

7.4.3 23/0023A/TO-9A: [redacted] (See Table 8.)

7.5 Target Analyte Standards (TA)

7.5.1 Target Analyte Standard Stock Solution: [redacted].

7.5.2 Target Analyte Standard Working Stock Solution: [redacted] of the target analyte standard stock solution [redacted] for a [redacted]

7.5.3 LCS Spiking Solution: [redacted] of the target analyte standard working stock solution to [redacted] of this solution is added to each LCS, LCSD or MS/MSD sample. See Table 11 for a complete list of compounds and their concentrations.

7.6 1613B/8290/8290A Isotope Dilution Analytes (IDA)

7.6.1 1613B/8290/8290A IDA Stock Solution: [redacted]

7.6.2 $^{13}C_{12}$-OCDF Stock Solution: [redacted] Prepare a working stock standard by diluting the purchased standard to a concentration [redacted]

7.6.3 1613B/8290/8290A IDA Spiking Solution: [redacted] working stock standard to [redacted] amber bottle with a PTFE lined cap with [redacted] to a final concentration [redacted] of this solution is added to each sample, method blank and QC sample. See Table 13 for a complete list of compounds and their concentrations.

7.7 2,3,7,8-TCDD/2,3,7,8-TCDF Isotope Dilution Analytes (IDA)

7.7.1 $^{13}C_{12}$-2,3,7,8-TCDD IDA Stock Solution: [redacted]

7.7.2 $^{13}C_{12}$-2,3,7,8-TCDF IDA Stock Solution: [redacted]

7.7.3 $^{13}C_{12}$-TCDD/$^{13}C_{12}$-TCDF IDA Secondary Stock Solution: [redacted] of the stock solutions [redacted] in a volumetric flask [redacted]

7.7.4 $^{13}C_{12}$-TCDD/$^{13}C_{12}$-TCDF IDA Spiking Solution: [redacted] of the internal standard secondary stock solution to [redacted] PTFE lined cap with [redacted] of this solution is added to each sample, method blank and QC sample extract that is extracted for TCDD and/or TCDF analysis only. See Table 13 for a complete list of compounds and their concentrations.

7.8 23/0023A/TO-9A Isotope Dilution Analytes (IDA)

7.8.1 23/0023A/TO-9A IDA Stock Solution: [redacted]

7.8.2 23/0023A/TO-9A IDA Spiking Solution: [redacted] internal standard stock solution and [redacted] working stock standard to [redacted] amber bottle with a PTFE lined cap with [redacted] to a final concentration of [redacted] 2.0 [redacted] of this solution is added to each sample, method blank, and QC sample. See Table 15 for a complete list of compounds and their concentrations.

7.9 Internal Standards (IS)

7.9.1 $^{13}C_{12}$-1,2,3,4-TCDD IS Stock Solution: [redacted]

7.9.2 $^{13}C_{12}$-1,2,3,7,8,9-HxCDD IS Stock Solution: [redacted]

7.9.3 IS Secondary Stock Solution: Dilute [redacted] of the stock solutions above to [redacted] to a final concentration of [redacted]

7.9.4 IS Spiking Solution: Add [redacted] amber vial with a Class A glass pipette. With a syringe, remove [redacted] from the vial and [redacted] of the IS secondary stock solution to a final concentration of [redacted] of this solution is added to each sample, method blank and QC sample extract. See Table 17 for a complete list of compounds and their concentrations.

7.10 1613B Cleanup Surrogate Standards (SU)

7.10.1 Cleanup Surrogate Standard Stock Solution: [redacted]

7.10.2 Cleanup Surrogate Standard Secondary Stock Solution: [redacted] of the [redacted] cleanup surrogate standard stock solution to [redacted] volumetric flask [redacted]

7.10.3 Cleanup Surrogate Standard Working Stock Solution: [redacted] cleanup surrogate standard secondary stock solution to [redacted] to a final concentration of [redacted]

7.10.4 Cleanup Surrogate Standard Spiking Solution: [redacted] cleanup surrogate standard working stock solution to [redacted] bottle with a PTFE lined cap [redacted] of this solution is added to each 1613B sample, method blank and QC sample extract prior to cleanup. See Table 14 for a complete list of compounds and their concentrations.

7.11 23/0023A/TO-9A Field Surrogate Standards

7.11.1 23/0023A/TO-9A Field Surrogate Standard Stock Solution: [redacted]

7.11.2 23/0023A/TO-9A Field Surrogate Standard Spiking Solution: [redacted] of the field surrogate standard stock solution to [redacted] to a final concentration of [redacted] of this solution is added to each sample train components before sampling. See Table 16 for a complete list of compounds and their concentrations.

7.12 PCDD/PCDF Window Defining and Isomer Specificity Standard

7.12.1 PCDD/PCDF Window Defining and Isomer Specificity Mixture: [redacted] This standard contains the daily standard, window defining mix and the isomer specificity mix.

7.13 [redacted] is used in neat form to tune and calibrate the mass spectrometer. [redacted])

8. Sample Collection, Preservation and Storage

8.1 Sampling is not performed for this method by Eurofins Knoxville. For information regarding sample shipping, refer to SOP KNOX-SC-0003, "Sample Receipt and Log In", current revision. Sample container and preservation recommendations are listed in the table below.

Method:	**1613B**	**8290/8290A**	**23**	**0023A**	**TO-9A**
Holding Times	Samples – 1 year from collection to extraction Extracts – 1 year from extraction to analysis	Samples – 30 days from collection to extraction Extracts – 45 days from extraction to analysis	Samples – 30 days from collection to extraction Extracts – 45 days from extraction to analysis	Samples – 30 days from collection to extraction Extracts – 45 days from extraction to analysis	Samples – 7 days from collection to extraction Extracts – 40 days from extraction to analysis
Containers	Amber Glass	Amber Glass	See KNOX-OP-0010	See KNOX-OP-0010	See KNOX-OP-0010
Preservation:					
Aqueous Samples	≤6 °C in the dark If residual chlorine is present, add 80 mg/L sodium thiosulfate. If pH > 9, adjust to pH 7-9 with sulfuric acid	≤6 °C in the dark If residual chlorine is present, add 80 mg/L sodium thiosulfate.	N/A	N/A	N/A
Solid Samples	<-10 °C in the dark	≤6 °C in the dark	N/A	N/A	N/A

Method:	**1613B**	**8290/8290A**	**23**	**0023A**	**TO-9A**
Tissue Samples	<-10 °C in the dark	<-20 °C in the dark[1]	N/A	N/A	N/A
Air Samples	N/A	≤6 °C in the dark	≤6 °C in the dark	≤6 °C in the dark	≤6 °C in the dark

1. If the freezer used to store samples is not capable of reaching a temperature of <-20 °C when the temperature control is set to its maximum limit, a storage higher temperature is acceptable as long as it is <-10 °C.

9. Quality Control

9.1 The Initial Demonstration of Capability (IDOC) studies described in Section 14 must be completed with acceptable results before analysis of samples can begin.

9.2 The Method Detection Limit (MDL) study described in Section 14 must be completed with acceptable results before analysis of samples can begin.

9.3 A laboratory method blank must be analyzed along with each analytical batch of 20 (10, including field blank if provided, for TO-9A) or fewer samples. The method blank is normally analyzed after the calibration standards. The method blank must meet the following acceptance criteria:

9.3.1 The concentration of target analytes in the method blank must be less than the minimum level (ML). "B" qualifiers are added to all associated samples with analytes detected in the method blank above the estimated detection limit (EDL). "B" qualifiers are only added to samples that have hits above the EDL for the same analytes as the method blank.

9.3.2 If the concentration of target analytes in the method blank is greater than the minimum level (ML) but less than 10% of the concentration in the associated samples, corrective action is required but the associated data can be reported. At minimum, corrective action includes the addition of "B" qualifiers to all associated samples with analytes detected in the method blank and documentation of the blank contamination in the narrative. Section 9.3.1 requires that "B" qualifiers are added to all associated samples with analytes detected in the method blank above the EDL.

9.3.3 If the method blank fails to meet the acceptance criteria, the Project Manager is notified. If it is determined in consultation with the client that the method blank provides data supporting the project requirements, a nonconformance is initiated describing the problem and corrective action and the data is reported with qualification in the project narrative. If it is determined that the method blank does not meet the project data quality objectives and additional sample volume is available, the entire sample batch is re-extracted. If there is insufficient sample volume remaining for re-extraction, the client is contacted for information about the availability of additional sample volume. If there is no additional sample available, the original sample data is flagged and reported. A nonconformance memo is initiated describing the problem and corrective action. The problem and corrective action is documented in the project narrative.

9.3.4 If there is no target analyte greater than the ML in the samples associated with an unacceptable method blank, the data can be reported with qualifiers. Such action must be done in consultation with the client.

9.3.5 The method blank IDA recoveries must be within established control limits. In the situation where method blank IDA recoveries are below acceptance limits, method blank results can be used if the following criteria are met:

- All IDA peaks must exhibit a 10:1 signal to noise ratio or greater.
- The EDL is at or below the minimum level ML.
- The application of the above criteria must be noted in the case narrative.

9.3.6 Refer to the QC Program document (QA-003) for further details of the corrective actions.

9.4 Instrument Blank

9.4.1 Instruments must be evaluated for contamination during each 12 hour analytical sequence. If the method blank has already been analyzed and there are no other method blanks needing to be run on the analytical shift, an instrument blank may be used to demonstrate the instrument is free from contamination. An instrument blank consists of solvent with the IDA and IS added. It is evaluated in the same way as the method blank.

9.5 Laboratory Control Sample

An LCS is analyzed along with each analytical batch of 20 (10, including field blank if provided, for TO-9A) or fewer samples. The LCS consists of reagent water for aqueous samples, and a clean solid matrix (sodium sulfate) for solid samples. The LCS extract must be subject to the same clean up procedures as the associated sample extracts. LCS spike components, concentrations, and control limits are given in Table 11.

9.5.1 If any analyte in the LCS is outside the control limits, corrective action must occur. Corrective action includes:

9.5.1.1 If the LCS fails to meet the acceptance criteria, the Project Manager is notified. If it is determined in consultation with the client that the LCS provides data supporting the project requirements, a nonconformance is initiated describing the problem and the data is reported with qualification in the project narrative. If it is determined that the LCS does not meet the project data quality objectives and additional sample volume is available, the entire sample batch is re-extracted. If there is insufficient sample volume remaining for re-extraction, the client is contacted for information about the availability of additional sample volume. If there is no additional sample available, the original sample data is flagged and reported. A nonconformance memo is initiated describing the problem. The problem is documented in the project narrative, using an NCM.

9.5.1.2 If the batch is not re-extracted and reanalyzed, an NCM must be initiated and the reasons for accepting the batch must be clearly presented in the project records and the report. (An example of an acceptable reason for not reanalyzing might be that the matrix spike and matrix spike duplicate recoveries are within control limits, the method blank and sample internal standard recoveries are within limits, and the data clearly demonstrates that the problem was confined to the LCS.) Sample results associated with a failing LCS must be qualified. When data associated with a failed LCS is reported the failure must be noted in the narrative.

9.5.1.3 For method TO-9A calculate the relative percent difference (RPD) from the LCS/LCSD. The precision must be within ± 30%.

9.5.2 Ongoing monitoring of the LCS provides evidence that the laboratory is performing the method within accepted QC guidelines for accuracy and precision.

9.6 Isoptope Dilution Analytes (IDA)

IDAs are spiked into all samples, blanks, and laboratory control samples to assess method performance on the sample matrix. The recovery of each labeled IDA must be within the limits in Table 13 for methods 1613B, 8290 and 8290A or in Table 15 for methods 23, 0023A, and TO-9A.

9.6.1 If the recovery is outside these limits the following corrective action must be taken:

9.6.1.1 Check all calculations for error.

9.6.1.2 Ensure that instrument performance is acceptable.

9.6.1.3 Recalculate the data and/or reanalyze if either of the above checks reveal a problem.

9.6.1.4 If the recovery of any IDA is less than the lower control limit, calculate the S/N ratio of the IDA. If the S/N is > 10 and the EDLs are less than the MLs, report the data as is with qualifiers in the report and a discussion in the case narrative. If the S/N is < 10 or the EDLs are greater than the MLs, re-extract and re-analyze the sample. If the poor IDA recovery is judged to be a result of sample matrix, a reduced portion of the sample can be re-extracted or additional clean-ups can be employed. The decision to reanalyze or flag the data is made in consultation with the client.

9.7 Matrix Spike/Matrix Spike Duplicate (MS/MSD) – Method 8290 only.

When method 8290 is performed, a MS/MSD is prepared and analyzed with every 20 samples of a given matrix. The MS/MSD is spiked with the same subset of analytes as the LCS (See Table 12). Compare the percent recovery and relative percent difference (RPD) to that in the laboratory specific historically generated limits.

9.7.1 If any individual recovery or RPD falls outside the acceptable range, corrective action must occur. The initial corrective action is to check the recovery of that analyte in the LCS. Generally, if the recovery of the analyte in the LCS is within limits, then the laboratory operation is in control and analysis can proceed.

9.7.2 If the recovery for any component is outside QC limits for both the MS/MSD and the LCS, the analysis is out of control and corrective action must be taken. Corrective action normally includes repreparation and reanalysis of the batch.

9.7.3 If a MS/MSD is not possible due to limited sample, then a LCSD must be analyzed. The LCSD is evaluated using the same acceptance criteria as the LCS. The RPD of the LCS and LCSD are compared to the acceptance limits in Table 12.

9.7.4 The MS/MSD must be analyzed at the same dilution as the unspiked sample, even if the matrix spike compounds are diluted out.

9.8 Field Surrogate Standards – Methods 23, 0023A, TO-9A

Field surrogate standards are added to the collection media prior to sample collection when performing methods 23, 0023A, or TO-9A. The field surrogate recoveries are calculated relative to the IDAs and are a measure of sampling efficiency. The recovery of the field surrogate standards must be within the limits specified in Table 16. Poor recoveries of the field surrogate standards can indicate breakthrough in the sampling train.

9.8.1 If the recovery is outside these limits the following corrective action must be taken:

9.8.1.1 Check all calculations for error.

9.8.1.2 Ensure that instrument performance is acceptable.

9.8.1.3 Recalculate the data and/or reanalyze if either of the above checks reveal a problem.

9.8.1.4 Flag the results that are outside control limits with the use of an NCM and notify the Project Manager. The client must be notified and consulted for additional corrective action.

10. Calibration and Standardization

10.1 Two types of calibration procedures are required. One type, initial calibration, is required before any samples are analyzed and is required intermittently throughout sample analyses as dictated by the results of continuing calibration procedures described below. The other type, continuing calibration, consists of analyzing the column performance check solution and a calibration solution (CS3). No samples are to be analyzed until acceptable calibration as described in sections 10.2 and 10.3 is demonstrated and documented. A [redacted] injection

volume is specified for all extracts, blanks, calibration solutions and performance check samples. A [redacted] injection volume can be used; however, the laboratory must keep the injection volume the same throughout calibration and analysis.

10.2 Initial Calibration

10.2.1 Prepare multi-level calibration standards containing the compounds and concentrations as specified in Table 5 for methods 1613B and 8290/8290A or in Table 6 for methods 23, 0023A, or TO-9A. Store calibration standards at room temperature in the dark. Calibration standard solutions have an expiration date of ten (10) years from date of receipt unless otherwise specified by the manufacturer/supplier.

10.2.2 Establish operating parameters for the GC/MS system (suggested operating conditions are displayed in and Figure 2). For method 1613B, adjust the GC conditions to meet the relative retention times for the PCDDs/PCDFs listed in Table 3. [redacted]

10.2.3 By using a [redacted] tune the instrument to meet the minimum resolving power of 10,000 (10 percent valley) at [redacted] or any other reference signal close to the [redacted] For each MID descriptor group, monitor and record the mass resolution of the fifteen masses listed below, depending on which reference gas is being used. Adjust operating parameters and tuning values until the mass resolution criteria is met on all masses. Document the mass resolution. The mass resolution must be greater than 10,000 throughout the mass range.

[redacted]

10.2.4 By using peak matching conditions and the aforementioned [redacted] reference peak, verify that the exact mass of [redacted] is within 5 ppm of the required value. [redacted]

10.2.5 Analyze [redacted] of the Window Defining Mixture and set the switchpoints for the MID descriptors. The switchpoints must be set to encompass the retention time window of each congener group.

10.2.6 If the initial calibration is being performed on the DB-5 or RTX-5 column, analyze [redacted] of the Column Performance solution. The chromatographic peak

separation between 2,3,7,8-TCDD and the closest eluting non-2,3,7,8-TCDD isomer must be resolved with a % valley of ≤ 25%, where

$$\%\ \text{Valley} = \frac{\text{baseline to valley height of closest eluting isomer}}{\text{peak height of 2,3,7,8 - TCDD}} \times 100$$

If the initial calibration is being performed on the DB-225 or RTX-225 column, analyze 1µL of the TCDF Column Performance solution. The chromatographic peak separation between 2,3,7,8-TCDF and the closest eluting non-2,3,7,8-TCDF isomer must be resolved with a % valley of ≤ 25%, where

$$\%\ \text{Valley} = \frac{\text{baseline to valley height of closest eluting isomer}}{\text{peak height of 2,3,7,8 - TCDF}} \times 100$$

10.2.7 Analyze [redacted] of each of the five calibration standards and calculate the RRF of each analyte vs. the appropriate IDA listed in Table 3 for methods 1613B, 8290/8290A or in Table 4 for methods 23, 0023A, and TO-9A using the following equation:

$$\text{RRF} = \frac{\text{As} \times \text{Cis}}{\text{Ais} \times \text{Cs}}$$

where:

As = sum of the areas of the quantitation ions of the compound of interest
Ais = sum of the areas of the quantitation ions of the appropriate IDA
Cis = concentration of the appropriate IDA
Cs = concentration of the compound of interest

10.2.7.1 Calculate the mean relative response factor (mean RRF) and the percent relative standard deviation (RSD) of the relative response factors for each compound of interest in the five calibration standard solutions using the following equations;

$$\overline{\text{RRF}}_{n=5} = \frac{1}{n} \times \sum_{i=1}^{n} \text{RF}_i$$

$$\text{RSD}_{n=5} = \sqrt{\frac{\sum_{i=1}^{n} \left(\text{RF}_i - \overline{\text{RF}}\right)^2}{n-1}} \times \frac{100}{\overline{\text{RRF}}}$$

10.2.8 Criteria for Acceptable Calibration - The criteria listed below for acceptable calibration must be met for each initial calibration standard before sample analyses are performed. If acceptable initial calibration is not achieved, identify

the root cause, perform corrective action, and repeat the initial calibration. If the root cause can be traced to problems with an individual analysis within the calibration series, follow the procedure in Eurofins TestAmerica Policy CA-Q-P-003 Calibration Curves and the Selection of Calibration Points, current revision.

10.2.8.1 The percent relative standard deviation (RSD) for the mean relative response factors must be within the acceptance criteria listed in Table 5 for methods 1613B, 8290/8290A or in Table 6 for methods 23, 0023A, and TO-9A.

10.2.8.2 The peaks representing the PCDDs/PCDFs and labeled compounds in the calibration standards must have signal-to-noise ratios (S/N) ≥ 10.

10.2.8.3 The ion abundance ratios must be within the specified control limits in Table 22.

10.2.8.4 For method 1613B the absolute retention time of $^{13}C_{12}$-1,2,3,4-TCDD must exceed 25.0 minutes on the DB/RTX-5 column and 15.0 minutes on the DB/RTX-225 column.

10.2.8.5 Corrective action can include replacing the injector port liner, replacing the injector port septum, removal of a small portion of the front of the analytical column, replacing the autosampler syringes and rinse solvent, adjusting the instrument tuning, cleaning the ion volume or ion source, installing a new analytical column and replacing the calibration standard solutions.

10.2.9 Analyze [redacted] of the Initial Calibration Verification (ICV) Standard in section 7.3 after the completion of the initial calibration and prior to sample analysis. Calculate the concentration of the ICV using the ICAL average RRFs from Section 10.2.7 and the formula in section 13.3.3. Calculate the percent difference (%D) between the expected and the calculated ICV concentration using the following formula.

$$\%D = \frac{(C_{Exp} - C_{Calc})}{C_{Exp}} \times 100$$

Where:
C_{Exp} = Expected concentration of the standard
C_{Calc} = Calculated concentration of the standard

10.2.9.1 The general criteria for percent difference acceptance limits is ±25% for all target compounds. The warning limits for percent difference is ±25% to ±35%.

10.2.9.2 All data associated with compounds with percent differences in the warning limits must be reviewed before acceptance.

10.2.9.3 All data associated with compounds with percent differences outside the warning limits must be documented as an NCM. Corrective action must be taken and can include the following:

- Reanalyze the ICV standard.
- Replace and reanalyze the ICV standard.
- Evaluate the instrument performance.
- Evaluate the initial calibration standards.

10.2.10 See corporate policy CA-Q-P-003 "Calibration Curves and the Selection of Calibration Points", current revision, for definitions and calculations using different curve models.

10.2.11 A readback of the low calibration point used in the calibration curve should have a read-back (%D) of no more than 50% for any calibration model. The read-back of the non low level standards of the initial calibration should have a read-back (%D) of no more than 30% for any calibration model.

10.3 Continuing Calibration

10.3.1 Continuing calibration is performed at the beginning of a 12 hour period after successful mass resolution and GC resolution performance checks. A calibration check is also required at the end of a 12 hour period when performing method 8290/8290A or 0023A.

10.3.2 Document the mass resolution performance as specified in sections 10.2.3 and 10.2.4. The mass resolution checks must be performed at the beginning and at the end of each 12-hour shift.

10.3.3 Analyze [redacted] of the Window Defining Mixture and/or Column Performance Solution Mixture under the same instrument conditions used to perform the initial calibration. Determine and document acceptable column performance as described in section 10.2.5 and 10.2.6.

10.3.4 Analyze [redacted] of the Daily Calibration Standard Solution (CS3). Calculate the concentrations and percent difference of the standard using the formulas in sections 13.3.3 and 10.2.9.

NOTE: The combined Continuing Calibration Standard/Window Defining Mix/Column Performance Solution specified in section 7.4.2 can be used in sections 10.3.4 and 10.3.6.

10.3.5 Criteria for Acceptable Calibration - The criteria listed below for acceptable calibration must be met at the beginning of each 12 hour period that samples are analyzed. If acceptable beginning continuing calibration criteria is not met,

identify the root cause, perform corrective action and repeat the continuing calibration. If the second consecutive beginning continuing calibration does not meet acceptance criteria, additional corrective action must be performed. Acceptable performance must be demonstrated after two consecutive failing beginning continuing calibrations by the analysis of two consecutive acceptable beginning continuing calibrations or by analysis of a new initial calibration.

10.3.5.1 The measured concentration or percent difference for each compound must be within the acceptance criteria in Table 7 for method 1613B, 8290/8290A or in Table 8 for methods 23, 0023A and TO-9A.

10.3.5.2 For method 1613B, the relative retention times of PCDDs/PCDFs and labeled compounds in the standard must be within the limits in Table 3.

10.3.5.3 The peaks representing the PCDDs/PCDFs and labeled compounds in the calibration standard must have signal-to-noise ratios (S/N) $\geq$ 10.

10.3.5.4 The ion abundance ratios must be within the specified control limits in Table 22.

10.3.5.5 Corrective action can include all of the items specified in section 10.2.8.5.

10.3.5.6 When performing method 8290/8290A or 0023A, if the continuing calibration fails at the beginning of a 12-hour shift, the instructions in section 10.3.5 must be followed. If the continuing calibration check performed at the end of a 12 hour period fails by no more than ±25 %D for unlabeled native analytes and ±35 %D for labeled standards, the closing standard must not be used as a beginning calibration standard for the next 12-hour shift and the requirements in section 10.3.5 must be met before analysis can continue. Use the mean RRF from the two daily continuing calibration runs to compute the analyte concentrations instead of the RRFs obtained from the initial calibration. If the continuing calibration check performed at the end of a 12 hour period fails by more than ±25 %D for unlabeled native analytes and ±35 %RPD for labeled standards initiate corrective action and reanalyze all sample extracts analyzed during the 12 hour period encompassing the failed end of shift calibration check.

It is realized that it might not always be possible to achieve all RF criteria. For example, the RF criteria for $^{13}C_{12}$-HpCDD and $^{13}C_{12}$-OCDD/F were not met, however the RF values for the corresponding unlabeled compounds were within the criteria established in this procedure. The data quality for the unlabeled HpCDD, OCDD and OCDF values were not compromised as a result of the calibration event. In these situations, the analyst must consult with the group manager and

the project manager to assess the impact on the data quality objectives on the affected samples. Corrective action must be taken and any decision to report sample data in this situation must be made in conjunction with the client. An NCM must be initiated if the data is to be reported. If any sample data is reported for samples bracketed by CCVs not meeting the acceptance criteria, this must also be documented in the project narrative.

10.3.6 Daily calibration must be performed every 12 hours of instrument operation. The 12 hour shift begins with the documentation of the mass resolution followed by the injection of the Window Defining Mixture or Column Performance Solution Mixture and the Daily Calibration Standard.

10.3.6.1 For methods 1613B, 23, TO-9A- The mass resolution documentation must also be performed at the end of the 12 hour shift. If the lab is operating consecutive 12 hour shifts, the mass resolution check from the end of the previous period can be used for the beginning of the next period.

10.3.6.2 For method 8290/8290A or 0023A - The Continuing Calibration Standard check and mass resolution documentation must also be performed at the end of the 12 hour shift. If the lab is operating consecutive 12-hour shifts, the Window Defining Mixture and/or Column Performance Solution Mixture must be analyzed at the beginning of each 12-hour period. The mass resolution and continuing calibration checks from the previous period can be used for the beginning of the next period.

11. Procedure

11.1 One time procedural variations are allowed only if deemed necessary in the professional judgment of supervision to accommodate variations in sample matrix, radioactivity, chemistry, sample size or other parameters. Any variations in the procedure, except those specified by project specific instructions, must be completely documented using a Nonconformance Memo and approved by a Technical Specialist, Project Manager and QA Manager. If contractually required the client must be notified.

11.2 Any unauthorized deviations from this procedure must also be documented as a nonconformance with a cause and corrective action described.

11.3 Sample Extract Analysis

11.3.1 Analyze the sample extracts under the same instrument operating conditions used to perform the instrument calibrations. Inject 1µL into the GC/MS and acquire data until OCDF has eluted from the column.

11.3.2 Create a Worklist in Chrom. The following information is required:

Worklist name.
Add samples to be analyzed (WDMCCV, MB, LCS, client, etc.)
Add special processing information.
Add quality test information.
Add reagents for the calibration standards.
Add any other required information.

11.3.3 Review the ion chromatograms in peak review for the masses listed in Table 21 that encompass the expected retention windows of the PCDD and PCDF homologous series.

11.4 Refer to the Eurofins TestAmerica Knoxville Quality Assurance Manual, current revision for the GC/MS instrument equipment maintenance table.

11.5 Refer to Eurofins TestAmerica SOP CA-I-S-006, current revision for requirements for computer hardware and software.

12. Maintanence and Troubleshooting

12.1 Troubleshooting is the identification and elimination of a problem or malfunction in a system or process. Troubleshooting is most effective when it is performed in a logical step by step sequence.

12.2 Basic Troubleshooting Principles

- Identify and analyze the problem and symptoms.
- Gather information that may help identify the problem such as prep information, system log, or output files.
- Evaluate the possibility that recent changes to the system caused the problem.
- Try to reproduce the problem if at all possible.
- Eliminate as many variables as possible.
- Document the system state then change variables one at a time and evaluate the effect on the problem.

12.3 Troubleshooting Guide

Sympton Observed	Maintenance Item Description	Frequency	Resolution Criteria
Poor Chromatography	1. Perform Column Maintenance 2. Replace Injection Port Liner 3. Replace Column 4. Replace Inlet Seal/Clean Injection Port	As needed	Pass CCV/ Window Criteria
Leaky Inlet	Replace Injection Port Septum	As needed	Pass CCV/ Window Criteria
Peak to Valley > 25%	Clip or Replace GC Column	As needed	Pass CCV/ Window Criteria
Response factors not acceptable	1. Clean Ion Volume/ Ion Source 2. Replace Transfer Line Ferrule	As needed	Pass CCV Criteria
Filament-No Emission Current	Change Filament	As needed	Monitor Voltage/ Pass CCV Criteria

Sympton Observed	Maintenance Item Description	Frequency	Resolution Criteria
Reference Inlet Leaking Reference Gas	Replace Reference Inlet Septum	As needed	Monitor Level to Check for Loss

12.4 Maintenance Guide

Maintenance	Maintenance Item Description	Frequency	Resolution Criteria
Routine Maintenance	Replace Carrier Gas Filter	As needed	Achieve Normal GC Flow Reading
Routine Maintenance	Check Carrier Gas Pressures	Weekly	Achieve Normal Reading/ Record
Routine Maintenance	Evaluate Air Spectrum, (Masses 28, 32)	Weekly	Achieve Normal Reading
Routine Maintenance	Check PCB Seating and Alignment	Bi-Annually	Achieve Proper Read-backs
Routine Maintenance	Replace Mechanical Pump Oil	Annually	Achieve Normal Vacum Level
Routine Maintenance	Replace Turbo Pump Oil	Annually	Achieve Normal Vacum Level

13. Data Analysis and Calculations

13.1 Refer to Figure 3 for example data review checklists used to perform and document the review of the data. Using the data review checklist and the NCM module, the analyst will create a narrative which includes any qualifications of the sample data.

13.2 Qualitative identification criteria for PCDDs and PCDFs - For a gas chromatographic peak to be identified as a PCDD or PCDF, it must meet all of the following criteria:

13.2.1 The ion current response for both ions used for quantitative purposes must reach maximum simultaneously (± 2 seconds).

13.2.2 The signal-to-noise ratio (S/N) for each GC peak at each exact m/z must be ≥ 2.5 for positive identification of a PCDD/PCDF compound.

13.2.3 The ratio of the integrated areas of the two exact m/z's specified in Table 21 must be within the limits specified in Table 22.

13.2.4 Method 1613B only - The relative retention time of the peak for a 2,3,7,8-substituted PCDD or PCDF must be within the limits in Table 3.

13.2.5 Method 8290, 8290A and 0023A only - For 2,3,7,8-substituted isomers, which have an isotopically labeled standard present in the sample extract, the retention time of the two ions used for quantitation purposes must be within -1 to +3 seconds of the isotopically labeled standard.

13.2.6 Method 23 and TO-9A only - For 2,3,7,8-substituted isomers, which have an isotopically labeled standard present in the sample extract, the retention time of the two ions used for quantitation purposes must be within ±3 seconds of the isotopically labeled standard.

13.2.7 Method 8290, 8290A, 23, 0023A, and TO-9A only - For 2,3,7,8-substituted isomers, which do not have an isotopically labeled IDA present in the sample extract, the retention time must fall within 0.005 retention time units of the relative retention times measured in the routine calibration.

13.2.8 The retention time of peaks representing non-2,3,7,8-substituted PCDDs/PCDFs must be within the retention time windows established in section 10.2.5.

13.2.9 No peaks detected in the polychlorinated diphenyl-ether (PCDPE) mass channel in the same retention time region (± 2 sec for method 8290, 8290A & 0023A) as a PCDF peak.

13.3 Quantitation for PCDDs and PCDFs

13.3.1 Calculate the IDA and Cleanup Surrogate Standard Recoveries (Ris) relative to the IS according to the following equation:

$$\text{Ris} = \frac{\text{Ais} \times \text{Qrs}}{\text{Ars} \times \text{RRFis} \times \text{Qis}} \times 100\%$$

Where:
Ais = Sum of the areas of the quantitation ions of the appropriate IDA ($^{37}Cl_4$-2,3,7,8-TCDD, cleanup surrogate standard is single ion)
Ars = Sum of the areas of the quantitation ions of the IS
Qrs = ng of IS added to extract
Qis = ng of IDA or surrogate standard added to sample
RRFis = Mean relative response factor of IDA obtained during initial calibration

13.3.2 When properly applied, isotope dilution techniques produce results that are independent of recovery. The recovery of each IDA must be within the limits specified in Table 13 for method 1613B, 8290 or 8290A or in Table 15 for method 23, 0023A, or TO-9A. If the recovery of any IDA is not within the specified limits, calculate the S/N ratio of the IDA. If the S/N is ≥ 10 and the EDL ≤ the ML, report the data as is with qualifiers in the report and add a NCM for addition to the case narrative. If the S/N is < 10 or the EDL > the ML, re-extract and re-analyze the sample. If the poor IDA recovery is judged to be a result of sample matrix, a reduced portion of the sample can be re-extracted or additional clean-ups can be employed.

13.3.3 Calculate the concentration of the 2,3,7,8 isomers according to the following equation:

$$C_{2,3,7,8\text{isomers}} = \frac{\text{Ata} \times \text{Qis}}{\text{Ais} \times \text{RRF} \times \text{Ws}}$$

Where:
C = Concentration of 2,3,7,8 isomers
Ata = Sum of the areas of the quantitation ions of the target analyte
Ais = Sum of the areas of the quantitation ions of the appropriate IDA
Qis = ng of IDA added to sample
RRF = Mean relative response factor from initial calibration.

Ws = Amount of sample spiked and extracted (grams or liters)

13.3.4 The concentrations of non-2,3,7,8-isomers are calculated using the RRF for the corresponding 2,3,7,8-isomer. If more than one 2,3,7,8-isomer exist for a particular level of chlorination, the average of the individual 2,3,7,8-isomer RRFs is used in the calculation.

$$C_{non2,3,7,8isomer} = \frac{Ata \times Qis}{Ais \times RRF \times Ws}$$

Where:
Ata = Sum of the areas of the quantitation ions of the non-2,3,7,8 isomer
Ais = Sum of the areas of the quantitation ions of the appropriate IDA
Qis = ng of IDA added to sample
RRF = Mean relative response factor from initial calibration for the corresponding 2,3,7,8 isomer.
Ws = Amount of sample spiked and extracted (grams or liters)

13.3.5 Calculate the total concentration of all isomers within each homologous series of PCDDs and PCDFs by summing the concentrations of the individual PCDD or PCDF 2,3,7,8 and non-2,3,7,8 isomers.

$$C_{Total} = \sum C_{2,3,7,8isomers} + \sum C_{non2,3,7,8isomers}$$

13.3.6 If solid samples are to be reported on a dry weight basis, the laboratory LIMS system performs the following calculation:

$$\text{Concentration (Dry Weight)} = \frac{C}{\%Solids \div 100}$$

Where:
C= Concentration of the target analyte
%Solids = Sample percent solids determined by moisture analysis

13.3.7 If no peaks are present in the region of the ion chromatogram where the compounds of interest are expected to elute, calculate the estimated detection limit (EDL) for that compound according to the following equation:

$$EDL = \frac{N \times 2.5 \times Qis}{His \times RRFs \times W \times Ssl}$$

Where:

N= Sum of the average peak noise heights for each target analyte quantitation ion signal in the region of the ion chromatogram where the compounds of interest are expected to elute
His = Sum of peak heights of the quantitation ions for the appropriate IDA

Qis = ng of IDA added to sample
RRFs = Mean relative response factor of compound from initial calibration
W = Amount of sample spiked and extracted (grams or liters)
Ssl = Decimal expression of percent solids (optional, if results are requested to be reported on dry weight basis)

NOTE: The percent solids calculation is performed by the laboratory LIMS system prior to final reporting.

13.3.8 If peaks are present in the region of the ion chromatogram which do not meet the qualitative criteria listed in section 13.2, calculate an Estimated Maximum Possible Concentration (EMPC). Two different calculation formulas can be used depending upon specific client requirements.

13.3.8.1 For all methods except 8290A and 0023A/8290A, use the equation in section 13.3.4 except that Ata represents the sum of the area under the smaller peak and for the other peak the area is calculated using the theoretical chlorine isotope ratio. The EMPC calculated in this manner will result in a lower result than using the uncorrected area.

13.3.8.2 For method 8290A and 0023A/8290A, use the equation in section 13.3.3 without correcting the areas. This method gives an EMPC which is always higher than the method above and would be considered the worst case.

13.3.9 If peaks are present in the diphenyl ether mass channel at the same retention time as a PCDF peak, the peak cannot be identified as a PCDF. Calculate the concentration of the peak using the equation in section 13.3.3 but report the concentration as an Estimated Maximum Possible Concentration.

13.3.10 If the concentration in the final extract of any 2,3,7,8-substituted PCDD/PCDF isomer (except OCDD or OCDF) exceeds the upper method calibration limits, a dilution of the extract or a re-extraction of a smaller portion of the sample must be performed. For OCDD and OCDF, report the measured concentration and indicate that the value exceeds the calibration limit by flagging the results with “E”. Dilutions of up to 1/20 can be performed on the extract. If the compounds that exceed the calibration range cannot be brought within the calibration range by a 1/20 dilution, a post dilution spike can be performed or extraction of a smaller aliquot of sample can be performed or the sample can be analyzed by a more appropriate analytical technique such as HRGC/LRMS. Consultation with the client must occur before any re-extraction is performed.

13.3.11 Evalute the ion chromatogram of the FC-43 lock mass and calibration mass for each MID group. The FC-43 mass intensity must be consistent throughout the retention time of the target compounds. Negative excursions or variations in the FC-43 mass intensity traces by greater than +/- 20% on both the lock and QC masses indicate the elution of interferences that may significatntly reduce the

sensitivity of the mass spectrometer for any analytes which elute at this retention time. Additional extract clean ups or dilutions can reduce the ion suppression. The quantitative results must be carefully evaluated when there is evidence of ion suppression and the result must be flagged with an "S" qualifier."

13.4 The DB-5 (RTX-5) column does not provide for isomer specificity of 2,3,7,8-TCDF using the operating condition required for this method. If a peak is determined to be present at the expected retention time of 2,3,7,8-TCDF and its calculated concentration is above the ML, the sample extract must be analyzed on the DB-225 (RTX-225) column. The lower of the two values are reported for each sample. Data not used is not reported.

Note: The DB-225 (RTX-225) column is isomer specific for 2,3,7,8-TCDF; however a lower value for this analyte is sometimes observed on the DB-5 (RTX-5) column. This may be due to a non-dioxin/furan interference resulting in a high bias on the DB-225 (RTX-225) column. Due to this potential interference the laboratory reports the lower of the two values.

13.5 The Minimum Level (ML) is defined as the level at which the instrument gives acceptable calibration assuming a sample is extracted at the recommended weight or volume and is carried through all normal extraction and analysis procedures. Deviation from the extraction amounts or final volumes listed Table 2 changes the ML. The ML is calculated as shown in the following equation:

$$\mathrm{ML} = \frac{C\min \times Vfe}{Ws}$$

Where:

Cmin = Concentration the analyte in the lowest calibration standard
Ws = Amount of sample spiked and extracted (grams or liters)
Vfe = Final volume of the extract, corrected for all splits and dilutions

$$\mathrm{V}fe = \frac{Vdel \times DFpr}{Spr \times S}$$

Where:

Vdel = Volume of extract delivered to the analysis
DFpr = Dilution factor for dilutions performed to the final extract
Spr = Split ratio for any post IS splits
S = Split ratio for any post-IDA and post-cleanup surrogate standard splits

13.6 The Maximum Level (MaxL) is defined as the concentration or mass of analyte in the sample that corresponds to the highest calibration level in the initial calibration. It is equivalent to the concentration of the highest calibration standard, assuming that all method-specified sample weights, volumes, and cleanup procedures have been employed. The MaxL is calculated as shown in the following equation:

$$MaxL = \frac{C\max \times Vfe}{Ws}$$

Where:

Cmax = Concentration the analyte in the highest calibration standard Vfe and Ws are defined in Section 13.5.

13.7 Flag all compound results in the sample that were detected in the method blank with a "B" qualifier.

13.8 Flag all compound results in the sample that are below the minimum level with a "J" qualifier, or any that is required by the program needs.

13.9 Flag all compound results in the sample that are above the upper calibration limit with an "E" qualifier.

13.10 Flag all compound results in the sample that are "Estimated Maximum Possible Concentrations" with a "q" qualifier, or any that is required by the program needs.

13.11 Flag compound results in the sample that are affected by ion suppression with an "S" qualifier.

13.12 Data Review

13.12.1 The analyst who performs the initial integrations and data calculations must verify all identifications are correct, that all manual integrations are correct, that all NCM's are attached, that all appropriate documentation is linked and that all QC links are correct in the AD II batches. Then place the Analyst Desktop II batch to 1st level reviewed..

13.12.2 A second analyst must verify all identifications are correct, that all manual integrations are correct, that all required NCM's are attached, that all appropriate documentation is linked and that all QC links are correct in the AD II batches. Then place the Analyst Desktop II batch to 2nd level reviewed. .

13.12.3 All items listed on the data review check list must be checked by both the analyst who performed the initial qualitative and quantitative analysis and by the analyst who performed the second level review on each worklist batch. After the final worklist of samples for a job is completed, using the data review checklists, the analyst will run the final report and create a narrative which includes any qualifications of the sample data (NCMs). An example data review check list is shown in Figure 3.

14. Method Performance

14.1 Method Detection Limit (MDL): An MDL must be determined for each analyte in each routine matrix prior to the analysis of any samples. The procedure for determination of the method detection limit is given in the SOP CA-Q-S-006, current revision, based on 40 CFR

Part 136 Appendix B. The result of the MDL determination must support the reporting limit. Current method detection limits are available in the TestAmerica Laboratory Information Management System (TALS).

14.2 Initial Demonstration of Capability: Each analyst must perform an initial demonstration of capability (IDOC) for each target analyte prior to performing the analysis independently. The IDOC is determined by analyzing four replicate spikes (e.g., LCSs) as detailed in Eurofins TestAmerica Knoxville SOP KNOX-QA-0009, current revision. Demonstration for both aqueous and solid matrices is required.

14.2.1 For aqueous samples, extract, concentrate, and analyze four 1-L aliquots of reagent water spiked with labeled IDAs and target analytes according to the procedures in section 11. For non-aqueous samples, extract, concentrate, and analyze four aliquots of sodium sulfate spiked with labeled IDAs and target analytes according to the procedures in section 11. It is recommended that a method blank be prepared with the IDOC samples. Extracts must be stored in the dark at room temperature in amber or clear glass vials prior to analysis.

14.2.2 Using the results of the set of four analyses, compute the average concentration (X) of the extracts in ng/mL and the standard deviation (S) of the concentration in ng/mL for each compound.

14.2.3 For each compound, compare S and X with the corresponding limits for initial precision and recovery in Table 9 for method 1613B and Table 10 for methods 8290, 8290A 23, 0023A, and TO-9A. If S and X for all compounds meet the acceptance criteria, system performance is acceptable and analysis of blanks and samples can begin. If, however, any individual S exceeds the precision limit or any individual X falls outside the range for accuracy, system performance is unacceptable for that compound. Correct the problem and repeat the test.

14.3 Training Qualification: The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its use and has the required experience. Refer to SOP KNOX-QA-0009, current revision for further requirements for performing and documenting initial and on-going demonstrations of capability.

15. Pollution Prevention

15.1 All attempts will be made to minimize, as far as practical, the use of solvents and standard materials.

16. Waste Management

16.1 All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the

policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

16.2 See the current revision of SOP KNOX-HS-0002 for specific waste handling guidelines.

16.3 The following waste streams are produced when this method is carried out:

16.3.1 Waste solvents must be placed in the flammable waste stream, contained in a steel satellite accumulation container or flammable solvent container.

16.3.2 Miscellaneous disposable glassware, chemical resistant gloves, bench paper and similar materials that may or may not be contaminated/hazardous must be placed in the incinerable laboratory waste stream, contained in a HDPE satellite accumulation container.

17. References

17.1 Eurofins TestAmerica Knoxville Quality Assurance Manual (QAM), current revision.

17.2 EPA Method 1613: Tetra- Through Octa- Chlorinated Dioxins and Furans by Isotope Dilutions HRGC/HRMS, Revision B, October 1994.

17.3 SW-846 Method 8290, Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS), Revision 0, September 1994.

17.4 SW-846 Method 8290A, Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (HRGC/HRMS), Revision 1, February 2007.

17.5 SW-846 Method 0023A, Sampling Method for Polychlorinated Dibenzo-p-Dioxins and Polychlorinated Dibenzofuran Emissions from Stationary Sources, Revision 1, December 1996.

17.6 USEPA Method 23 – Determination of Polychlorinated Dibenzo-p-dioxins and Polychlorinated Dibenzofurans from Municipal Waste Combustors. 40 CFR Part 60 Appendix A.

17.7 Method TO-9A: Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, Second Edition EPA/625/R-96/010b.

17.8 Eurofins TestAmerica Knoxville SOP KNOX-OP-0010, "Method 0023A and Method 0010 Sampling Train Pre-Sampling Preparation and Sample Extraction Procedure (Includes TO-9A Sampling Components)", current revision.

17.9 Eurofins TestAmerica Knoxville SOP KNOX-OP-0001, "Extraction of Polychlorinated Dioxins/Furans for Analysis by HRGC/HRMS Based on Methods 8290, 8290A and 1613B", current revision.

17.10 Eurofins TestAmerica Policy, CA-Q-P-003, Calibration Curves and the Selection of Calibration Points, current revision.

17.11 Method 8000C "Determinative Chromatographic Separations" March 2003.

18. Miscellaneous

18.1 Deviations from Reference Methods.

18.1.1 Spiking levels have been reduced to minimize the amount of dioxin contaminated waste generated by this procedure. It has been demonstrated that the performance criteria specified in the method are not affected by this modification.

18.1.2 The absolute retention time requirements in Method 1613B section 15.4.1.1 is not required in this procedure. The routine maintenance required of GC columns when analyzing samples from hazardous waste sites makes this requirement virtually impossible to meet in a commercial laboratory environment. This requirement provides no additional quality assurance purpose beyond those already provided by the use of labeled isotope dilution analytes and required relative retention time limits.

18.1.3 This procedure provides for additional calculation and reporting of sample specific detection limits and estimated maximum possible concentrations not required by Method 1613B. These reporting conventions are similar to those required by EPA SW-846 Method 8290 and expected by data users familiar with EPA Office of Solid Waste program requirements.

18.1.4 Methods 8290/8290A do not require dilution and reanalysis of samples for which OCDD/OCDF and non-2378's exceed the calibration range. Although this allowance is not made by method 1613B, this procedure does not require dilution for OCDD/OCDF and non-2378's on samples analyzed by that method.

18.1.5 The calibration standards specified in method 23 are used for method 0023A and TO-9A.

18.1.6 Extracts are stored at room temperature rather than at <10 °C as specified in method 1613B. Methods 8290 and 8290A allow for the storage of extracts at room temperature in the dark. All of the reference methods require that standards be stored at room temperature. Recovery studies performed by Cambridge Isotopes Laboratories (CIL) indicate freezing or refrigeration of standards causes problems with precipitation and irreversible adsorption to the inside surface of the vial. CIL recommends the storage of standards and extracts at room temperature as long as they are protected from exposure to UV and evaporative losses.

18.1.7 This procedure allows for the use of [redacted] for mass calibration and resolution instead of the method recommended reference compound, [redacted] The use of another mass reference substance is noted in both reference methods 1613B and 8290A[redacted] provides for less noise and less ion source contamination than the method recommended PFK.

18.1.8 The percent valley column resolution criteria is ≤ 25% for this SOP. Among the reference methods both ≤ 25% and < 25% are represented.

18.1.9 This procedure has added [redacted] as an isotope dilution analye (IDA) for the calculation of native OCDF.

18.1.10 Holding time of 45 days from sample extraction to analysis is used for the 8290/8290A tissue matrix.

18.2 List of tables and figures referenced in the body of the SOP.

18.2.1 Table 1 – Polychlorinated Dibenzodioxins and Furans Determined by Isotope Dilution and High Resolution Gas Chromatography /High Resolution Mass Spectrometry (HRGC/HRMS)

18.2.2 Table 2 – Methods – All, Minimum Levels by Matrix

18.2.3 Table 3 – Methods – 1613B and 8290/8290A, Retention Time References, Quantitation References, and Relative Retention Times

18.2.4 Table 4 – Methods – 23, 0023A, and TO-9A, Retention Time References and Quantitation References

18.2.5 Table 5 – Methods – 1613B and 8290/8290A, Initial Calibration Standard Concentrations and Acceptance Criteria

18.2.6 Table 6 – Methods – 23, 0023A, and TO-9A, Initial Calibration Standard Concentrations and Acceptance Criteria

18.2.7 Table 7 – Methods – 1613B and 8290/8290A, Daily Verification Standard (VER) Concentrations and Acceptance Criteria

18.2.8 Table 8 – Methods – 23, 0023A, and TO-9A, Daily Verification Standard (VER) Concentrations and Acceptance Criteria

18.2.9 Table 9 – Method – 1613B, Initial Demonstration of Capability (IDOC) Acceptance Criteria

18.2.10 Table 10 – Methods – 8290/8290A, 23, 0023A, and TO-9A, Initial Demonstration of Capability (IDOC) Acceptance Criteria

18.2.11 Table 11 – Laboratory Control Sample (LCS) Spiking Solution Component Concentrations and Acceptance Limits

18.2.12 Table 12 – Method – 8290/8290A. Matrix Spike and Matrix Spike Duplicate Sample (MS/MSD) Spiking Solution Component Concentrations and Acceptance Limits

18.2.13 Table 13 - Methods – 1613B and 8290/8290A, IDA Spiking Solution Component Concentrations and Acceptance Limits

18.2.14 Table 14 – Method – 1613B, Cleanup Surrogate Standard Spiking Solution Component Concentrations and Acceptance Limits

18.2.15 Table 15 – Methods – 23, 0023A, and TO-9A, IDA Spiking Solution Component Concentrations and Acceptance Limits

18.2.16 Table 16 – Methods – 23, 0023A, and TO-9A, Field Surrogate Standard Spiking Solution Component Concentrations and Acceptance Limits

18.2.17 Table 17 – Methods – All, IS Spiking Solution Component Concentrations

18.2.18 Table 18 – RTX-5/DB-5 Column Window Defining Standard Mixture Components. – RTX-5 (DB-5) Column Performance Standard Mixture Components

18.2.19 Table 19 – RTX-5/DB-5 Column Performance Standard Mixture Components

18.2.20 Table 20 – RTX-225/DB-225 Column Performance Standard Mixture Components

18.2.21 Table 21 – DB-225 (RTX-225) Column Performance Standard Mixture Components

18.2.22 Table 21 – Ions Monitored for HRGC/HRMS Analysis of PCDDs and PCDFs

18.2.23 Table 22 – Theoretical Ion Abundance Ratios and Their Control Limits for PCDDs and PCDFs

18.2.24 Table 23 – HiRes Dilution Factors

18.2.25 Figure 1 – Recommended GC Operating Conditions

18.2.26 Figure 2 – Recommended MID Descriptors

18.2.27 Figure 3 – Example Data Review Checklist

Table 1

Polychlorinated Dibenzo-p-dioxins/Dibenzofurans Determined by Isotope Dilution High Resolution Gas Chromatography/High Resolution Mass Spectrometry (HRGC/HRMS)

PCDD /PCDF [1] Isomer/Congener	CAS Registry	Labeled Analog	CAS Registry
2,3,7,8-TCDD	1746-01-6	$^{13}C_{12}$-2,3,7,8-TCDD $^{37}Cl_4$-2,3,7,8-TCDD	76523-40-5 85508-50-5
Total TCDD	41903-57-5		
2,3,7,8-TCDF	51207-31-9	$^{13}C_{12}$-2,3,7,8-TCDF	89059-46-1
Total TCDF	55722-27-5		
1,2,3,7,8-PeCDD	40321-76-4	$^{13}C_{12}$-1,2,3,7,8-PeCDD	109719-79-1
Total PeCDD	36088-22-9		
1,2,3,7,8-PeCDF	57117-41-6	$^{13}C_{12}$-1,2,3,7,8-PeCDF	109719-77-9
2,3,4,7,8-PeCDF	57117-31-4	$^{13}C_{12}$-2,3,4,7,8-PeCDF	116843-02-8
Total PeCDF	30402-15-4		
1,2,3,4,7,8-HxCDD	39227-28-6	$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	109719-80-4
1,2,3,6,7,8-HxCDD	57653-85-7	$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	109719-81-5
1,2,3,7,8,9-HxCDD	19408-74-3	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	109719-82-6
Total HxCDD	34465-46-8		
1,2,3,4,7,8-HxCDF	70648-26-9	$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	114423-98-2
1,2,3,6,7,8-HxCDF	57117-44-9	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	116843-03-9
2,3,4,6,7,8-HxCDF	60851-34-5	$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	116843-05-1
1,2,3,7,8,9-HxCDF	72918-21-9	$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	116843-04-0
Total HxCDF	55684-94-1		
1,2,3,4,6,7,8-HpCDD	35822-46-9	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	109719-83-7
Total HpCDD	37871-00-4		
1,2,3,4,6,7,8-HpCDF	67562-39-4	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	109719-84-8
1,2,3,4,7,8,9-HpCDF	55673-89-7	$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	109719-94-0
Total HpCDF	38998-75-3		
OCDD	3268-87-9	$^{13}C_{12}$-OCDD	114423-97-1
OCDF	39001-02-0	$^{13}C_{12}$-OCDF	109719-78-0

Notes:

1. Polychlorinated dioxins and furans

TCDD	= Tetrachlorodibenzo-p-dioxin	TCDF	= Tetrachlorodibenzofuran
PeCDD	= Pentachlorodibenzo-p-dioxin	PeCDF	= Pentachlorodibenzofuran
HxCDD	= Hexachlorodibenzo-p-dioxin	HxCDF	= Hexachlorodibenzofuran
HpCDD	= Heptachlorodibenzo-p-dioxin	HpCDF	= Heptachlorodibenzofuran
OCDD	= Octachlorodibenzo-p-dioxin	OCDF	= Octachlorodibenzofuran

Table 2

Methods – All
Minimum Levels by Matrix

Target Analyte	Extract (ng/mL) [1]	Water (pg/L) [2]	Solids (pg/g) [3]	Biological Tissue (pg/g) [3]	Waste (pg/g) [4]	Air/Wipe (pg) [5]
2,3,7,8-TCDD	0.5	10	1	1	10	10
2,3,7,8-TCDF	0.5	10	1	1	10	10
1,2,3,7,8-PeCDD	2.5	50	5	5	50	50
1,2,3,7,8-PeCDF	2.5	50	5	5	50	50
2,3,4,7,8-PeCDF	2.5	50	5	5	50	50
1,2,3,4,7,8-HxCDD	2.5	50	5	5	50	50
1,2,3,6,7,8-HxCDD	2.5	50	5	5	50	50
1,2,3,7,8,9-HxCDD	2.5	50	5	5	50	50
1,2,3,4,7,8-HxCDF	2.5	50	5	5	50	50
1,2,3,6,7,8-HxCDF	2.5	50	5	5	50	50
2,3,4,6,7,8-HxCDF	2.5	50	5	5	50	50
1,2,3,7,8,9-HxCDF	2.5	50	5	5	50	50
1,2,3,4,6,7,8-HpCDD	2.5	50	5	5	50	50
1,2,3,4,6,7,8-HpCDF	2.5	50	5	5	50	50
1,2,3,4,7,8,9-HpCDF	2.5	50	5	5	50	50
OCDD	5.0	100	10	10	100	100
OCDF	5.0	100	10	10	100	100

Notes:
1 Concentration in the extract assuming a 20 µL volume.
2 Based on a sample volume of 1.0 L.
3 Based on a sample weight of 10.0 g.
4 Based on a sample weight of 1.0 g.
5 Based on extraction of the entire sample.

Table 3

Methods – 1613B and 8290/8290A
Retention Time References, Quantitation References and Relative Retention Times

Compound	Retention Time and Quantitation Reference	Relative Retention Time
Compounds using $^{13}C_{12}$-1,2,3,4-TCDD as the IS		
2,3,7,8-TCDD	$^{13}C_{12}$-2,3,7,8-TCDD	0.999-1.002
2,3,7,8-TCDF	$^{13}C_{12}$-2,3,7,8-TCDF	0.999-1.003
1,2,3,7,8-PeCDD	$^{13}C_{12}$-1,2,3,7,8-PeCDD	0.999-1.002
1,2,3,7,8-PeCDF	$^{13}C_{12}$-1,2,3,7,8-PeCDF	0.999-1.002
2,3,4,7,8-PeCDF	$^{13}C_{12}$-2,3,4,7,8-PeCDF	0.999-1.002
$^{13}C_{12}$-2,3,7,8-TCDD	$^{13}C_{12}$-1,2,3,4-TCDD	0.976-1.043
$^{37}Cl_4$-2,3,7,8-TCDD	$^{13}C_{12}$-1,2,3,4-TCDD	0.989-1.052
$^{13}C_{12}$-2,3,7,8-TCDF	$^{13}C_{12}$-1,2,3,4-TCDD	0.923-1.103
$^{13}C_{12}$-1,2,3,7,8-PeCDD	$^{13}C_{12}$-1,2,3,4-TCDD	1.000-1.567
$^{13}C_{12}$-1,2,3,7,8-PeCDF	$^{13}C_{12}$-1,2,3,4-TCDD	1.000-1.425
$^{13}C_{12}$-2,3,4,7,8-PeCDF	$^{13}C_{12}$-1,2,3,4-TCDD	1.011-1.526
Compounds using $^{13}C_{12}$-1,2,3,7,8,9-HxCDD as the IS		
1,2,3,4,7,8-HxCDD	$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	0.999-1.001
1,2,3,6,7,8-HxCDD	$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	0.998-1.004
1,2,3,7,8,9-HxCDD	--[1]	1.000-1.019
1,2,3,4,7,8-HxCDF	$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	0.999-1.001
1,2,3,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	0.997-1.005
2,3,4,6,7,8-HxCDF	$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	0.999-1.001
1,2,3,7,8,9-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	0.999-1.001
1,2,3,4,6,7,8-HpCDD	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	0.999-1.001
1,2,3,4,6,7,8-HpCDF	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	0.999-1.001
1,2,3,4,7,8,9-HpCDF	$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	0.999-1.001
OCDD	$^{13}C_{12}$-OCDD	0.999-1.001
OCDF	$^{13}C_{12}$-OCDF	0.999-1.008
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.977-1.000
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.981-1.003
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.944-0.970
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.949-0.975
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.959-1.021
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.977-1.047
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	1.086-1.110
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	1.043-1.085
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	1.057-1.151
$^{13}C_{12}$-OCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	1.032-1.311
$^{13}C_{12}$-OCDF[2]	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	1.032-1.311

Notes:

1 The retention time reference for 1,2,3,7,8,9-HxCDD is $^{13}C_{12}$-1,2,3,6,7,8-HxCDD. 1,2,3,7,8,9-HxCDD is quantified using the averaged responses for $^{13}C_{12}$-1,2,3,4,7,8-HxCDD and $^{13}C_{12}$-1,2,3,6,7,8-HxCDD.

2 Compound is not listed in EPA Method 1613. It has been added to improve quantitation.

Table 4

Methods – 23, 0023A and TO-9A
Retention Time References and Quantitation References

Compound	Retention Time and Quantitation Reference
Compounds using $^{13}C_{12}$-1,2,3,4-TCDD as the IS	
2,3,7,8-TCDD	$^{13}C_{12}$-2,3,7,8-TCDD
2,3,7,8-TCDF	$^{13}C_{12}$-2,3,7,8-TCDF
1,2,3,7,8-PeCDD	$^{13}C_{12}$-1,2,3,7,8-PeCDD
1,2,3,7,8-PeCDF	$^{13}C_{12}$-1,2,3,7,8-PeCDF
2,3,4,7,8-PeCDF	$^{13}C_{12}$-1,2,3,7,8-PeCDF
$^{13}C_{12}$-2,3,7,8-TCDD	$^{13}C_{12}$-1,2,3,4-TCDD
$^{37}Cl_4$-2,3,7,8-TCDD	$^{13}C_{12}$-2,3,7,8-TCDD
$^{13}C_{12}$-2,3,7,8-TCDF	$^{13}C_{12}$-1,2,3,4-TCDD
$^{13}C_{12}$-1,2,3,7,8-PeCDD	$^{13}C_{12}$-1,2,3,4-TCDD
$^{13}C_{12}$-1,2,3,7,8-PeCDF	$^{13}C_{12}$-1,2,3,4-TCDD
$^{13}C_{12}$-2,3,4,7,8-PeCDF	$^{13}C_{12}$-1,2,3,7,8-PeCDF
Compounds using $^{13}C_{12}$-1,2,3,7,8,9-HxCDD as the IS	
1,2,3,4,7,8-HxCDD	$^{13}C_{12}$-1,2,3,6,7,8-HxCDD
1,2,3,6,7,8-HxCDD	$^{13}C_{12}$-1,2,3,6,7,8-HxCDD
1,2,3,7,8,9-HxCDD	$^{13}C_{12}$-1,2,3,6,7,8-HxCDD
1,2,3,4,7,8-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF
1,2,3,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF
2,3,4,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF
1,2,3,7,8,9-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF
1,2,3,4,6,7,8-HpCDD	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD
1,2,3,4,6,7,8-HpCDF	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF
1,2,3,4,7,8,9-HpCDF	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF
OCDD	$^{13}C_{12}$-OCDD
OCDF	$^{13}C_{12}$-OCDF
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	$^{13}C_{12}$-1,2,3,6,7,8-HxCDD
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	$^{13}C_{12}$-1,2,3,6,7,8-HxCDF
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF
$^{13}C_{12}$-OCDD	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD
$^{13}C_{12}$-OCDF	$^{13}C_{12}$-1,2,3,7,8,9-HxCDD

Table 5

Methods – 1613B and 8290/8290A
Initial Calibration Standard Concentrations and Acceptance Criteria

	CS1	CS2	CS3	CS4	CS5	1613B	8290	8290A
Compound	**(ng/mL)**	**(ng/mL)**	**(ng/mL)**	**(ng/mL)**	**(ng/mL)**	**%RSD**	**%RSD**	**%RSD**
Target PCDD and PCDF	[redacted]							
2,3,7,8-TCDD	[redacted]					±20	±20	±20
2,3,7,8-TCDF	[redacted]					±20	±20	±20
1,2,3,7,8-PeCDD	[redacted]					±20	±20	±20
1,2,3,7,8-PeCDF	[redacted]					±20	±20	±20
2,3,4,7,8-PeCDF	[redacted]					±20	±20	±20
1,2,3,4,7,8-HxCDD	[redacted]					±20	±20	±20
1,2,3,6,7,8-HxCDD	[redacted]					±20	±20	±20
1,2,3,7,8,9-HxCDD	[redacted]					±35	±20	±20
1,2,3,4,7,8-HxCDF	[redacted]					±20	±20	±20
1,2,3,6,7,8-HxCDF	[redacted]					±20	±20	±20
2,3,4,6,7,8-HxCDF	[redacted]					±20	±20	±20
1,2,3,7,8,9-HxCDF	[redacted]					±20	±20	±20
1,2,3,4,6,7,8-HpCDD	[redacted]					±20	±20	±20
1,2,3,4,6,7,8-HpCDF	[redacted]					±20	±20	±20
1,2,3,4,7,8,9-HpCDF	[redacted]					±20	±20	±20
OCDD	[redacted]					±20	±20	±20
OCDF	[redacted]					±35	±20	±20
	[redacted]							
Labeled IDA's	[redacted]							
$^{13}C_{12}$-2,3,7,8-TCDD	[redacted]					±35	±30	±20
$^{13}C_{12}$-2,3,7,8-TCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,7,8-PeCDD	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,7,8-PeCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-2,3,4,7,8-PeCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	[redacted]					±35	±30	±20
$^{13}C_{12}$-OCDD	[redacted]					±35	±30	±20
$^{13}C_{12}$-OCDF	[redacted]					±35	±30	±20
Labeled Cleanup Surrogate Standard								
$^{37}Cl_4$-2,3,7,8-TCDD	[redacted]					±35	-	-
Labeled IS								
$^{13}C_{12}$-1,2,3,4-TCDD	[redacted]					-	-	-
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	[redacted]					-	-	-

Table 6

Methods – 23, 0023A and TO-9A
Initial Calibration Standard Concentrations and Acceptance Criteria

	CS1	CS2	CS3	CS4	CS5	23 / TO-9A	0023A
Compound	**(ng/mL)**	**(ng/mL)**	**(ng/mL)**	**(ng/mL)**	**(ng/mL)**	**%RSD**	**%RSD**
Target PCDD and PCDF							
2,3,7,8-TCDD	[redacted]					±25	±20
2,3,7,8-TCDF						±25	±20
1,2,3,7,8-PeCDD						±25	±20
1,2,3,7,8-PeCDF						±25	±20
2,3,4,7,8-PeCDF						±25	±20
1,2,3,4,7,8-HxCDD						±25	±20
1,2,3,6,7,8-HxCDD						±25	±20
1,2,3,7,8,9-HxCDD						±25	±20
1,2,3,4,7,8-HxCDF						±25	±20
1,2,3,6,7,8-HxCDF						±25	±20
2,3,4,6,7,8-HxCDF						±25	±20
1,2,3,7,8,9-HxCDF						±25	±20
1,2,3,4,6,7,8-HpCDD						±25	±20
1,2,3,4,6,7,8-HpCDF						±25	±20
1,2,3,4,7,8,9-HpCDF						±25	±20
OCDD						±25	±20
OCDF						±30	±20
Labeled IDA							
$^{13}C_{12}$-2,3,7,8-TCDD	[redacted]					±25	±30
$^{13}C_{12}$-2,3,7,8-TCDF						±30	±30
$^{13}C_{12}$-1,2,3,7,8-PeCDD						±30	±30
$^{13}C_{12}$-1,2,3,7,8-PeCDF						±30	±30
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD						±25	±30
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF						±30	±30
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD						±30	±30
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF						±30	±30
$^{13}C_{12}$-OCDD						±30	±30
$^{13}C_{12}$-OCDF						±30	±30
Field Surrogate Standard							
$^{37}Cl_4$-2,3,7,8-TCDD	[redacted]					±25	±30
$^{13}C_{12}$-2,3,4,7,8-PeCDF						±25	±30
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD						±25	±30
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF						±25	±30
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF						±25	±30
Labeled IS							
$^{13}C_{12}$-1,2,3,4-TCDD	[redacted]					-	-
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD						-	-

Table 7

Methods – 1613B and 8290/8290A
Daily Verification Standard (VER) Concentrations and Acceptance Criteria

		1613B			8290/8290A	
Compound	**VER (ng/mL)**	**All Isomers (ng/mL)**	**Tetra only (ng/mL)**		**Shift Open %D**	**Shift Close[1] %D**
Target PCDD and PCDF						
2,3,7,8-TCDD	10	7.8-12.9	8.2-12.3		±20	±25
2,3,7,8-TCDF	10	8.4-12.0	8.6-11.6		±20	±25
1,2,3,7,8-PeCDD	50	39-65	-		±20	±25
1,2,3,7,8-PeCDF	50	41-60	-		±20	±25
2,3,4,7,8-PeCDF	50	41-61	-		±20	±25
1,2,3,4,7,8-HxCDD	50	39-64	-		±20	±25
1,2,3,6,7,8-HxCDD	50	39-64	-		±20	±25
1,2,3,7,8,9-HxCDD	50	41-61	-		±20	±25
1,2,3,4,7,8-HxCDF	50	45-56	-		±20	±25
1,2,3,6,7,8-HxCDF	50	44-57	-		±20	±25
2,3,4,6,7,8-HxCDF	50	44-57	-		±20	±25
1,2,3,7,8,9-HxCDF	50	45-56	-		±20	±25
1,2,3,4,6,7,8-HpCDD	50	43-58	-		±20	±25
1,2,3,4,6,7,8-HpCDF	50	45-55	-		±20	±25
1,2,3,4,7,8,9-HpCDF	50	43-58	-		±20	±25
OCDD	100	79-126	-		±20	±25
OCDF	100	63-159	-		±20	±25
Labeled IDA						
$^{13}C_{12}$-2,3,7,8-TCDD	100	82-121	85-117		±30	±35
$^{13}C_{12}$-2,3,7,8-TCDF	100	71-140	76-131		±30	±35
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	62-160	-		±30	±35
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	76-130	-		±30	±35
$^{13}C_{12}$-2,3,4,7,8-PeCDF	100	77-130	-		±30	±35
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	100	85-117	-		±30	±35
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	85-118	-		±30	±35
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	100	76-131	-		±30	±35
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	70-143	-		±30	±35
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	100	73-137	-		±30	±35
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	100	74-135	-		±30	±35
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	72-138	-		±30	±35
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	78-129	-		±30	±35
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	100	77-129	-		±30	±35
$^{13}C_{12}$-OCDD	200	96-415	-		±30	±35
$^{13}C_{12}$-OCDF	200	96-415	-		±30	±35
Labeled Cleanup Surrogate Standard						
$^{37}Cl_4$-2,3,7,8-TCDD	10	7.9-12.7	8.3-12.1		-	-
Labeled IS						
$^{13}C_{12}$-1,2,3,4-TCDD	100	-	-		-	-
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	100	-	-		-	-

Notes:

1 If the closing standard %D exceeds the opening %D criteria, the average of the Opening and Closing RF is used instead of the Initial Calibration RF to calculate sample concentrations.

Table 8

Methods – 23, 0023A and TO-9A
Daily Verification Standard (VER) Concentrations and Acceptance Criteria

			0023A	
	VER	23 and TO-9A	Shift Open	Shift Close[1]
Compound	**(ng/mL)**	**%D**	**%D**	**%D**
Target PCDD and PCDF				
2,3,7,8-TCDD	5	±25	±20	±25
2,3,7,8-TCDF	5	±25	±20	±25
1,2,3,7,8-PeCDD	25	±25	±20	±25
1,2,3,7,8-PeCDF	25	±25	±20	±25
2,3,4,7,8-PeCDF	25	±25	±20	±25
1,2,3,4,7,8-HxCDD	25	±25	±20	±25
1,2,3,6,7,8-HxCDD	25	±25	±20	±25
1,2,3,7,8,9-HxCDD	25	±25	±20	±25
1,2,3,4,7,8-HxCDF	25	±25	±20	±25
1,2,3,6,7,8-HxCDF	25	±25	±20	±25
2,3,4,6,7,8-HxCDF	25	±25	±20	±25
1,2,3,7,8,9-HxCDF	25	±25	±20	±25
1,2,3,4,6,7,8-HpCDD	25	±25	±20	±25
1,2,3,4,6,7,8-HpCDF	25	±25	±20	±25
1,2,3,4,7,8,9-HpCDF	25	±25	±20	±25
OCDD	50	±25	±20	±25
OCDF	50	±30	±20	±25
Labeled IDA				
$^{13}C_{12}$-2,3,7,8-TCDD	100	±25	±30	±35
$^{13}C_{12}$-2,3,7,8-TCDF	100	±30	±30	±35
$^{13}C_{12}$-1,2,3,7,8-PeCDD	100	±30	±30	±35
$^{13}C_{12}$-1,2,3,7,8-PeCDF	100	±30	±30	±35
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	100	±25	±30	±35
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	100	±30	±30	±35
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	100	±30	±30	±35
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	100	±30	±30	±35
$^{13}C_{12}$-OCDD	200	±30	±30	±35
$^{13}C_{12}$-OCDF	200	±30	±30	±35
Field Surrogate Standard				
$^{37}Cl_4$-2,3,7,8-TCDD	5	±25	±30	±35
$^{13}C_{12}$-2,3,4,7,8-PeCDF	25	±25	±30	±35
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	25	±25	±30	±35
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	25	±25	±30	±35
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	25	±25	±30	±35
Labeled IS				
$^{13}C_{12}$-1,2,3,4-TCDD	100	-	-	-
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	100	-	-	-

Notes:

1 If the closing standard %D exceeds the opening %D criteria, the average of the Opening and Closing RF is used instead of the Initial Calibration RF to calculate sample concentrations.

Table 9

Method – 1613B
Initial Demonstration of Capability (IDOC) Acceptance Criteria

	Test	1613B			1613B Tetra Only	
Compound	**Conc. (ng/mL) [1]**	**s[2] (ng/mL) [1]**	**X[3] (ng/ml) [1]**		**s[2] (ng/mL) [1]**	**X[3] (ng/ml) [1]**
Target PCDD and PCDF						
2,3,7,8-TCDD	10	2.8	8.3-12.9		2.7	8.7-12.4
2,3,7,8-TCDF	10	2.0	8.7-13.7		2.0	9.1-13.1
1,2,3,7,8-PeCDD	50	7.5	38-66		-	-
1,2,3,7,8-PeCDF	50	7.5	43-62		-	-
2,3,4,7,8-PeCDF	50	8.6	36-75		-	-
1,2,3,4,7,8-HxCDD	50	9.4	39-76		-	-
1,2,3,6,7,8-HxCDD	50	7.7	42-62		-	-
1,2,3,7,8,9-HxCDD	50	11.1	37-71		-	-
1,2,3,4,7,8-HxCDF	50	8.7	41-59		-	-
1,2,3,6,7,8-HxCDF	50	6.7	46-60		-	-
2,3,4,6,7,8-HxCDF	50	7.4	37-74		-	-
1,2,3,7,8,9-HxCDF	50	6.4	42-61		-	-
1,2,3,4,6,7,8-HpCDD	50	7.7	38-65		-	-
1,2,3,4,6,7,8-HpCDF	50	6.3	45-56		-	-
1,2,3,4,7,8,9-HpCDF	50	8.1	43-63		-	-
OCDD	100	19	89-127		-	-
OCDF	100	27	74-146		-	-
Labeled IDA						
$^{13}C_{12}$-2,3,7,8-TCDD	50	18.5	14-67		17.5	16-57.5
$^{13}C_{12}$-2,3,7,8-TCDF	50	17.5	15.5-56.5		17	17.5-49.5
$^{13}C_{12}$-1,2,3,7,8-PeCDD	50	19.5	13.5-92		-	-
$^{13}C_{12}$-1,2,3,7,8-PeCDF	50	17.0	13.5-78		-	-
$^{13}C_{12}$-2,3,4,7,8-PeCDF	50	19.0	8-139.5		-	-
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	50	20.5	14.5-73.5		-	-
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	50	19.0	17-61		-	-
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	50	21.5	13.5-76		-	-
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	50	17.5	15-61		-	-
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	50	18.5	14.5-68		-	-
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	50	20.0	12-78.5		-	-
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	50	17.5	17-64.5		-	-
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	50	20.5	16-55		-	-
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	50	20.0	14-70.5		-	-
$^{13}C_{12}$-OCDD	100	47.5	20.5-13.8		-	-
$^{13}C_{12}$-OCDF	100	47.5	20.5-13.8		-	-
Labeled Cleanup Surrogate Standard						
$^{37}Cl_4$-2,3,7,8-TCDD	10	3.6	3.9-15.4		3.4	4.5-13.4

Notes:

1 All specifications are given as concentration in the final extract, assuming a 20-µL volume.

2 s = standard deviation of the concentration

3 X = average concentration. The acceptance range for average recovery can be normalized (shifted to center on 100% recovery) to compensate for the bias in the collaborative study used to develop the acceptance criteria.

Table 10

Methods – 8290/8290A, 23, 0023A and TO-9A
Initial Demonstration of Capability (IDOC) Acceptance Criteria

Target Analyte	Test Conc (ng/mL) [1]	s[2] (%Rec)	X[3] (%Rec)
Target PCDD and PCDF			
2,3,7,8-TCDD	10	15[4]	70-130[4]
2,3,7,8-TCDF	10	15[4]	70-130[4]
1,2,3,7,8-PeCDD	50	15[4]	70-130[4]
1,2,3,7,8-PeCDF	50	15[4]	70-130[4]
2,3,4,7,8-PeCDF	50	15[4]	70-130[4]
1,2,3,4,7,8-HxCDD	50	15[4]	70-130[4]
1,2,3,6,7,8-HxCDD	50	15[4]	70-130[4]
1,2,3,7,8,9-HxCDD	50	15[4]	70-130[4]
1,2,3,4,7,8-HxCDF	50	15[4]	70-130[4]
1,2,3,6,7,8-HxCDF	50	15[4]	70-130[4]
2,3,4,6,7,8-HxCDF	50	15[4]	70-130[4]
1,2,3,7,8,9-HxCDF	50	15[4]	70-130[4]
1,2,3,4,6,7,8-HpCDD	50	15[4]	70-130[4]
1,2,3,4,6,7,8-HpCDF	50	15[4]	70-130[4]
1,2,3,4,7,8,9-HpCDF	50	15[4]	70-130[4]
OCDD	100	15[4]	70-130[4]
OCDF	100	15[4]	70-130[4]

Notes:
1 All specifications are given as concentration in the final extract, assuming a 20 µL volume.
2 s = standard deviation of the percent recovery
3 X = average percent recovery
4 Inhouse generated historical control limits can be used in place of the specified limit.

Table 11

Laboratory Control Sample (LCS) Spiking Solution Component Concentrations and Acceptance Limits

Target Analyte	LCS Solution Conc. (ng/mL)[1]	Final Extract Conc (ng/mL)[2]	1613B LCS Conc (ng/mL)[2]	8290/8290A, 23, 0023A, TO-9A Recovery (%Rec)
2,3,7,8-TCDD	0.2	10	6.7-15.8	70-130[4]
2,3,7,8-TCDF	0.2	10	7.5-15.8	70-130[4]
1,2,3,7,8-PeCDD	1.0	50	35-71	70-130[4]
1,2,3,7,8-PeCDF	1.0	50	40-67	70-130[4]
2,3,4,7,8-PeCDF	1.0	50	34-80	70-130[4]
1,2,3,4,7,8-HxCDD	1.0	50	35-82	70-130[4]
1,2,3,6,7,8-HxCDD	1.0	50	38-67	70-130[4]
1,2,3,7,8,9-HxCDD	1.0	50	32-81	70-130[4]
1,2,3,4,7,8-HxCDF	1.0	50	36-67	70-130[4]
1,2,3,6,7,8-HxCDF	1.0	50	42-65	70-130[4]
2,3,4,6,7,8-HxCDF	1.0	50	35-78	70-130[4]
1,2,3,7,8,9-HxCDF	1.0	50	39-65	70-130[4]
1,2,3,4,6,7,8-HpCDD	1.0	50	35-70	70-130[4]
1,2,3,4,6,7,8-HpCDF	1.0	50	41-61	70-130[4]
1,2,3,4,7,8,9-HpCDF	1.0	50	39-69	70-130[4]
OCDD	2.0	100	78-144	70-130[4]
OCDF	2.0	100	63-170	70-130[4]
Tetras Only				
2,3,7,8-TCDD	0.2	10	7.3-14.6	70-130[4]
2,3,7,8-TCDF	0.2	10	8.0-14.7	70-130[4]

Notes:

1 1.0 mL of this solution is added to the LCS before extraction

2 The final extract concentration is based on an extract volume of 20 µL.

3 Spike concentrations are based on a 1.0 L extraction for water, 10.0g extraction for solids, and entire sample extraction for air/wipe samples.

4 Inhouse generated historical control limits can be used in place of the specified limit.

Table 12

Method – 8290
Matrix Spike and Matrix Spike Duplicate Sample (MS/MSD) Spiking Solution Component Concentrations and Acceptance Limits[1]

Target Analyte	LCS Solution Conc. (ng/mL)[2]	Final Extract Conc (ng/mL)[3]	8290 Recovery (%Rec)	8290 Precision (RPD)
2,3,7,8-TCDD	0.2	10	70-130[4]	±15[4]
2,3,7,8-TCDF	0.2	10	70-130[4]	±15[4]
1,2,3,7,8-PeCDD	1.0	50	70-130[4]	±15[4]
1,2,3,7,8-PeCDF	1.0	50	70-130[4]	±15[4]
2,3,4,7,8-PeCDF	1.0	50	70-130[4]	±15[4]
1,2,3,4,7,8-HxCDD	1.0	50	70-130[4]	±15[4]
1,2,3,6,7,8-HxCDD	1.0	50	70-130[4]	±15[4]
1,2,3,7,8,9-HxCDD	1.0	50	70-130[4]	±15[4]
1,2,3,4,7,8-HxCDF	1.0	50	70-130[4]	±15[4]
1,2,3,6,7,8-HxCDF	1.0	50	70-130[4]	±15[4]
2,3,4,6,7,8-HxCDF	1.0	50	70-130[4]	±15[4]
1,2,3,7,8,9-HxCDF	1.0	50	70-130[4]	±15[4]
1,2,3,4,6,7,8-HpCDD	1.0	50	70-130[4]	±15[4]
1,2,3,4,6,7,8-HpCDF	1.0	50	70-130[4]	±15[4]
1,2,3,4,7,8,9-HpCDF	1.0	50	70-130[4]	±15[4]
OCDD	2.0	100	70-130[4]	±15[4]
OCDF	2.0	100	70-130[4]	±15[4]

Notes:
1 If insufficient sample exists for MS/MSD analysis, these limits apply to LCS/LCSD samples.
2 1.0 mL of this solution is added to the LCS before extraction
3 The final extract concentration is based on an extract volume of 20 µL.
4 Inhouse generated historical control limits can be used in place of the specified limit.

Table 13

Methods – 1613B and 8290/8290A
Isotope Dilution Analyte Spiking Solution Component Concentrations and Acceptance Limits

Labeled IDA	Solution Conc (ng/mL)[1]	Test Conc. (ng/mL)[2]	1613B LCS Conc (ng/mL)[2]	1613B Sample Conc (ng/mL)[2]	8290 Recovery (%Rec)
$^{13}C_{12}$-2,3,7,8-TCDD	1.0	50	10.0-87.5	12.5-82.0	40-135
$^{13}C_{12}$-2,3,7,8-TCDF	1.0	50	11.0-76.0	12.0-84.5	40-135
$^{13}C_{12}$-1,2,3,7,8-PeCDD	1.0	50	10.5-113.5	12.5-90.5	40-135
$^{13}C_{12}$-1,2,3,7,8-PeCDF	1.0	50	10.5-96.0	12.0-92.5	40-135
$^{13}C_{12}$-2,3,4,7,8-PeCDF	1.0	50	6.5-164.0	10.5-89.0	40-135
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	1.0	50	10.5-96.5	16.0-70.5	40-135
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	1.0	50	12.5-81.5	14.0-65.0	40-135
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	1.0	50	9.5-101.0	13.0-76.0	40-135
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	1.0	50	10.5-79.5	13.0-61.5	40-135
$^{13}C_{12}$-2,3,4,6,7,8-HxCDF	1.0	50	11.0-88.0	14.0-68.0	40-135
$^{13}C_{12}$-1,2,3,7,8,9-HxCDF	1.0	50	8.5-102.5	14.5-73.5	40-135
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	1.0	50	13.0-83.0	11.5-70.0	40-135
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	1.0	50	10.5-79.0	14.0-71.5	40-135
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	1.0	50	10.0-93.0	13.0-69.0	40-135
$^{13}C_{12}$-OCDD	2.0	100	13.0-198.5	17.0-157	40-135
$^{13}C_{12}$-OCDF	2.0	100	13.0-198.5	17.0-157	40-135
Tetras Only					
$^{13}C_{12}$-2,3,7,8-TCDD	1.0	50	12.5-70.5	15.5-68.5	40-135
$^{13}C_{12}$-2,3,7,8-TCDF	1.0	50	13.0-63.0	14.5-70.0	40-135

Notes:
1 1.0 mL of the IDA Spiking Solution is added to each sample, method blank and LCS prior to extraction.
2 Specifications given as concentration in the final extract, assuming a 20 µL volume

Table 14

Method – 1613B
Cleanup Surrogate Standard Spiking Solution Component Concentrations and Acceptance Limits

Labeled Cleanup Surrogate	Solution Conc (ng/mL)[1]	Test Conc. (ng/mL)[2]	1613B LCS Conc (ng/mL)[2]	1613B Sample Conc (ng/mL)[2]	1613B LCS Tetra Only Conc (ng/mL)[2]	1613B Sample Tetra Only Conc (ng/mL)[2]
$^{37}Cl_4$-2,3,7,8-TCDD	0.2	10	3.1-19.1	3.5-19.7	3.7-15.8	4.2-16.4

Notes:
1 1.0 mL of the Cleanup Surrogate Standard Spiking Solution is added to each sample, method blank and LCS prior to cleanup.
2 Specifications given as concentration in the final extract, assuming a 20 µL volume

Table 15

Methods – 23, 0023A and TO-9A
Isotope Dilution Analyte Spiking Solution Component Concentrations and Acceptance Limits

Labeled IDA	Solution Conc (ng/mL)[1]	Test Conc. (ng/mL)[2]	23 Recovery (%Rec)	0023A Recovery (%Rec)	TO-9A Recovery (%Rec)
$^{13}C_{12}$-2,3,7,8-TCDD	1.0	50	40-130	40-135	50-120
$^{13}C_{12}$-2,3,7,8-TCDF	1.0	50	40-130	40-135	50-120
$^{13}C_{12}$-1,2,3,7,8-PeCDD	1.0	50	40-130	40-135	50-120
$^{13}C_{12}$-1,2,3,7,8-PeCDF	1.0	50	40-130	40-135	50-120
$^{13}C_{12}$-1,2,3,6,7,8-HxCDD	1.0	50	40-130	40-135	50-120
$^{13}C_{12}$-1,2,3,6,7,8-HxCDF	1.0	50	40-130	40-135	50-120
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDD	1.0	50	25-130	40-135	40-120
$^{13}C_{12}$-1,2,3,4,6,7,8-HpCDF	1.0	50	25-130	40-135	40-120
$^{13}C_{12}$-OCDD	2.0	100	25-130	40-135	40-120
$^{13}C_{12}$-OCDF	2.0	100	25-130	40-135	40-120

Notes:

1 1.0 mL of the IDA Spiking Solution is added to each sample, method blank and LCS prior to extraction.
2 Specifications given as concentration in the final extract, assuming a 20 µL volume.

Table 16

Methods – 23, 0023A, and TO-9A
Field Surrogate Standard Spiking Solution Component Concentrations and Acceptance Limits

Labeled Field Surrogate	Solution Conc (ng/mL)[1]	Test Conc. (ng/mL)[2]	23 Recovery (%Rec)	0023A Recovery (%Rec)	TO-9A Recovery (%Rec)
$^{37}Cl_4$-2,3,7,8-TCDD	20	100	70-130	70-130	50-120
$^{13}C_{12}$-2,3,4,7,8-PeCDF	20	100	70-130	70-130	50-120
$^{13}C_{12}$-1,2,3,4,7,8-HxCDD	20	100	70-130	70-130	50-120
$^{13}C_{12}$-1,2,3,4,7,8-HxCDF	20	100	70-130	70-130	50-120
$^{13}C_{12}$-1,2,3,4,7,8,9-HpCDF	20	100	70-130	70-130	40-120

Notes:
1 100 µL of the Field Surrogate Spiking Solution is added to each sample train prior to sampling.
2 Specifications given as concentration in the final extract, assuming a 20 µL volume.

Table 17

Methods – All
IS Spiking Solution Component Concentrations

Labeled IS	Solution Conc (µg/mL)[1]	Test Conc. (ng/mL)[2]
$^{13}C_{12}$-1,2,3,4-TCDD	0.1	100
$^{13}C_{12}$-1,2,3,7,8,9-HxCDD	0.1	100

Notes:
1 20 µL of the IS Spiking Solution is added to each sample, method blank and LCS prior to analysis.
2 Specifications given as concentration in the final extract, assuming a 20 µL volume.

Table 18

RTX-5/DB-5 Column Window Defining Standard Mixture Components

Congener	First Eluted	Last Eluted
TCDF	1,3,6,8-	1,2,8,9-
TCDD	1,3,6,8-	1,2,8,9-
PeCDF	1,3,4,6,8-	1,2,3,8,9-
PeCDD	1,2,4,6,8-/1,2,4,7,9-	1,2,3,8,9-
HxCDF	1,2,3,4,6,8-	1,2,3,4,8,9-
HxCDD	1,2,4,6,7,9-/1,2,4,6,8,9-	1,2,3,4,6,7-
HpCDF	1,2,3,4,6,7,8-	1,2,3,4,7,8,9-
HpCDD	1,2,3,4,6,7,9-	1,2,3,4,6,7,8-

Table 19

RTX-5 (DB-5) Column Performance Standard Mixture Components

Isomer
1,2,3,7/1,2,3,8-TCDD
1,2,3,9-TCDD
2,3,7,8-TCDD

Table 20

DB-225 (RTX-225) Column Performance Standard Mixture Components

Isomer
2,3,4,7-TCDF
2,3,7,8-TCDF
1,2,3,9-TCDF

Table 21

Ions Monitored for HRGC/HRMS Analysis of PCDDs and PCDFs

Descriptor	Accurate Mass[1]	Ion ID	Elemental Composition	Analyte
1	313.9834	LOCK	C_7F_{11} ($C_6NF_{12}^+$)	FC43
	303.9016	M	$C_{12}H_4{}^{35}Cl_4O$	TCDF
	305.8987	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF
	315.9419	M	$^{13}C_{12}H_4{}^{35}Cl_4O$	TCDF (IDA)
	317.9389	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO$	TCDF (IDA)
	319.8965	M	$C_{12}H_4{}^{35}Cl_4O_2$	TCDD
	321.8936	M+2	$C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD
	327.8847	M	$C_{12}H_4{}^{37}Cl_4O_2$	TCDD
	331.9368	M	$^{13}C_{12}H_4{}^{35}Cl_4O_2$	TCDD (IDA)
	333.9338	M+2	$^{13}C_{12}H_4{}^{35}Cl_3{}^{37}ClO_2$	TCDD (IDA)
	363.9802	QC	C_8F_{13} ($C_7NF_{14}^+$)	FC43
	375.8364	M+2	$C_{12}H_4{}^{35}Cl_5{}^{37}ClO$	HxCDPE
2	313.9834	LOCK	C_7F_{13} ($C_6NF_{12}^+$)	FC43
	339.8597	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF
	341.8567	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF
	351.9000	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO$	PeCDF (IDA)
	353.8970	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O$	PeCDF (IDA)
	355.8546	M+2	$C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD
	357.8516	M+4	$C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD
	367.8949	M+2	$^{13}C_{12}H_3{}^{35}Cl_4{}^{37}ClO_2$	PeCDD (IDA)
	369.8919	M+4	$^{13}C_{12}H_3{}^{35}Cl_3{}^{37}Cl_2O_2$	PeCDD (IDA)
	375.9802	QC	C_8F_{15} ($C_8NF_{14}^+$)	FC43
	409.7974	M+2	$C_{12}H_3{}^{35}Cl_6{}^{37}ClO$	HpCDPE
3	373.8208	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF
	375.8178	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O$	HxCDF
	375.9802	LOCK	C_8F_{15} ($C_8NF_{14}^+$)	FC43
	383.8639	M	$^{13}C_{12}H_2{}^{35}Cl_6O$	HxCDF (IDA)
	385.8610	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO$	HxCDF (IDA)
	389.8156	M+2	$C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD
	391.8127	M+4	$C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD
	401.8559	M+2	$^{13}C_{12}H_2{}^{35}Cl_5{}^{37}ClO_2$	HxCDD (IDA)
	403.8529	M+4	$^{13}C_{12}H_2{}^{35}Cl_4{}^{37}Cl_2O_2$	HxCDD (IDA)
	413.9770	QC	$C_{10}F_{15}$ ($C_8NF_{16}^+$)	FC43
	445.7555	M+4	$C_{12}H_2{}^{35}Cl_6{}^{37}Cl_2O$	OCDPE

Table 21 (Continued)

Ions Monitored for HRGC/HRMS Analysis of PCDDs and PCDFs

Descriptor	Accurate Mass[1]	Ion ID	Elemental Composition	Analyte
4	413.9770	LOCK	$C_{10}F_{15}$ ($C_8NF_{16}^+$)	FC43
	407.7818	M+2	$C_{12}H\,^{35}Cl_6\,^{37}Cl\,0$	HpCDF
	409.7788	M+4	$C_{12}H\,^{35}Cl_5\,^{37}Cl_2\,0$	HpCDF
	417.8250	M	$^{13}C_{12}H\,^{35}Cl_7\,0$	HpCDF (IDA)
	419.8220	M+2	$^{13}C_{12}H\,^{35}Cl_6\,^{37}Cl\,0$	HpCDF (IDA)
	423.7767	M+2	$C_{12}H\,^{35}Cl_6\,^{37}Cl\,0_2$	HpCDD
	425.7737	M+4	$C_{12}H\,^{35}Cl_5\,^{37}Cl_2\,0_2$	HpCDD
	435.8169	M+2	$^{13}C_{12}H\,^{35}Cl_6\,^{37}Cl\,0_2$	HpCDD (IDA)
	437.8140	M+4	$^{13}C_{12}H\,^{35}Cl_5\,^{37}Cl_2\,0_2$	HpCDD (IDA)
	463.9738	QC	$C_{10}F_{17}$ ($C_9NF_{18}^+$)	FC43
	479.7165	M+4	$C_{12}H\,^{35}Cl_7\,^{37}Cl_2\,0$	NCDPE
5	425.9770	LOCK	C_9F_{17} ($C_9NF_{16}^+$)	FC43
	441.7428	M+2	$C_{12}\,^{35}Cl_7\,^{37}Cl\,0$	OCDF
	443.7399	M+4	$C_{12}\,^{35}Cl_6\,^{37}Cl_2\,0$	OCDF
	453.7830	M+2	$^{13}C_{12}\,^{35}Cl_7\,^{37}Cl\,0$	OCDF (IDA)
	455.7801	M+4	$^{13}C_{12}\,^{35}Cl_6\,^{37}Cl_2\,0$	OCDF (IDA)
	457.7377	M+2	$C_{12}\,^{35}Cl_7\,^{37}Cl\,0_2$	OCDD
	459.7348	M+4	$C_{12}\,^{35}Cl_6\,^{37}Cl_2\,0_2$	OCDD
	469.7780	M+2	$^{13}C_{12}\,^{35}Cl_7\,^{37}Cl\,0_2$	OCDD (IDA)
	471.7750	M+4	$^{13}C_{12}\,^{35}Cl_6\,^{37}Cl_2\,0_2$	OCDD (IDA)
	501.9706	QC	$C_{10}F_{19}$ ($C_9NF_{20}^+$)	FC43
	513.6775	M+4	$C_{12}\,^{35}Cl_8\,^{37}Cl_2\,0$	DCDPE

Notes:

1 Nuclidic masses used:

H = 1.007825	C = 12.00000	^{13}C = 13.003355	F = 18.9984
O = 15.994915	^{35}Cl = 34.968853	^{37}Cl = 36.965903	

Table 22

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

Number of Chlorine Atoms	Ion Type	Theoretical Ratio	Control Limits Lower	Control Limits Upper
4	M/M+2	0.77	0.65	0.89
5	M+2/M+4	1.55	1.32	1.78
6	M+2/M+4	1.24	1.05	1.43
6 [1]	M/M+2	0.51	0.43	0.59
7	M+2/M+4	1.04/1.05[3]	0.88	1.20
7 [2]	M/M+2	0.44	0.37	0.51
8	M+2/M+4	0.89	0.76	1.02

Notes:

1 Used for ^{13}C-HxCDF (IDA).
2 Used for ^{13}C-HpCDF (IDA).
3 Method 1613B Theoretical Ratio.

Table 23

Example: HiRes Dilution Factors

EurofinsTestAmerica Laboratories, Inc. - Knoxville

Example HiRes Dilution Factors

Dilution Factor	Routine Dilution(uL)	Sample Volume (uL)	Final Volume (uL)
1	Yes	[redacted]	[redacted]
2	Yes	[redacted]	[redacted]
3	Yes	[redacted]	[redacted]
4	Yes	[redacted]	[redacted]
5	Yes	[redacted]	[redacted]
10	Yes	[redacted]	[redacted]
20	Yes	[redacted]	[redacted]

* If dilutions are performed differently than the dilutions listed above then the sample volume and final volume must be recorded in the comment section of the runlog

QA105R0 11/13/19

Figure 1

RTX-5 Recommended GC Operating Conditions

[redacted]

DB-225 Recommended GC Operating Conditions

[redacted]

Figure 2

RTX-5 Recommended MID Descriptors

[redacted]

Figure 2 (Continued)

RTX-5 Recommended MID Descriptors

[redacted]

Figure 2 (Continued)

RTX-5 Recommended MID Descriptors

[redacted]

Figure 2 (Continued)

RTX-5 Recommended MID Descriptors

[redacted]

Figure 2 (Continued)

RTX-5 Recommended MID Descriptors

[redacted]

DB-225 Recommended MID Descriptor

[redacted]

Figure 3: Example Sample Data Review Checklist

Eurofins Knoxville Dioxin Initial Calibration Data Review / Narrative Checklist
Method: __8290 __8290A __1613B – KNOX-ID-0004-R23

Instrument:			**TALS Batch / Event #**	**Dioxin**	**Scanned**
Analysis Date:			**8290**	/	
Mass Res Check Time			**8290A**	/	
Chrom WL#			**1613B**	/	

Chrom Worklist/Peak Review	**1st**	***Comments/NCM#***	**2nd**
1. Verify the mass resolution is documented before beginning the initial calibration.			
2. Was the instrument resolution >10,000 (<100 ppm) on the reference gas for the masses as listed in SOP section 10.2.3?			
3. Was the measured exact mass within 5ppm at reduced accelerating voltage for masses listed in SOP section 10.2.4 for the reference gas?			
4. Was the Window Defining Mixture analyzed and the MID switch points set to encompass the retention time windows of each congener group?			
5. Was the Column Performance solution analyzed and the %Valley ≤25 for separation between 2378-TCDD/F and the closest eluting non-2378 isomer on their respective columns?			
6. Was the Column Performance solution analyzed and the %Valley ≤25 for separation between 2378-TCDD/F and the closest eluting non-2378 isomer on their respective columns?			
7. Verify the limit groups are correctly picked in the WL.			
8. Are the reagents and initial./final volumes correct?			
9. First level "unlock/clear" or "unlock/clear by sublist" as appropriate?			
10. Were the five calibration standard solutions, at the concentrations specified in Table 5 of the SOP analyzed?			
11. Were all standards injected within 12 hrs of the time of the mass resolution check?			
12. Was the high point std checked for saturation?			
13. Is the S/N for all target and labeled analytes > 10:1?			
14. Are all ion ratios within the limits listed in Table 22 of the SOP?			
15. Is the retention time of $^{13}C_{12}$-1,2,3,4-TCDD >25.0 minutes on the Rtx-5 column (15.0 minutes on the DB-225 column)?			
16. Are the relative retention times of all PCDDs/PCDFs and all labeled compounds within the limits specified in Table 3 (1613B only)?			
17. If manual integrations were performed, are they appropriate with proper reason given?			
18. Was the mass resolution check scanned and attached to the IC1 in each AD II batch?			

Figure 3: Example Sample Data Review Checklist (Continued)

Eurofins Knoxville Dioxin Initial Calibration Data Review / Narrative Checklist
Method: __8290 __8290A __1613B – KNOX-ID-0004-R23

Chrom MLG Review	1st	Comments/NCM#	2nd
19. Are the DOD Performance check criteria of F/L labeled on calibration standards met?			
20. Are ICAL start/end dates/times correct on summary?			
21. Are ≥ 5 levels of each analyte, where required by the SOP, active?			
22. Is low level standard at or below RL?			
23. Are %RSD for all unlabeled target analytes and labeled IDA's within the limits listed in the SOP, Table 5?			
24. Are the RSD for compounds w/o identically labeled analog ≤ 50%?			
25. Was DoD ICV Criteria met (8290A/1613B only)? For unlabeled standards, RF within ± 20% D of RF established in the ICAL and for labeled standards, RF within ± 30% D of the ICAL RF established in ICAL. Was the ICV criteria listed in section 10.2.9.1 of the SOP met for all non-DOD analyses?			
26. If manual integrations were performed, are they appropriate with proper reason given?			

TALS MLG Review	1st	*Comments*	2nd
27. Graphics uploaded?			
28. All points are in the most recent active calibration event #?			
29. After review in TALS, approve the calibrations in TALS	-N/A-		
30. ICV uploaded and included in all limit group batches?			
31. If criteria not met, was a NCM generated?			
32. Checklist scanned & attached properly?	-N/A-		

1st Level	Date:	2nd Level	Date:
Comments:		Comments:	

Figure 3: Example Sample Data Review Checklist (Continued)

Eurofins Knoxville Dioxin GC/MS Continuing Calibration Review / Narrative Checklist
Method: __8290 __8290A __1613B – KNOX-ID-0004-R23

	TALS Batch #:		
		ICAL TALS Batch / Event #	Scanned r:
Instrument:			
Analysis Date:			
Open/Close Res Check	/		
CCAL Chrom WL #			

CCV Chrom/Worklist Review	1st	*Comments/NCM #*	2nd
1. Was the mass resolution documented at both the beginning and end of the 12 hour shift and is data verified as within the 12 hour clock? Was the continuing calibration performed at the beginning of the shift (all methods) and ending of the shift (8290/8290A)?			
2. Was the instrument resolution >10,000 (<100 ppm) for the reference gas for the masses listed in SOP section 10.2.3?			
3. Was the measured exact mass within 5 ppm at reduced accelerating voltage for masses listed in the SOP section 10.2.4?			
4. Was the Window Defining Mixture analyzed and the MID switch points set to encompass the retention time windows of each congener group?			
5. Was the Column Performance solution analyzed and the %Valley ≤25 for separation between 2378-TCDD/F and the closest eluting non-2378 isomer on their respective columns?			
6. Were the calibration standards analyzed in the correct run order as specified in the SOP section 10.3.6?			
7. Were all reagents used for calibration verified as correct?			
8. Manual integrations properly performed correctly to include analyst and correct reason given?			
9. Have the retention times been updated for the method? And the method saved as most recent?			
10. Were the response factors calculated for each labeled standard and unlabeled target analyte using the SOP specified reference compound (Table 3), quantitation ions (Table 21), and formula (Section 10.2.7)?			
11. Are the measured RRFs and/or concentrations for each compound within the specified control limits in Table 7 for all PCDDs/PCDFs?		◻ CCV-Capping, RR Confirms (NCM#_____) ◻ CCV-Capping-Detects (8290/8290A) (NCM#_____) ◻ CCV-Capping-IDA (8290/8290A) (NCM#_____)	
12. Are the relative retention times of all PCDDs/PCDFs and all labeled compounds within the limits specified in Table 3 (1613B)?			
13. Is the retention time of C^{13}-1,2,3,4-TCDD >25 minutes on the Rtx-5 column and/or >15.0 min on the DB-225?			
14. Is the S/N for all target and labeled analytes > 10:1?			
15. Are the ion abundance ratios for all labeled and unlabeled analytes within the control limits specified in Table 22 of the SOP?			
CCV Chrom/TALS MLG Review			
16. Are the DOD Performance check criteria met?			
17. Were all graphics checked after upload? Was the mass res check scanned and attached to the corresponding CCV(s)?			
18. For 8290/8290A: if an average daily RF was used do the target reports uploaded from Chrom show this calculation for all appropriate analyses?			
19. Is the calibration event # correct for each CCV?			

Continued on next page

Figure 3: Example Sample Data Review Checklist (Continued)

Eurofins Knoxville Dioxin GC/MS Continuing Calibration Review / Narrative Checklist
Method: __8290 __8290A __1613B – KNOX-ID-0004-R23

Batch Chrom/IALS review	*1st*	*Comments/NCM #*	*2nd*
1. Have the sample ID's and dilution factors been confirmed between the autosampler positions, worklist, and AD II?			
2. Is the dates/times correct and were all samples injected within the 12 hr mass resolution clock?			
3. Sample analyses done within preparation and analytical HT? (Check for H-flag in sample result in AD II.)		☐ Holding Time-Initial Analysis (NCM#_____) ☐ Holding Time-Reanalysis (NCM#_____)	
4. Were all DOD requirements met?		☐ NCM#140-11724: Add to Case Narrative if Manual Integrations Performed (NCM#_____) ☐ Narrate reasons for multiple analyses of samples (NCM#_____)	
5. Method blank or instrument blank analyzed before first sample in sequence?			
6. Are all target analytes in the method blank < RL		☐ MB Rpt ND (NCM#_____) ☐ MB-Rpt.10x (NCM#_____) ☐ MB-insuff samp (NCM#_____)	
7. Method blank IDA, IS, and Surrogate (if applicable) recoveries within QC limits as specified in Table 13 of the SOP?		☐ IDA - High (NCM#_____) ☐ IDA - Low - S/N 10:1 (NCM#_____)	
8. LCS done per batch and criteria met for natives, IDA, IS and Surrogates?		☐ LCS/D-Insuff smp (NCM#_____) ☐ LCS/D-Insuff smp - CONSUMED (NCM#_____) ☐ LCS/D %R High < RL in smp (NCM#_____) ☐ LCS/D out-RX HT out (NCM#_____) ☐ LCS/D-%RPD (%R OK) (NCM#_____)	
9. All runs – peaks ID'd correctly and false positives removed? Were reported PCDD/Fs which did not meet the criteria below properly calculated and reported as EMPCs? • RT of 2378 isomers within SOP Table 3 limits. • RT of non-2378 isomers within established first/last windows. • Both native ions maximized within ±2 seconds. • Ion abundance ratios within the control limits specified in Table 22. • No corresponding peak at PCDPE mass (**dpe tab checked and flag added in peak review, "F"**). • Ion suppression tab checked and **flags added in peak review, "S"**.			
10. Manual integrations properly performed correctly to include analyst and correct reason given?			
11. Are sample IDA recoveries within QC limits as specified within Table 13 of the SOP?		☐ IDA - High (1) no effect (NCM#_____) Samples Samples _____ _____ _____ _____ ☐ IDA – Low - S/N > 10:1 – OK (NCM#_____) Samples Samples _____ _____ _____ _____	

Batch/IALS Review	*1st*	*Comments/NCM #*	*2nd*
12. Was a post dilution spike technique used?		☐ Dil-Re-Spike IDA (NCM#_____) Samples: _____	
13. All sample and QC IDA, iSTD and surrogate std ion ratios specified in Table 22 of the SOP within QC limits?		☐ Ion abundance ratio (s) outside limits (NCM#_____)	
14. Are non-detects that are G-qualified narrated? (RL elevated to the EDL due to sample matrix).		(NCM#_____)	
15. Were all 2378-TCDF hits greater than or equal to the ML turned to acceptable on the primary column and confirmed on the DB-225 confirmation column?			
16. Were all of the samples marked as acceptable for TCDF analyzed on a DB-225 column and the lower result reported?			
17. Are all positive results of the target analytes referenced in section 13.3.10 within the upper calibration range?		☐ non-2378's or OCDD/F (NCM#_____)	
18. Graphics uploaded?			

ID023R29.doc, 01/19/23

Figure 3: Example Sample Data Review Checklist (Continued)

Eurofins Knoxville Dioxin GC/MS Continuing Calibration Review / Narrative Checklist
Method: __8290 __8290A __1613B – KNOX-ID-0004-R23

19. Sample instructions verified?			
20. Each job has QC created and linked properly to each sample with QC turned to 2nd level for each job?			
21. Correct ICV and WDM from the ICAL linked to samples?			
22. Final report acceptable (1. Job Data Review was checked and all CCVs, QC, and samples are turned to 2nd Level, 2. The narrative was checked in Supervisor Desktop for all deviations and grammar errors, and 3. All QC links were verified and at least one sample from every job is linked to the ICAL)?			
23. Checklist scanned & attached properly?			

1st level:	**Date**	**2nd level:**	**Date**
Comments:			

EUROFINS STANDARD OPERATING PROCEDURE

SVOC BY METHOD 8270E

STANDARD OPERATING PROCEDURE

TITLE: GC/MS ANALYSIS BASED ON METHOD 8270E

(SUPERSEDES: KNOX-MS-0028, Revision 1)

Approvals (Signature/Date):

David Stout Prepared by:	Date 11/23/22
David Wiles Technical Specialist	Date 11/23/22
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1. SCOPE AND APPLICATION

1.1. This procedure is based upon SW846 8270E, and is applicable to the determination of the concentration of semivolatile organic compounds in extracts prepared from solid, aqueous, waste and air matrices, prepared according to the extraction SOP's KNOX-OP-0011 and KNOX-OP-0009 (current revisions). Refer to Tables 1, 2 and 3 for the list of compounds applicable for this method at Eurofins Knoxville. Additional compounds may be amenable to this method as described in the reference method. If non-standard analytes are required, they must be validated by the procedures described in Section 13 before sample analysis.

1.1.1. The following compounds may require special treatment when being determined by this method:

- Benzidine can be subject to oxidative losses during solvent concentration and exhibits poor chromatography. Neutral extraction should be performed if this compound is expected.
- Hexachlorocyclopentadiene is subject to thermal decomposition in the inlet of the gas chromatograph, chemical reaction in acetone solution, and photochemical decomposition.
- N-Nitrosodiphenylamine decomposes in the gas chromatographic inlet and cannot be distinguished from diphenylamine.
- Pentachlorophenol, 2,4-dinitrophenol, 4-nitrophenol, 4,6-dinitro-2-methylphenol, 4-chloro-3-methylphenol, benzoic acid, 2-nitroaniline, 3-nitroaniline, 4-chloroaniline, and benzyl alcohol are subject to erratic chromatographic behavior, especially if the GC system is contaminated with high boiling material.
- Hexachlorophene is not amenable to analysis by this method.
- 3-Methylphenol cannot be separated from 4-methylphenol by the conditions specified in this method.
- Azobenzene is formed by decomposition of 1,2-diphenlyhydrazine. If 1,2-diphenylhydrazine is requested, it will be analyzed as azobenzene.

1.2. The standard reporting limit (RL) of this method for determining an individual compound is approximately 0.33 mg/kg (wet weight) for soil/sediment samples, 1 - 200 mg/kg for wastes (dependent on matrix and method of preparation), 10 ug for air samples and 10 µg/L for groundwater samples. Some compounds have

higher reporting limits. Refer to Tables 1, 2 and 3 for specific RLs. Reporting limits will be proportionately higher for sample extracts that require dilution.

2. SUMMARY OF METHOD

2.1. Aqueous samples are extracted with methylene chloride using a separatory funnel, or a continuous extractor. Solid samples are extracted with methylene chloride / acetone using sonication. Waste dilution is used for samples that are miscible with the solvent. Air samples are prepared using a Soxhlet extraction. The extract is dried, concentrated to a volume of 1 mL, and analyzed by GC/MS. Qualitative identification of the parameters in the extract is performed using the retention time and the relative abundance of characteristic ions. Quantitative analysis is performed using the internal standard technique with a single characteristic ion.

3. DEFINITIONS

3.1. SPCC (System Performance Check Compounds) – Common target compounds designated to monitor chromatographic performance, sensitivity, and compound instability or degradation on active sites. Minimum response factors are specified for acceptable performance. Refer to Tables 6 and 7 for the minimum response factors for target analytes.

3.2. Batch - The batch is a set of up to 20 samples of the same matrix processed using the same procedures and reagents within the same time period. The Quality Control batch must contain a matrix spike/spike duplicate (MS/MSD), a Laboratory Control Sample (LCS), and a method blank. When there is insufficient sample to analyze an MS/MSD, and LCS/LCSD is analyzed. In some cases, at client request, the MS/MSD may be replaced with a matrix spike and sample duplicate. Batches are defined at the sample preparation stage. Batches should be kept together through the whole analytical process to the extent possible, but it is not mandatory to analyze prepared extracts on the same instrument or in the same sequence.

3.3. Method Blank - An analytical control consisting of all reagents, internal standards and surrogate standards, which is carried through the entire analytical procedure. The method blank is used to define the level of laboratory background and reagent contamination.

3.4. LCS (Laboratory Control Sample)/LCSD (Laboratory Control Sample Duplicate) - A blank spiked with the parameters of interest that is carried through the entire analytical procedure. Analysis of this sample with acceptable recoveries of the spiked materials demonstrates that the laboratory techniques for this method are acceptable.

3.5. MS (Matrix Spike) - An aliquot of a matrix (water or soil) fortified (spiked) with known quantities of specific compounds and subjected to the entire analytical procedure in order to indicate the appropriateness of the method for the matrix by measuring recovery.

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

3.7. Additional definitions can be found in the Eurofins Knoxville LQM glossary and in the Eurofins Quality Management Plan.

4. INTERFERENCES

4.1. Method interferences may be caused by contaminants in solvents, reagents, glassware, and other processing apparatus that lead to discrete artifacts. All of these materials must be routinely demonstrated to be free from interferences under conditions of the analysis by running laboratory method blanks as described in the Quality Control section. Raw GC/MS data from all blanks, samples, and spikes must be evaluated for interferences. If an interference is detected it is necessary to determine if the source of interference is in the preparation and/or cleanup of the samples; then take corrective action to eliminate the problem.

4.2. The use of high purity reagents, solvents, and gases helps to minimize interference problems.

4.3. Matrix interferences may be caused by contaminants that are coextracted from the sample. The extent of matrix interferences will vary considerably from source to source, depending upon the nature of the sample.

4.4. Contamination by carryover can occur whenever high-level and low-level samples are sequentially analyzed. To reduce carryover, the sample syringe must be rinsed with solvent between samples. Whenever an unusually concentrated sample is encountered, it should be followed by the analysis of solvent to check for cross contamination.

4.5. Phthalate contamination may be observed in this analysis and its occurrence above the reporting limit must be carefully evaluated as an indicator of a contamination problem in the sample preparation step of the analysis.

5. SAFETY PRECAUTIONS

5.1. Employees must abide by the policies and procedures in the Corporate Safety Manual, Radiation Safety Manual and this document.

5.2. Primary Materials Used: The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material (1)	**Hazards**	**Exposure Limit (2)**	**Signs and symptoms of exposure**
Methylene Chloride	Carcinogen Irritant	25 ppm-TWA 125 ppm-STEL	Causes irritation to respiratory tract. Has a strong narcotic effect with symptoms of mental confusion, light-headedness, fatigue, nausea, vomiting and headache. Causes irritation, redness and pain to the skin and eyes. Prolonged contact can cause burns. Liquid degreases the skin. May be absorbed through skin.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

5.2.1. Chemicals that have been classified as carcinogens, or potential carcinogens, under OSHA include: Benzo(a)anthracene, benzidine, 3,3'-dichlorobenzidine, benzo(a)pyrene, dibenzo(a,h)anthracene, and n-nitrosodimethylamine. Primary standards are purchased in solution. If neat materials must be obtained, they shall be handled in a hood.

5.2.2. Exposure to chemicals must be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples should be opened, transferred, and prepared in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers should be kept closed unless transfers are being made.

5.2.3. All work must be stopped in the event of a known or potential compromise to the health and safety of an associate. The situation must be reported immediately to a laboratory supervisor.

5.2.4. Instruments have heated zones (inlets, detector, etc) that analysts must be aware of when performing maintenance. The mass spectrometer is under a deep vacuum and must be properly vented before gaining access to the source. See the instrument manual for instructions to vent the source and cool heated zones.

6. EQUIPMENT AND SUPPLIES

6.1. Gas Chromatograph/Mass Spectrometer (GC/MS) System: An HP5973 analytical system complete with a temperature-programmable gas chromatograph suitable for split/splitless injection and all required accessories, including syringes,

analytical columns, and gases. The GC capillary column is directly coupled to the MS source.

6.2. Column: 30 m x 0.25 mm I.D. 0.25-µm film thickness silicon-coated fused-silica capillary column (Restek RTX-5MS or equivalent).

6.3. Mass Spectrometer: Capable of scanning from 35 to 500 AMU every one second or less, using 70 volts (nominal) electron energy in the electron impact ionization mode. The mass spectrometer must be capable of producing a mass spectrum for decafluorotriphenylphosphine (DFTPP) which meets all of the criteria in Table 5 when 50 ng of the GC/MS tuning standard is injected through the GC.

6.4. Data System: A computer system must be interfaced to the mass spectrometer. The system must allow the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. Chrom software is used and can search any GC/MS data file for ions of a specific mass and that can plot such ion abundances versus time or scan number. This type of plot is defined as the Extracted Ion Current Profile (EICP). This software allows integrating the abundances in any EICP between specified time or scan-number limits. The most recent version of the EPA/NIH Mass Spectral Library is recommended.

6.5. Syringe: 10 µL Hamilton Laboratory grade syringes or equivalent.

6.6. Carrier gas: Ultra high purity helium.

6.7. Volumetric flask (class A) of appropriate sizes with ground-glass stoppers.

6.8. Balance capable of weighing 0.0001g.

6.9. Glass bottles with PTFE-lined screw caps or crimp tops.

7. REAGENTS AND STANDARDS

7.1. Stock Solutions: Stock solutions are purchased as certified solutions from commercial sources. These standards are stored away from light in PTFE-sealed vials at less than -10º C. Highly concentrated stock solutions and neat materials may be stored per manufacturer's recommendation. All solutions are allowed to come to room temperature before taking aliquots. The stock solutions are examined at room temperature to ensure compounds are not crystallized in solution. If crystallization has been noted, the solution should be sonicated until crystals have been dissolved. The following stock standard solutions are used or equivalent and are prepared in methylene chloride unless otherwise noted:

7.1.1. GCMS Tuning Mixture: 1000 ug/ml DFTPP, Pentachlorophenol, DDT, and Benzidine, Restek Cat. No. 31615.

7.1.2. GCMS Primary (List 1) Calibration Mixes: Restek Cat. No's. 571995, 569730, 569731, 569732, or equivalent.

7.1.3. GCMS Appendix IX (List 2) Calibration Mixes: Restek Cat. No's. 570667, 569733, 567680, 567681.

7.1.4. GCMS Internal Standard Mix: 2000 ug/ml SV Internal Standard Mix, Restek, Cat No. 567684.

7.1.5. GCMS Surrogate Calibration and Spike Solution: 5000 ug/ml, Restek, Cat. No. 567685.

7.2. Working Calibration Standards: Working standard solutions containing the compounds of interest prepared from the stock solution(s) in methylene chloride. See Tables 11, 12 and 13 for the recommended working calibration standard concentrations.

7.3. A minimum five point calibration curve is prepared at nominal concentrations, typically ranging from 10 to 200 ug/ml for each compound of interest. Some compounds may be prepared at different levels due to chromatographic performance, stability, and sensitivity. See Tables 11, 12 and 13.

7.4. A 2000 ug/mL internal standard solution is prepared in methylene chloride. Compounds in the I.S. Mix are: acenaphthene-d10, chrysene-d12, 1,4-dichlorobenzene-d4, naphthalene-d8, perylene-d12, and phenanthrene-d10.

7.4.1. Internal Standards are added to all standards and extracts at 20 µg per mL of extract. For example, if the volume of an extract used is 300 µL, 3 µL of the 2000 µg/mL internal standard solution is added.

7.5. Surrogate Standard Spiking Solution: Surrogate compounds and spiking levels are listed in Table 10. A spiking solution prepared from stock solution is used for spiking.

7.6. GC/MS Tuning Standard: A working solution containing 50 µg/mL of decafluorotriphenylphosphine (DFTPP) is prepared in methylene chloride. Pentachlorophenol, benzidine, and DDT are also included in the Tuning Standard at 50 µg/mL.

7.7. Laboratory Control Sample (LCS) and Matrix Spike (MS) Solution: LCS/MS compounds and levels are listed in Table 9. A spiking solution prepared from stock solution is used for spiking.

7.8. For unopened or opened neat materials, the manufacturer's expiration date is used. If the manufacturer does not supply an expiration date for neat materials, two years from receipt is used for both opened and unopened containers.

7.9. Unopened stock standards have an expiration date given by the manufacturer. If the manufacturer does not supply the expiration date for a stock standard, 2 years from the date of receipt will be the expiration date.

7.10. Once a stock standard is opened, the standard expiration date will be one year from the date opened or the manufacturer's expiration date, whichever comes first. The date opened is recorded by the analyst.

7.11. Working standards must be replaced at least once a year, or the date described in sections 7.8 and 7.10, whichever comes first.

7.12. The continuing calibration standard is prepared as necessary, not to exceed 1 year or parent expiration date.

7.13. All standards in solution in the GCMS laboratory are kept in the freezer at ≤ -10º C when not in use. Standards are allowed to warm to room temperature before use. Neat materials are stored per manufacturer's specifications.

7.14. Refer to SOP KNOX-QA-0001, "Standard/Reagent Labeling and Documentation", current revision, for guidance on standard documentation and labeling

8. SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1. Sampling is not performed for this method by Eurofins Knoxville. For information regarding sample shipping, refer to SOP KNOX-SC-0003, Sample Receipt and Log In, current revision.

8.2. Recommended containers for water, solid or waste samples are as follows: 1 Liter amber glass containers with PTFE lined caps for water samples and either 125ml or 250ml wide mouth glass jars with PTFE lined lids for solid or waste samples. Preservation of these samples during shipping is 4 ± 2º C.

8.3. Samples are stored at ≥ 0º C to ≤ 6º C. (Extracts will normally be stored for 30 days after invoicing.)

8.4. Water samples are extracted within seven days of sampling and the extracts are analyzed within forty days of extraction. Solids, sludges and organic liquids are extracted within fourteen days of sampling and the extracts are analyzed within forty days of extraction.

8.5. Air samples for source testing (prepared according to EPA Method 3542 and SOP KNOX-OP-0009 current revision) must be prepared within fourteen days of sampling and analyzed within forty days of extraction.

8.6. Store sample extracts at ≥ 0º C to ≤ 6º C, protected from light, in sealed vials (e.g. screw-capped vials or crimp-capped vials) with unpierced PTFE-lined septa.

9. QUALITY CONTROL

9.1. Initial Demonstration of Capability and Method Detection Limit Studies: For the standard analyte list (See Tables 1, 2 and 3), the initial demonstration and method detection limit (MDL) studies described in Section 13 must be acceptable before analysis of samples may begin. Refer to Table 14 for initial demonstration of capability acceptance criteria.

9.2. Control Limits: In-house historical control limits must be determined for surrogates, matrix spikes, and laboratory control samples (LCS). These limits must be determined at least annually. The recovery limits are mean recovery +/- 3 standard deviations for surrogates, MS and LCS; + 4 SD for marginal exceedence limits

9.2.1. All surrogate, LCS, and MS recoveries (except when surrogates are diluted greater than 5X) must be entered into TALS (when available) or other database so that accurate historical control limits can be generated. For tests without a separate extraction, surrogates and matrix spikes will be reported for all dilutions.

9.2.2. Refer to the SOP KNOX-QA-0004 for further details regarding control limits.

9.3. Method Blank: A method blank is prepared and analyzed with each batch of samples. The method blank consists of reagent water for aqueous samples, and sodium sulfate for soil samples (refer to SOP KNOX-OP-0011 for details). Refer to SOP KNOX-OP-0009 for details regarding air media sample method blanks. Surrogates are added and the method blank is carried through the entire analytical procedure. The method blank must not contain any analyte of interest at or above ½ the reporting limit (RL) or above the RL for common laboratory contaminants, e.g., phthalates, or at or above 10% of the measured concentration of that analyte in the associated samples, whichever is higher.

- Reanalysis of any samples with concentrations at or above the RL for analytes found in the method blank is required unless other actions are agreed with the client.

- If there is no target analyte greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with qualifiers. Such action should be taken in consultation with the client.

9.3.1. The method blank must have acceptable surrogate recoveries. If surrogate recoveries are not acceptable, the data must be evaluated to determine if

the method blank has served the purpose of demonstrating that the analysis is free of contamination. If surrogate recoveries are low and there are reportable analytes in the associated samples, re-extraction of the blank and affected samples will normally be required. Consultation with the client should take place.

9.3.2. If repreparation and reanalysis of the batch is not possible (e.g. due to limited sample volume), the method blank is reported, all associated sample results are flagged with a "B", and appropriate comments must be made in a narrative to provide further documentation.

9.3.3. Sample results are NOT blank subtracted.

9.4. Instrument Blank: Instruments must be evaluated for contamination during each 12 hour analytical run before samples are analyzed. This may be accomplished by analysis of a method blank. If a method blank is not available, an instrument blank must be analyzed. An instrument blank consists of methylene chloride with the internal standards added. It is evaluated in the same way as the method blank.

9.5. Laboratory Control Sample (LCS)

9.5.1. A laboratory control sample (LCS) is prepared and analyzed with every batch of samples. It is used to access analytical control of the method. The LCS is spiked with the compounds listed in Table 9. The compounds are spiked at an extract concentration equivalent to 100 ug/mL.

9.5.2. All target analytes requested that are listed in Table 9 are considered control analytes in the LCS. Historical LCS limits are based on the mean recovery +/-3 standard deviations as described in SOP KNOX-QA-0004, current revision. Marginal exceedances are allowed depending on the number of target analytes requested. The control limits for marginal exceedances are set to measure +/-4 standard deviations. See the following table for the number of allowed marginal exceedances.

Number of target analytes in LCS	Allowable # of marginal exceedances of LCS control limits
>90	5
71 – 90	4
51 – 70	3
31 – 50	2
11 – 30	1
< 11	0

9.5.3. An LCS is considered to be "out of control" if any target analyte is outside marginal exceedance limits, or if the total number exceedances is more than the allowed number. A nonconformance memo must be issued and corrective action must occur.

- If the batch is not re-extracted and reanalyzed, the reasons for accepting the batch must be clearly presented in the project records and the report. It is acceptable to report the data, if the LCS recovery is outside the limits with a high bias and no target analytes are detected above the RL in any of the samples.

- If re-extraction and reanalysis of the batch is not possible (e.g. due to limited sample volume), the LCS is reported, all associated samples are identified with appropriate comments in the narrative to provide further documentation.

9.5.4. If marginal exceedances are observed, the analyst must review the previous LCS (e.g., review the control chart) for each analyte marginally exceeding the control limits to determine if the marginal exceedance is a consecutive occurrence. If there are two consecutive marginal exceedances for the same analyte, the LCS is considered "out of control" and a NCM must be generated and corrective action taken.

9.5.4.1. When evaluating the control chart, the analyst should also check whether there was more than one out of the last three consecutive LCSs outside control limits. If more than one out of the last three LCSs was outside the LCS control limits but within the marginal exceedance limits, then the analyst should evaluate the system for non-random systematic trends.

9.5.5. Samples in the same batch as an LCS determined to be "out of control" shall be considered suspect and the samples re-extracted and re-analyzed or the data reported with appropriate data qualifying codes.

9.5.5.1. If the LCS recovery for a target analyte is biased high outside acceptance limits and that target analyte is not detected in any of the associated samples above the reporting limit, the sample data may be reported with qualification in the project narrative. Analytes that are biased high in the LCS and not detected in the associated samples are counted in the total number of allowable marginal exceedances.

9.5.5.2. If the batch is not re-extracted and reanalyzed, the reasons for reporting the batch must be clearly presented in the project narrative (e.g. due to limited sample volume).

9.6. Matrix Spike/Matrix Spike Duplicate (MS/MSD): A matrix spike/matrix spike duplicate (MS/MSD) is prepared and analyzed with every batch of samples. The MS/MSD is spiked with the same analytes as the LCS (see Table 9). Compare the percent recovery and relative percent difference (RPD) to that in the laboratory specific, historically generated limits; limits are based on the mean recovery +/-3 standard deviations as described in SOP KNOX-QA-0004, current revision.

- If any individual control analyte recovery or RPD falls outside the acceptable range, corrective action must occur. The initial corrective action will be to check the recovery of that analyte in the LCS. If the LCS meets the acceptance limits stated in Section 9.5, then the laboratory operation is in control and analysis may proceed. The reasons for accepting the batch must be documented.

- If the recovery for any spiked target analyte is outside QC limits for both the MS/MSD and the LCS, the laboratory is out of control and corrective action must be taken. Corrective action will normally include repreparation and reanalysis of the batch.

- The MS/MSD must be analyzed at the same dilution as the unspiked sample, even if the matrix spike compounds will be diluted out.

9.7. Surrogates

9.7.1. Every sample, blank, and QC sample is spiked with surrogate standards. Surrogate spike recoveries must be evaluated by determining whether the concentration (measured as percent recovery) falls within the required recovery limits. Surrogate compounds are spiked at an extract concentration of 75 ug/ml. The compounds routinely included in the surrogate spiking solution, along with recommended standard concentrations, are listed in Table 10.

9.7.2. If any surrogates are outside limits, the following corrective actions must take place (except for dilutions greater than 5X):

9.7.2.1. Surrogates are categorized by acidic surrogates and base/neutral surrogates. If there are no analytes associated with their respective surrogates, there is no corrective action. For example, if PAH's are the only target analyte requested, there is no corrective action for any phenolic surrogate failure.

- Check all calculations for error.
- Ensure that instrument performance is acceptable.
- Recalculate the data and/or reanalyze the extract if either of the above checks reveals a problem.
- Re-extract and reanalyze the sample or flag the data as "Estimated Concentration" if neither of the above resolves the problem.

The decision to reanalyze or flag the data should be made in consultation with the client. It is only necessary to re-extract/reanalyze a sample once to demonstrate that poor surrogate recovery is due to matrix effect, unless the analyst believes that the repeated out of control results are not due to matrix effect. Re-extract samples with failing surrogates if sufficient sample material is available and matrix effects have not already been confirmed. The client may be contacted for input if the re-extraction is expected to take place after the sample holding time has been exceeded.

9.7.3. If the sample with surrogate recoveries outside the recovery limits was a sample used for an MS/MSD and the surrogate recoveries in the MS/MSD are also outside of the control limits, then the sample, the MS, and the MSD do not require reanalysis as this phenomenon would indicate a possible matrix problem.

9.7.4. If the sample is reanalyzed and the surrogate recoveries in the reanalysis are acceptable, then the problem was within the analyst's control and only the reanalyzed data is typically reported. (Unless the reanalysis was outside holding times, in which case reporting both sets of results may be appropriate.)

9.7.5. If the reanalysis does confirm the original results, both analyses are reported with an indication in the narrative to document that the data is estimated due to matrix effect.

9.7.6. If the target analyte list only contains analytes that are not represented by the phenolic surrogates (e.g., PAHs only), then the sample results may be accepted without re-extraction and re-analysis when one or more of the phenolic surrogate recoveries are outside acceptance limits. This must be noted in the project narrative.

9.8. For internal standard recovery acceptance criteria, refer to section 11.5.

9.9. Nonconformance and Corrective Action

9.9.1. Any deviations from QC procedures must be documented as a nonconformance, with applicable cause and corrective action approved by the facility QA Manager.

9.10. Quality Assurance Summaries: Certain clients or regulatory programs may require specific project or program QC that may supersede these method requirements. Quality Assurance Summaries are developed to address these requirements.

10. CALIBRATION AND STANDARDIZATION

10.1. Refer to NDSC-QA-SOP43862, current revision, Manual Integration for information on manual integration practices and documentation requirements.

10.2. Summary: The instrument tune is checked using DFTPP which defines the start of the 12-hour shift to complete the initial calibration analysis. The instrument is calibrated initially with a multipoint (at least five-point) calibration curve, and verified each 12-hour shift with one or more calibration verification standard(s). Recommended instrument conditions are listed in Table 4.

10.3. All standards and extracts are allowed to warm to room temperature before injecting.

10.4. Instrument Tuning: At the beginning of every twelve hour shift when the initial calibration is to be performed, the GC/MS system must be checked to see if acceptable performance criteria (Table 5) is achieved for DFTPP (decafluorotriphenylphosphine).

10.4.1. Inject 50 ng (or less) of the GC/MS tuning standard (1 uL of the 50 ug/ml solution) into the GC/MS system. Obtain a mass spectra of DFTPP and confirm that all the key m/z criteria in Table 5 are achieved. The typical approach is to use the average of the peak apex, the scan

immediately before the apex, and the scan immediately after the apex, with background subtraction of a single scan. This single scan must be prior to and within 20 seconds of the start of the DFTPP elution but must not be part of the DFTPP peak. Alternatively the peak apex may be used. Background subtraction as above is required. If all the criteria in Table 5 are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria are achieved. The performance criteria must be achieved before any samples, blanks, or standards are analyzed.

10.4.2. The GC/MS tuning standard must also be used to evaluate the inertness of the chromatographic system. Benzidine and pentachlorophenol must not exhibit excessive tailing. DDT breakdown must not exceed 20%. Benzidine and Pentachlorophenol tailing factor must be $\leq$2.0. Refer to sections 12.10 and 12.11 for the appropriate calculations. (See Figure 2). Breakdown and tailing checks are optional when the analytes of interest are not subject to the same chromatography or reactivity problems (e.g. PAH's).

10.5. Initial Calibration

10.5.1. Internal Standard Calibration Procedure: Internal standards are listed in Table 6 along with assigned analytes. Use the base peak m/z as the primary m/z for quantitation of the standards. If interferences are noted, use one of the next two most intense masses for quantitation.

10.5.2. Prepare calibration standards at a minimum of five concentration levels for each parameter of interest. Add the internal standard mixture at 20 µg per mL of calibration standard. (For example, if the volume of the calibration standard used is 1 mL, add 10 µL of the 2000 µg/mL internal standard solution). The recommended working range of the GC/MS system is defined by calibration standards at concentrations from 2 to 200 µg/mL.

10.5.3. Analyze each calibration standard and tabulate the area of the primary characteristic m/z against concentration for each compound and internal standard. Calculate response factors (RF), average response factors, and the percent RSD of the response factors for each compound using the equations in Section 12 and verify that the RSD and SPCC criteria in section 10.5.6 and 10.5.7 are met. **No sample analysis may be performed unless these criteria are met.**

10.5.4. It may be necessary to analyze more than one set of calibration standards to encompass all of the analytes required for some tests.

10.5.5. The high point calibration standard is checked for saturation. If a quantitation ion saturates the mass spectrometer, the analyte will be removed from the calibration series, and the next highest concentration is checked for saturation as well. Saturation is present when an ion peak in Chrom reaches a Y axis maximum of 8.4×10^6.

10.5.6. System Performance Check Compounds (SPCCs): The minimum RF for the most common semivolatile SPCCs is listed in Tables 6 & 7. These minimum response factors should be met for each calibration level in the calibration event at the RL and above. Calibration levels below the RL may be activated to achieve better curve fits but do not have the minimum RF requirement. If the minimum response factors are not met, the system must be evaluated and corrective action must be taken before sample analysis begins. Some possible problems are standard mixture degradation, injection port inlet contamination, contamination at the front end of the analytical column, and active sites in the column or chromatographic system. This check must be met before analysis begins.

10.5.6.1. If the minimum response factor for the calibration standard equivalent to the RL is not met, if the peak's signal-to-noise ratio is ≥ 6, analysis may continue as long as the criteria in 10.5.7 are met.

10.5.7. If the % RSD of the response factors for each analyte in the initial calibration is less than or equal to 20%, the relative response factor is assumed to be constant over the calibration range, and the average relative response factor may be used for quantitation. Problems similar to those listed under SPCCs could affect this criterion.

10.5.7.1. The analyst will evaluate analytes with % RSD > 20% for calibration on a curve. Linear or quadratic curve fits may be used. Use of $1/\text{Concentration}^2$ weighting may be used to improve the accuracy of quantitation at the low end of the curve. The correlation coefficient (coefficient of determination for non-linear curves) must be ≥ 0.990.

10.5.7.1.1. The analyst may elect to drop points from calibration to improve subsequent quantitation. The rules for dropping points are:

- May drop points below the RL as long as there is a point remaining at or below the RL.

- May drop high points, decreasing linear range.
- May **NOT** drop a point between points.

Rules for curve use:

- The r^2 value obtained from Chrom must be ≥ 0.990.
- At least 5 points must be used for average or linear curve.
- At least 6 points must be used for a quadratic curve.
- For quadratic curves, the tangent line to the slope of the curve must be continuous and have either only positive or negative slopes (i.e., no parabolas or breaks in the curve).
- Forcing through zero is allowed. To activate "force through zero" in Chrom, pick a "Curve Select" model that uses a "Force" for "Origin". "Include" zero for "curve origin" must ***not*** be used.
- If "force through zero" is ***no***t used, the X and Y-intercept must be below ½ the RL.
- To evaluate the X- and Y-intercept, evaluate each analyte's Curve Details in Chrom to ensure that the Zero Intercept flag is not activated due to improper intercept.

10.5.7.2. For more guidance see corporate policy NDSC-QA-QP44940 "Calibration Curves & Selection of Calibration Points", current revision, for definitions and calculations using the different curve models.

10.5.8. At the mid-level calibration point (typically designated as the continuing calibration level), benzo(b) and benzo(k) fluoranthene must be 50% resolved. The height of the valley between the two isomer peaks must be less than 50% of the average of the two peak heights. *Note, measurement is performed on the primary mass m/z 252, not the total ion chromatogram.*

10.5.9. Quantitation is performed using the calibration curve or average response factor from the initial curve, not the continuing calibration.

10.5.10. A readback of the low calibration point used in the calibration curve should have a read-back (%D) of no more than 50% for any calibration model. The readback of the non-low level standards of the initial calibration should have a read-back (%D) of no more than 30% for any calibration model

10.5.11. Initial Calibration Verification Standard (2nd Source Standard)

10.5.11.1. A mid-level standard from a second source is analyzed as the initial calibration verification (ICV). The ICV shall be analyzed with each initial calibration. The ICV must be within ± 30% of its expected value.

10.5.12. If time remains in the 12 hour period initiated by the injection of the last initial calibration standard, samples may be analyzed. Otherwise, proceed to continuing calibration.

10.6. Calibration Verification

10.6.1. Daily analysis of the DFTPP, breakdown and tailing solution is recommended, but not required. The analyst should monitor the CCV for chromatography issues, internal standard and target responses for system deterioration and reactivity (e.g. losses of reactive analytes, unusual tailing, loss of resolution). If this solution is analyzed, it must meet the criteria described in section 10.4.

10.6.2. At the start of each 12-hour period, the calibration verification standard(s) are analyzed. The standards must contain all semivolatile analytes, including all required surrogates. A mid level calibration standard is used for the calibration verification.

10.6.3. The following criteria must be met for the calibration verification to be acceptable:

- The internal standard response must be within 50-200% of the response in the corresponding calibration level of the initial calibration.
- The internal standard retention times must be within 30 seconds of the retention times in the corresponding calibration level of the initial calibration.
- Although the method does not require the analytes meet the minimum response factor criteria listed in Tables 6 through 8, they should be evaluated for potential issues.

- The percent difference or drift of the compounds from the initial calibration must be ≤ 20% for 80% of the compounds (see section 12 for calculations).
    - For compounds greater than 20% difference or drift that have a higher response factor, data may be reported without flagging if these compounds are not detected in the samples.
    - For compounds greater than 20% that have a lower response factor, non-detects may be reported without flagging if adequate sensitivity has been demonstrated by a low level calibration verification standard run after the 12 hour calibration verification standard and before samples are analyzed.
    - For compounds exceeding 20% that are detected in the samples, the client should be consulted to determine if these compounds are critical project-required compounds. These compounds must be reported as estimated values.

10.6.4. Once the above criteria have been met, sample analysis may begin. Initial calibration average RFs (or the calibration curve) will be used for sample quantitation, not the continuing calibration RFs. Analysis may proceed until 12 hours from the injection of the CCV have passed. (A sample *injected* less than 12 hours after the CCV is acceptable.)

10.6.5. If the calibration verification does not meet acceptance criteria, corrective action is required before sample analysis.

10.6.6. If internal standard retention times are not within 30 seconds of the retention times in the corresponding calibration level of the initial calibration due to routine column maintenance (i.e. shortened column length) analysis may proceed but this must be clearly noted on the calibration verification data review checklist.

10.6.7. Benzo(b) and benzo(k) fluoranthene must be 50% resolved. The height of the valley between the two isomer peaks must be less than 50% of the average of the two peak heights (see Figure 3). *Note, measurement is performed on the primary mass m/z 252, not the total ion chromatogram.*

10.6.8. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, then the laboratory has to demonstrate performance after corrective action with two consecutive successful calibration

verifications. If the laboratory has not demonstrated acceptable performance, sample analyses must not occur until a new initial calibration curve is established and verified.

11. PROCEDURE

11.1. Sample Preparation: Samples are prepared following SOP KNOX-OP-0011, current revision for soils, water and wastes. Source air samples are prepared following KNOX-OP-0009 current revision.

11.2. Sample Analysis Procedure

11.2.1. Calibrate the instrument as described in Section 10. Depending on the target compounds required by the client, it may be necessary to use more than one set of calibration standards.

11.2.2. All samples must be analyzed using the same instrument conditions as the preceding continuing calibration standard.

11.2.3. Add internal standard to the extract to result in 20 ng injected on column (for example, 5.0 µL internal standard solution in 0.5 mL of extract for a 1 µL injection). Mix thoroughly before injection into the instrument.

11.2.4. Inject the sample extract into the GC/MS system using the same injection technique as used for the standards.

11.2.5. The data system will determine the concentration of each analyte in the extract using calculations equivalent to those in Section 12. Quantitation is based on the initial calibration, not the continuing calibration.

11.2.6. Identified compounds are reviewed for proper integration. Manual integrations are performed only if necessary and are documented by the analyst and automatically flagged by the data system according to NDSC-QA-SOP43862 “Manual Integration” current revision.

11.2.7. Target compounds identified by the data system are evaluated using the criteria listed in Section 12.2.

11.2.8. Library searches of peaks present in the chromatogram that are not target compounds (Tentatively Identified Compounds, TIC) may be performed if required by the client. They are evaluated using the Eurofins Knoxville SOP KNOX-MS-0014, current revision, “Determination of Tentatively Identified Compounds (TICs)”.

11.3. Dilutions: If the response for any compound exceeds the working range of the GC/MS system, a dilution of the extract is prepared and analyzed. An appropriate dilution should be in the upper half of the calibration range. Samples may be screened to determine the appropriate dilution for the initial run. If the initial diluted run has no hits or hits below 20% of the calibration range and the matrix allows for analysis at a lesser dilution, the sample must be reanalyzed at a dilution targeted to bring the largest hit above 50% of the calibration range.

11.3.1. Guidance for Dilutions Due to Matrix: If the sample is initially run at a dilution and the baseline rise is less than twice the height of the internal standards, or if individual non-target peaks are less than four times the height of the internal standards, the sample should be reanalyzed at a more concentrated dilution. This requirement is approximate and subject to analyst judgment. For example, samples containing organic acids may need to be analyzed at a higher dilution to avoid destroying the column.

11.3.2. Reporting Dilutions: The most concentrated dilution with no target compounds above the calibration range will be reported. Other dilutions will only be reported at client request.

11.4. Perform all qualitative and quantitative measurements. When the extracts are not being used for analyses, refrigerate them at ≥ 0º C to ≤ 6º C, protected from light in tightly capped vials equipped with unpierced PTFE lined septa.

11.5. Internal standard criteria for samples

11.5.1. If the retention time for any internal standard changes by more than 0.5 minutes from the last continuing calibration standard, the chromatographic system must be inspected for malfunctions and corrected. Reanalysis of samples analyzed while the system was malfunctioning is required.

11.5.1.1. If the retention time of any internal standard in any sample varies by more than 0.1 minute from the preceding continuing calibration standard, the data must be carefully evaluated to ensure that no analytes have shifted outside their retention time windows.

11.5.2. Any samples that do not meet the internal standard criteria for the continuing calibration must be evaluated for validity. **Note:** The samples reference the continuing calibration, not the initial calibration. If the change in sensitivity is a matrix effect confined to an individual sample reanalysis is not necessary. The sample in question must be bracketed by acceptable runs. The decision to reanalyze may also be client-specific. If

the change in sensitivity is due to instrument problems, all affected samples must be reanalyzed after the problem is corrected.

11.5.3. If one or two internal standard responses have been severely degraded by the sample matrix (e.g., hydrogen-deuterium exchange), the analyst will not report the analytes or the reporting limit associated with that internal standard. A dilution should be performed on the sample extract such that the internal standard response is not degraded by the sample matrix. Only the analytes associated with the degraded internal standard will be reported from the diluted analysis.

11.6. Percent Moisture: Analytical results may be reported as dry or wet weight, as required by the client. Percent moisture must be determined if results will be reported as dry weight. Refer to the KNOX-WC-0012 current revision for determination of percent moisture.

11.7. One time procedural variations are allowed only if deemed necessary in the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variation in procedure, except those specified by project specific instructions, shall be completely documented using a Nonconformance Memo and approved by a Technical Specialist, Project Manager and QA Manager. If contractually required, the client shall be notified.

11.8. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

11.9. Troubleshooting Guide (Refer to the manufacturer's manual for specific guidance)

11.9.1. Daily Instrument Maintenance: In addition to the checks listed in the instrument maintenance schedule in the Knoxville Quality Assurance Manual (QAM), current revision, the following daily maintenance should be performed as necessary.

11.9.1.1. Clip Column.

11.9.1.2. Install new or cleaned injection port liner.

11.9.1.3. Install new septum.

11.9.1.4. Install new inlet seal.

11.9.1.5. Perform mass calibration (e.g DFTPP autotune).

11.9.2. Major Maintenance: A new initial calibration is necessary following major maintenance. Major maintenance includes changing the column, replacing lenses or repeller, replacing the multiplier, or changing electronics.

11.9.3. Minor Maintenance

11.9.3.1. Minor maintenance includes daily instrument maintenance described in 11.9.1, cleaning injector port, replacing filters, changing pump oil, autotuning, switching or replacing filaments (instrument contains two filaments under vacuum), cleaning the source, replacing source insulators, replacing syringe or injector tower, change/refill calibration vial, changing seals and o-rings, ballasting pump, replacing fuses, replacing heaters or heater sensors, or replacing roughing pumps. These types of maintenance should not automatically require recalibration of the instrument.

11.9.3.2. Replace filters and change pump oil about every 6-12 months.

11.9.3.3. A multiplier gain check is performed if sensitivity is still poor and/or analyst suspects that the multiplier is going bad.

11.9.3.4. Autotuning is performed if the analyst notices mass misassignments or a drift in the response of analytes or internal standards.

11.9.3.5. If minor maintenance does not result in acceptable chromatography, it may be necessary to change the column or clean the source.

11.9.3.6. Cleaning the source does not require recalibration as long as the calibration verification standard meets the acceptance criteria in section 10.6

11.10. Refer to current revision of Eurofins TestAmerica CA-I-S-006, “Software Testing Validation and Verification”, for requirements for computer hardware and software.

12. DATA ANALYSIS AND CALCULATIONS

12.1. Refer to Figure 1 for an example data review checklists used to perform and document the review of the data. Using the data review checklist, the analyst also creates a narrative which includes any qualifications of the sample data.

12.2. Qualitative identification: An analyte is identified by retention time and by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference may be obtained on the user's GC/MS by analysis of the calibration standards or from the NBS library. Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC retention time as the standard component; and (2) correspondence of the sample component and the standard component characteristic ions. (Note: Care must be taken to ensure that spectral distortion due to co-elution is evaluated.) The characteristic ions from the reference mass spectrum are defined as the three ions with greatest relative intensity, or any ions over 30% relative intensity, if less than three such ions are 30present in the reference spectrum (i.e. characteristic ions have relative intensity ≥30%).

- The sample component retention time must compare to within ± 10 seconds of the retention time of the standard component in the CCV, or within 10 seconds of the relative shift of the associate internal standard.

- The characteristic ions of a compound must maximize in the same scan or within one scan of each other.

- The relative intensities of ions should agree to within ± 30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance must be between 20% and 80%.)

12.2.1. If a compound cannot be verified by all the above criteria, but in the technical judgment of the analyst the identification is correct, the analyst shall report that identification and proceed with quantitation.

12.3. For samples containing components not associated with the calibration standards, a library search may be made for the purpose of tentative identification. See Eurofins TestAmerica Knoxville SOP KNOX-MS-0014, current revision, “Determination of Tentatively Identified Compounds (TICs)”.

12.4. Anyone evaluating data is trained to know how to handle isomers with identical mass spectra and close elution times. These include:

Dichlorobenzenes
Methylphenols
Trichlorophenols
Phenanthrene, anthracene
Fluoranthene, pyrene
Benzo(b) and (k)fluoranthene
Chrysene, benzo(a)anthracene

Extra precautions concerning these compounds are to more closely scrutinize retention time vs. the calibration standard and also to check that all isomers have distinct retention times.

A second category of problem compounds would be the poor responders or compounds that chromatograph poorly. Included in this category would be:

Benzoic acid
Chloroanilines
Nitroanilines
2,4-Dinitrophenol
4-Nitrophenol
Pentachlorophenol
3,3'-Dichlorobenzidine
Benzyl alcohol
4,6-Dinitro-2-methylphenol

Manually checking the integrations would be appropriate for these compounds.

NOTE: Analytes not automatically identified by the data system in the continuing calibration must be manually searched for in the associated samples.

12.5. Calculations

12.5.1. Percent Relative Standard Deviation for Initial Calibration

$$\%RSD = \frac{SD}{\overline{RF}} \times 100$$

$\overline{RF}$ = Mean of RFs from intial caibration for a compound

SD = Standard deviation of RFs from initial calibration for a compound,

$$= \sqrt{\sum_{i=1}^{N} \frac{\left(RFi - \overline{RF}\right)^2}{N-1}}$$

RFi = RF for each of the calibration levels

N = Number of RF values

12.5.2. Continuing calibration percent drift or percent difference (note: Chrom/TALS uses "%D" in the report header for both % difference and % drift).

$$\%Drift = \frac{C_{actual} - C_{found}}{C_{actual}} \times 100$$

C_{actual} = Known concentration in standard

C_{found} = Measured concentration using selected quantitation method

$$\%\text{Difference} = \frac{\overline{\text{RF}} - \text{RF}}{\overline{\text{RF}}} \times 100$$

$\overline{\text{RF}}$ = Average Analyte Response Factor from Initial Calibration

RF = Measured Analyte Response Factor from Calibration Verification

12.5.3. Concentration in the extract

12.5.3.1. The concentration of each identified analyte and surrogate in the extract is calculated from the linear or quadratic curve fitted to the initial calibration points, or from the average RF of the initial calibration.

12.5.3.2. Average response factor: If the analyte %RSD in the initial calibration is $\leq$ 20%, the average response factor from the initial calibration may be used for quantitation.

$$\text{Cex} = \frac{\text{RxCis}}{\text{Ris}\,\overline{\text{RF}}}$$

12.5.3.3. Linear fit

$$\text{Cex} = \text{A} + \text{B}\frac{(\text{RxCis})}{\text{Ris}}$$

C_{ex} = Concentration in extract, ng/ul (Amt)

R_x = Response for analyte (area of quantitation ion)

R_{is} = Response for internal standard (area of quantitation ion)

C_{is} = Concentration of internal standard

A = Intercept

B = Slope

12.5.3.4. Quadratic fit

$$Cex = A + B\left(\frac{RxCis}{Ris}\right) + C\left(\frac{RxCis}{Ris}\right)^2$$

C = Curvature

12.5.4. The concentration in the sample is then calculated.

12.5.4.1. Aqueous Calculation

$$\text{Concentration, } \mu g/L = \frac{Cex \cdot DF \cdot Vt}{Vo \cdot Uf}$$

Where:

V_t = Volume of final extract delivered to GCMS, (ul)

V_o = Volume of water extracted (ml)

DF = Dilution Factor (e.g. for a one to ten dilution of extract D=10)

Uf = Unit correction factor (default =1 [ng·L/ml·ug])

12.5.5. Sediment/Soil, Sludge (on a dry-weight basis) and Waste (normally on a wet-weight basis:

$$\text{Concentration, } \mu g/kg = \frac{Cex \cdot DF \cdot Vt}{Ws \cdot X}$$

W_s = Weight of sample extracted or diluted in grams

X = (100 - % moisture in sample)/100, for a dry weight basis or 1 for a wet weight basis (moisture factor applied by LIMS)

(Note: ng/g is equivalent to ug/kg)

12.5.6. Air:

$$\text{Concentration, } \mu g = \frac{Cex \cdot DF \cdot Vt \cdot Sf}{Vo \cdot Uf}$$

Sf = Sample split ratio (e.g. if air media sample is split into two fractions and one half of sample is represented in extract delivered to GCMS for analysis then S=2.0)

Uf = Unit correction factor (A value of 1000 [ng·sample/ml·ug] used to convert concentration to ug/sample)

V_o = 1 sample

12.6. MS/MSD percent recovery calculation.

$$\text{Matrix Spike Recovery} = \frac{S_{SR} - S_R}{S_A} \times 100\%$$

S_{SR} = Spike sample result

S_R = Sample result

S_A = Spike added

12.7. Relative % Difference calculation for the MS/MSD

$$RPD = \frac{|MSR - MSDR|}{1/2(MSR + MSDR)} \times 100$$

RPD = Relative percent difference

MS_R = Matrix spike result

MSD_R = Matrix spike duplicate result

12.8. Relative response factor calculation

$$RF = \frac{AxCis}{AisCx}$$

A_x=Area of the characteristic ion for the compound being measured

A_{is}=Area of the characteristic ion for the specific internal standard

C_x=Concentration of the compound being measured (µg/ml)

C_{is} =Concentration of the specific internal standard (µg/ml)

12.9. Calculation of TICs: The calculation of TICs (tentatively identified compounds) is identical to the above calculations with the following exceptions:

A_x= Height of the total ion chromatogram for the compound being measured

A_{is}= Height of the total ion chromatogram for the nearest internal standard without interference

RF= 1

12.10. Percent DDT breakdown

$$\%\,\text{DDT breakdown} = \frac{\text{DDEarea} + \text{DDDarea}}{\text{DDTarea} + \text{DDEarea} + \text{DDDarea}} \times 100$$

Note: measurement is done on primary mass (i.e. DDT & DDD = m/z 235, DDE = m/z 246)

12.11. Tailing Factor Calculation

Using the horizontal line drawn at 10% peak height, calculate the tailing factor as the ratio of the line segment length after the intersection of the peak height line (BC) to the line segment length before the intersection with the peak height line (AB) (see Figure 2).

$$\text{Tailing Factor} = \frac{BC}{AB}$$

Note: measurement is done on primary mass (i.e. Pentachlorophenol = m/z 266, benzidine = m/z 184)

12.12. Benzo (b) fluoranthene and Benzo (k) fluoranthene Resolution Calculation

$$\%\,Valley = \frac{Baseline\,to\,Valley\,Height}{(Peak\,height\,Benzo(b)fluoranthene + Peak\,height\,Benzo(k)fluoranthene)/2}$$

Note, measurement is performed on the primary mass m/z 252, not the total ion chromatogram.

13. METHOD PERFORMANCE

13.1. Method Detection Limit: Method Detection Limit (MDL) - An MDL must be determined for each analyte in each routine matrix prior to the analysis of any samples. Method Detection limits are determined and verified as specified in the current revision of NDSC-QA-SOP42091 based on 40 CFR Part 136 Appendix B The result of the MDL determination must support the reporting limit. Current method detection limits are available in the TestAmerica Laboratory Information Management System (TALS).

13.2. Initial Demonstration of Capability: Each analyst must perform an initial demonstration of capability (IDOC) for each target analyte prior to performing the analysis independently. The IDOC is determined by analyzing four replicate spikes (e.g., LCSs) as detailed in Eurofins Knoxville SOP KNOX-QA-0009. Demonstration of capability for both soil and water matrices is required. This requires analysis of QC check samples containing all of the standard analytes for the method. For some tests it may be necessary to use more than one QC check mix to cover all analytes of interest.

13.2.1. Four aliquots of the QC check sample are analyzed using the same procedures used to analyze samples, including sample preparation. The concentration of the QC check sample is listed in Table 14.

13.2.2. Calculate the average recovery and standard deviation of the recovery for each analyte of interest. Compare these results with the acceptance criteria given in Table 14. Demonstration results for non-aqueous matrices may also be compared to the acceptance criteria in Table 14. Historical matrix specific laboratory control sample acceptance criteria may also be used for evaluation of method demonstrations. Acceptance criteria for non standard analytes should be within 70 to 130% and no greater than 20% RSD. Some non standard analytes may not meet this criteria and should be evaluated against laboratory historical acceptance criteria where available.

13.2.3. If any analyte does not meet the acceptance criteria the test must be repeated. Only those analytes that did not meet criteria in the first test need to be evaluated. Repeated failure for any analyte indicates the need for the laboratory to evaluate the analytical procedure and take corrective action.

13.3. Training Qualification: The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its

use and has the required experience. Refer to SOP KNOX-QA-0009 current revision for further requirements for performing and documenting initial and on-going demonstrations of capability.

14. POLLUTION PREVENTION

14.1. All attempts will be made by laboratory personnel to minimize the use of solvents when performing this procedure.

15. WASTE MANAGEMENT

15.1. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention".

15.2. Waste Streams Produced by the Procedure: The following waste streams are produced when this method is carried out.

- Solvent waste shall be placed in the flammable waste stream, contained in a steel SAC container type or flammable solvent container.
- Expired standards are stored in metal closed-top containers.

16. REFERENCES

16.1. SW-846, Test Method 8270E: Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)

16.2. Eurofins Knoxville Quality Assurance Manual (QAM), current revision.

16.3. NDSC-QA-SOP43862, Manual Integration, current revision.

16.4. NDSC-QA-QP44940, "Calibration Curves and the Selection of Calibration Points", current revision.

16.5. NDSC-QA-SOP42091, "Detection and Quantitation Limits", current revision

16.6. KNOX-OP-0011, current revision, "Extraction and Cleanup of Organic Compounds from Waters, Soils, Solids, and Wastes Based on SW-846 3500 and 3600 Methods."

16.7. Method 8000D "Determinative Chromatographic Separations", March 2018.

17. MISCELLANEOUS

17.1. Modifications from Reference Method

17.1.1. The quantitation and qualifier ions for some compounds have been changed from those recommended in SW-846 in order to improve the reliability of qualitative identification.

17.1.2. Internal standard concentration in this SOP is 2000 ug/mL, for a final concentration in the extracts of 20 ng/uL. The concentration listed in 8270E is 4000 ug/mL for a final concentration in the extracts of 40 ng/uL.

17.1.3. Some analytes reference different internal standards than listed in 8270E. This SOP assigns the closest internal standards eluting to the analyte.

17.1.4. This SOP uses surrogate phenol-d5, while the 8270E uses phenol-d6.

17.2. List of Tables, Figures and Attachments

17.2.1. Figure 1: Example Data Review Checklist

17.2.2. Table 1 – Primary Standard and Standard Reporting Limits

17.2.3. Table 2 – Appendix IX Analyte Reporting Limits

17.2.4. Table 3 - Additional Analyte Reporting Limits

17.2.5. Table 4 – Typical Instrument Conditions

17.2.6. Table 5 – DFTPP Key Ions and Ion Abundance Criteria

17.2.7. Table 6 – Analyte in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions, Primary Standard

17.2.8. Table 7 – Analytes in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions, Appendix IX Standard

17.2.9. Table 8 – Additional Analyte in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions

17.2.10. Table 9 - LCS and Matrix Spike Analytes

17.2.11. Table 10 – 8270E Surrogate Compounds

17.2.12. Table 11 – Typical Calibration Levels, Primary Standard, ug/mL

17.2.13. Table 12 – Typical Calibration Levels, Appendix IX Analytes, ug/mL

17.2.14. Table 13 – Typical Calibration Levels, Additional Analyte, ug/mL

17.2.15. Table 14 – Initial Demonstration Recovery and Precision Limits for Aqueous Matrices

17.2.16. Figure 2: Example Tailing Factor Calculation

17.2.17. Figure 3: Example Benzo (b) fluoranthene and Benzo (k) fluoranthene Resolution Calculation.

Figure 1: Example Data Review Checklist

Eurofins Knoxville Semivolatile GC/MS Initial Calibration Data Review / Narrative Checklist
Method 8270C - KNOX-MS-0016, Rev 17; Method TO-13A Mod – KNOX-MS-0017, Rev 12;
8270D – KNOX-MS-0024, Rev 6; 8270E – KNOX-MS-0028, Rev 2

Instrument:			TALS Batch / Event #	8270E	8270D	8270C	TO-13	Scanned ☐
Analysis			8270:	/	/	/	/	
Chrom WL			A9:	/	/	/	/	
			XTRA:	/	/	/	/	
			Other:	/	/	/	/	
			Other:	/	/	/	/	

Chrom Worklist/Peak Review	*1st*	*Comments*	*2nd*
1. Re-read each limit group [method editor-limit groups]			-na-
2. Verify LOD [method editor -> edit -> MDL]			-na-
3. Are the reagents & init./final vol. correct [Sample & Run Reagents]			-na-
4. First levels "unlock/clear" or "unlock/clear by sublist" as appropriate?			
5. Are the Cal Levels & groups correct in WL?			
6. Were all standards injected within 12 hr of DFTPP? [F7]			
7. Was the high point std checked for saturation [flags + visible inspection: $8.4x10^6$]			
8. If manual integrations were performed, are they appropriate with proper reason given?			
9. Were all peaks identified automatically? If not, list analytes: _____		*Modify method for detection must be attempted and all points reprocessed. Any non-detected peaks must be verified in each affected sample.*	
10. Elution order checked on isomeric pairs?			
• aniline / bis(2-chloroethyl)ether			
• 1,3- , 1,4- , 1,2-dichlorobenzene			
• benzyl alcohol / 2-methylphenol / 4-methylphenol			
• 2 & 1 - methylnaphthalene			
• 2,4,6- and 2,4,5-trichlorophenol			
• phenanthrene / anthracene			
• fluoranthene / pyrene			
• benzo(a)anthracene / chrysene			
• bis(2-ethylhexyl)/di-n-octyl phthalate			
• benzo(b)fluoranthene / benzo(k)fluoranthene			
• indeno(1,2,3-cd)pyrene / benzo(g,h,i)perylene			
• safrole/isosafrole/1-chloronaphthalene			
• 1-/2-naphthylamine			

Chrom MLG Review	8270E	8270D	8270C	TO-13	**Comments/NCM#**	8270E	8270D	8270C	TO-13
11. Did the DFTPP meet tune criteria? [F8]									
12. Was DDT breakdown ≤ 20% [F8]				-na-					-na-
13. Benzidine and PCP tailing < 2? (8270D) Benzidine tailing < 3 and PCP tailing < 5? (8270C) [F8]				-na-					-na-
14. Are ICAL start/end dates/times correct on summary? [F6]									
15. Are ≥ 5 levels of each compound/surrogate active? [F6]									
16. Is low level standard at or below RL & points consecutive? [F6]									
17. Average RRFs for SPCCs met (8270C)? [F6]	-na-	-na-		-na-		-na-	-na-		-na-
18. RRF for each point ≥ RL meet min RF's (8270D/8270E/TO-13)? [F6]			-na-					-na-	
19. S/N for low point ≥ 6 & at least 5 scans/peak									
20. Are %RSD ≤30% for CCCs? (8270C/TO-13) [F6]	-na-	-na-				-na-	-na-		
21. Was a linear or quadratic fit used for analytes >15% RSD for 8270C & TO-13? >20% for 8270D & 8270E? [F6]									

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Figure 1: Example Data Review Checklist, (continued)

Eurofins Knoxville Semivolatile GC/MS Initial Calibration Data Review / Narrative Checklist
Method 8270C - KNOX-MS-0016, Rev 17; Method TO-13A Mod – KNOX-MS-0017, Rev 12;
8270D – KNOX-MS-0024, Rev 6; 8270E – KNOX-MS-0028, Rev 2

Chrom MLG Review	8270E	8270D	8270C	TO-13	**Comments/NCM#**	8270E	8270D	8270C	TO-13
22. If curves were used, is correlation coefficient ≥0.990? [F6]									
23. At least 6 consecutive points used for quadratic curves? [F6]									
24. For quadratic: is a tangent's slope to the curve entirely positive or negative and continuous? [Cntrl-C, details]									
25. Is the intercept < than ½ the RL for each curve (<RL for TO-13)? [Cntrl-C, details]									
26. Is the read-back for each point within criteria? TO-13/8270C: ≤30% for all points, low point ≤ 50 % 8270E: ≤ 30% for all points, low point ≤ 50 % 8270D: low point linear regression ≤ 30% [F6-Drift]									
27. RT for each IS +20 sec avg. RT? (TO-13A) [F6-RRT]	**-na-**	**-na-**	**-na-**			**-na-**	**-na-**	**-na-**	
28. Each analyte ±0.06 RRT of avg. RRT? (TO-13A) [F6-RRT]	**-na-**	**-na-**	**-na-**			**-na-**	**-na-**	**-na-**	
29. Benzo(b/k)fluoranthene: height of the valley between must be less than 50% of the average of the two peak heights? [F8]			**-na-**	**-na-**				**-na-**	**-na-**
30. Was the ICV within ± 30% recovery? [F8-icv]					□ ICV out high, samples ND **NCM#:**				
31. Lock method in Chrom, uploaded to TALS and setup as most recent method?	**-na-**	**-na-**	**-na-**	**-na-**					
1st level reviewer:	**Date:**				**2nd level reviewer**			**Date:**	
Comments:									

TALS MLG Review	*8270E*	*8270D*	*8270C*	*TO-13*	*Comments*	*8270E*	*8270D*	*8270C*	*TO-13*
32. Graphics uploaded? [Sample List Tab]									
33. All points are in the most recent active calibration event #? [Calibration ID # in sample results tab & Calibration Events] [Calibration Events - 'Fix ICAL Linkage' if needed]									
34. Run Data Review Checker and acknowledge findings.									
35. After review in TALS, approve the calibrations in TALS	**-na-**	**-na-**	**-na-**	**-na-**					
36. Runs linked to DFTPP & ICV to ICIS? [QC Links]									
37. If criteria not met, was a NCM generated?									
38. Checklist scanned & attached properly?	**-na-**	**-na-**	**-na-**	**-na-**					
1st Level:		**Date:**			**2nd Level:**			**Date**	
Comments:									

Figure 1: Example Data Review Checklist, (continued)

Eurofins/TestAmerica Knoxville Semivolatile GC/MS Continuing Calibration Data Review / Narrative Checklist
Method 8270C - KNOX-MS-0016, Rev 17; Method TO-13A Mod – KNOX-MS-0017, Rev 12;
8270D – KNOX-MS-0024, Rev 6; 8270E – KNOX-MS-0028, Rev 2

8270E ☐ **8270D** ☐ **8270C** ☐ **TO-13** ☐

	TALS Batch #:						
		ICAL TALS Batch / Event #					Scanned ☐
Instrument:		8270:					
Analysis Date:		A9:					
ICAL Chrom WL #		XTRA:					
CCAL Chrom WL #		Other:					

CCV Chrom/Worklist Review	1st	*Comments/NCM #*	2nd
1. Are the reagents & init/final volumes correct? (Verify reagents & amt. injected) [WL Sample Reagent Tab]			
2. Are all required calibration standards in worklist?			
3. Is the Chrom method locked?			
4. Did DFTPP meet tune criteria for each LG? (8270E optional) [F8]			
5. Benzidine and PCP tailing < 2? (8270D; 8270E optional) [F8]			
6. Benzidine tailing < 3 and PCP tailing <5? (8270C) [F8]			
7. Was DDT breakdown ≤20% (8270C & D; 8270E optional) [F8]			
8. Was the CCAL compared to the most recent & correct ICAL for each CCV & LG? (verify ICAL batch #, start/end Cal date & time) [F8]			
9. Elution order checked on isomeric pairs/coeluters?			
• aniline / bis(2-chloroethyl)ether			
• 1,3- , 1,4- , 1,2-dichlorobenzene			
• benzyl alcohol / 2-methylphenol / 4-methylphenol			
• 2 & 1 - methylnaphthalene			
• 2,4,6- and 2,4,5-trichlorophenol			
• phenanthrene / anthracene			
• fluoranthene / pyrene			
• benzo(a)anthracene / chrysene			
• bis(2-ethylhexyl)/di-n-octyl phthalate			
• benzo(b)fluoranthene / benzo(k)fluoranthene			
• indeno(1,2,3-cd)pyrene / benzo(g,h,i)perylene			
• safrole/isosafrole/1-chloronaphthalene			
• 1-/2-naphthylamine			
10. Manual integrations properly performed, correctly ID'd, baseline clearly identified, and correct reason given?		*Note: manual selections should be updated and all data reprocessed*	
11. Were all peaks identified automatically? *If not, list analytes:*		*Note: any non-detected peaks must be verified in each affected sample.*	
12. Has the retention time been updated to the method?			
13. Are the internal standard responses within limits for each CCV? (50-200% of the mid-level ICAL standard) [F8-istd]			
14. Are the internal standard retention times within limits for each CCV? (±30 seconds of the mid-level ICAL standard) [F8-istd]			

CCV Chrom/TALS MLG Review *[F8] or TALS sample tab*	*8270D 8270E*	*8270C*	*TO-13*	*Comments/NCM #*	*8270D 8270E*	*8270C*	*TO-13*
15. (8270C) - Are the RFs for SPCCs ≥0.050?							
16. (8270C) - Is the %D or drift ≤20% for all CCCs?							
17. (8270C) - Is the %D or drift ≤ 30% for all target analytes [up to 3 TCL's may have %D or drift ≤ 40%, any more and the calibration is INVALID; 3 add'l allowed for A9 & extra compounds				☐ CLP-CCV-Allow#failed (NCM#_____) ☐ CCV high, sample ND (NCM#_____)			
18. (TO-13A Mod) - Do the RFs meet minimum criteria?							
19. (TO-13A Mod) - Is the %D or drift ≤30% for PAH's (& meet 8270 requirements for remaining CCC's if necessary)?				☐ CCV high, sample ND (NCM#_____) ☐ CLP-CCV-Allow#failed (NCM#_____)			
20. (8270D) - Do the RF's meet minimum criteria							
21. (8270D/E) - Is the %D ≤20% for 80% of compounds?							
22. (8270D/E) - For any compound > 20% (low), was a RL standard analyzed & detected? *				☐ CCV out, EST (1) (NCM#_____)			
23. (8270D/E) - For any compound > 20%D (high or low), NCM generated? *				☐ CCV out, EST (2) (NCM#_____)			
24. (8270D/E) - Benz(b & k) fluoranthene: height of the valley < 50% of average of the two peak heights? [F8 Resolution]							
25. Is the calibration event # correct for each CCV? *[TALS Sample Results tab]*							

* Such action must be taken in consultation with client.

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Figure 1: Example Data Review Checklist, (continued)

Eurofins/TestAmerica Knoxville Semivolatile GC/MS Continuing Calibration Data Review / Narrative Checklist
Method 8270C - KNOX-MS-0016, Rev 17; Method TO-13A Mod – KNOX-MS-0017, Rev 12;
8270D – KNOX-MS-0024, Rev 6; 8270E – KNOX-MS-0028, Rev 2

*TALS BATCH #:*_____

Batch Chrom/TALS review	*1st*	*Comments/NCM #*	*2nd*
1. Have the sample ID's and dilution factors been confirmed (check sequence, autosampler positions, etc.)?			
2. Were all samples injected within 12 hr of DFTPP (or CCV for 8270E)?			
3. Method blank or instrument blank analyzed?			
4. 8270C/TO-13 - Are all analytes in the method blank < RL? 8270D/E -- Are all analytes in the method blank < ½ RL (< RL for phthalates)?		□ MB CLC <5x RL (NCM#_____) □ MB Rpt ND (NCM#_____) □ MB-Rpt.10x (NCM#_____) □ MB-insuff samp (NCM#_____) □ MB-insuff samp -CONSUMED (NCM#_____) □ MB > ½ RL (explain) (NCM#_____) □ MB RX - HT out (NCM#_____)	
5. Method blank surrogate recoveries within QC limits? [F8] or [Batch Results SUR Tab]		□ Surr-MB (1) high (NCM#_____) + (2) smp OK (NCM#_____) **or** (3) Insuff. sample (NCM#_____) **or** (4) CONSUMED (NCM#_____)	
6. 8270 C/D/E: LCS done per batch and criteria met with limited # marginal exceedences allowed (see table) and no two consecutive MEs? --For TO-13: LCS done per batch within method QC limits? (non-PAH's use the marginal exceedence table above) [Chrom-F8] [TALS-Sample Results Tab]		□ LCS/D-Insuff smp (NCM#_____) □ LCS/D-Insuff smp - CONSUMED (NCM#_____) □ LCS/D %R High < RL in smp (1+2-5) (NCM#_____) □ LCS/D out-RX HT out (NCM#_____) □ Mar. Exceed. w/in ME limits & Random (NCM#_____) □ LCS/D-%RPD (%R OK) (NCM#_____) □ NCM# **140-6154**: Water wash	
7. All runs - peaks ID'd correctly and false positives removed? Sample Reason Sample Reason _____ _____ _____ _____ _____ _____ _____ _____		□ Interf-Chrom (NCM#_____) □ "cn" (see narrative): (NCM#_____)	
Manual integrations properly performed, correctly ID'd, baseline clearly identified, and correct reason given?			
8. Are surrogates within QC limits? [Batch Results SUR Tab] If no, list samples, reason and NCM # Sample Reason Sample Reason _____		□ Surr-High-ND (1,8) (NCM#_____) □ Surr-Incorrect Spike amt (NCM#_____) □ Surr-Insuff Smp (1) insuff smp (NCM#_____) or (4) CONSUMED (NCM#_____) + (2) low bias (NCM#_____) or (3) high bias (NCM#_____) □ Surr-Insuff Smp - CONSUMED (NCM#_____) □ Surr-Matrix (1-5) (NCM#_____) □ Surr-rpt per client (released w/o further investigation)* (NCM#_____) □ Surr-RX concur (NCM#_____) □ Surr-RX pass (RX outside HT, but w/in limits) (NCM#_____) □ Dil – Surr dil out or estimated & elev RL's (opt 1-4 & 5-8): (NCM#_____) □ NCM# **140-6154**: Water wash	
9. Are internal standards within QC limits? [Batch Results IS Tab] If no, list samples, reason and NCM # Sample Reason Sample Reason _____ _____ _____ _____ _____ _____ _____ _____		□ ISTD- Matrix (NCM#_____) □ ISTD- Matrix DL required (NCM#_____) □ ISTD- non-targets affected (NCM#_____) □ ISTD- RX/RA concur (NCM#_____) □ NCM# **140-5757:** Samples bracketed by acceptable runs*.	

Number of target analytes in LCS	# marginal exceedances of LCS control limits allowed
>90	5
71 - 90	4
51 - 70	3
31 - 50	2
11 - 30	1
< 11	0

* Such action must be taken in consultation with client.

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Figure 1: Example Data Review Checklist, (continued)

Eurofins/TestAmerica Knoxville Semivolatile GC/MS Continuing Calibration Data Review / Narrative Checklist
Method 8270C - KNOX-MS-0016, Rev 17; Method TO-13A Mod – KNOX-MS-0017, Rev 12;
8270D – KNOX-MS-0024, Rev 6; 8270E – KNOX-MS-0028, Rev 2

		*TALS BATCH #:*_____	
10. For initial analysis with elevated RL's, explain: *List diluted samples and reason:* Sample Reason Sample Reason _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____		□ RL – Final Vol (NCM#_____) □ RL – Init Vol (matrix) (NCM#_____) □ RL – Insuff. Smp (NCM#_____) □ RL – Dil Screen (NCM#_____) □ RL – Dil Targets (NCM#_____) □ RL – Dil Non-targets (NCM#_____)	
Batch TALS Review	***1st***	***Comments/NCM #***	***2nd***
11. Graphics uploaded?			
12. Sample special instructions verified?			
13. Suffixes assigned properly (DL/RE)? [Sample List Tab]			
14. Each job has QC created (DFTPP, CCV, MB, LCS)? [Sample List Tab]			
15. Analytes over calibration range set to secondary & dilutions scheduled for analysis? [Conditions Review Tab] Sample Reason Sample Reason _____ _____ _____ _____ _____ _____ _____ _____		□ ICAL-Range Exceed; Min Dil 1 – client OK'd * (NCM#_____) 2 – dil for other cmpds (NCM#_____)	
16. For dilutions, diluted analytes set to primary, others to "Acceptable"? [Sample Results Tab}			
17. If MS/MSD was done on this client's sample or for reported batch QC, were the MS/MSD recoveries and RPDs within laboratory generated QC limits?		□ MS/MSD - %R out, LCS OK □ MS/MSD - high targets □ MS/MSD – spk/surr diluted out □ MS/MSD/Dup - % RPD	
18. Verify reagents have not expired [Reagents Tab]			
19. Samples not reported set to "Acceptable" or "Rejected" [Sample Results Tab]			
20. DFTPP/CCV linked to all samples? [QC Links]			
21. Samples linked to correct method blank & LCS/D & MS/D? [QC Links]			
22. Correct ICV's linked to all samples? [QC Links]			
23. Run Data Review Checker and acknowledge findings.			
24. Runs set to 1st level review?		Runs set to 2nd level review?	
25. QC checker run for batch and items addressed			
26. Checklist scanned & attached properly?			

1st level:	**Date**	**2nd level:**	**Date**
Comments:			
Example calculation (per prep batch):			

* Such action must be taken in consultation with client.

Figure 1: Example Data Review Checklist, (continued)

Eurofins/TestAmerica Knoxville Semivolatile GC/MS Job Data Review / Narrative Checklist
Method 8270C - KNOX-MS-0016, Rev 17; Method TO-13A Mod – KNOX-MS-0017, Rev 12;
8270D – KNOX-MS-0024, Rev 6; 8270E – KNOX-MS-0028, Rev 2

Job #:_____

Method: **8270E** □ **8270D** □ **8270C** □ **TO-13** □

TALS Analytical Batch #'s:

ICAL Instrument:						
Batch #:						

CCAL batch #'s:						

	Prep method 1	**prep method 2**	**prep method 3**			
Prep batch #'s:						

Job / Reports Review	*1st*	*Comments/NCM/Narrative notes*	*2nd*
1.QC checker run for job and items addressed			
2.Were all client special project requirements met?		□ Non-routine analyte-no MDL: (NCM_____)	
3.Sample prep and analyses done within analytical holding time? *["H" flags]*		□ HT Init Analysis (NCM#_____) □ HT Init Prep (NCM#_____) □ HT RePrep (NCM#_____) □ HT Receipt (NCM#_____) □ HT Insuff time (NCM#_____) □ HT (see Surr RX) (NCM#_____)	
4.MS/MSD (or LCS for TO13A) done per prep batch? *('NA' for air samples)*		□ MS/MS/DUP- insufficient vol (2) (NCM#_____)	
5.Appropriate NCM's on the right are assigned to the job?		□ NCM#: **140-6034:** Air Train 0010-3 separate fractions □ NCM#: **140-6036:** Air Train 0010-2 fractions combined □ NCM#: **140-6033:** Waste SVOA	
6.All NCM's are complete, free of grammatical/spelling errors, and correct references to batches/samples/analytes?		List all other NCM's with job:	
7.Run deliverable & assemble report.			
8.All "E" values have "DL" runs?		If 'no', create NCM on analytical batch	
9.Data Summaries correct (L2 & L4)?			
10.Forms II-V & VIII correct (L4)?			
11.ICV present per ICAL (L4)?			
12.Checklists (ICAL & batch DRC) attached to Job (L4)?			

1st Level:	**Date:**	**2nd Level:**	**Date:**

* Such action must be taken in consultation with client.

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Table 1

Primary Standard[1] and Standard Reporting Limits

Analyte	CAS Number	Standard Reporting Limits			
		Aqueous µg/L	Air (ug) Filter	Air (ug) XAD	Low Soil/Sediment µg/kg
1,4-Dioxane	123-91-1	5	NA	NA	NA
Pyridine	110-86-1	20	20	20	660
N-nitrosodimethylamine	62-75-9	10	10	10	330
Aniline	62-53-3	10	20	20	330
Phenol	108-95-2	10	10	10	330
Bis(2-chloroethyl)ether	111-44-4	10	10	10	330
2-Chlorophenol	95-57-8	10	10	10	330
1,3-Dichlorobenzene	541-73-1	10	10	10	330
1,4-Dichlorobenzene	106-46-7	10	10	10	330
Benzyl alcohol	100-51-6	10	100	100	330
1,2-Dichlorobenzene	95-50-1	10	10	10	330
2-Methylphenol	95-48-7	10	10	10	330
2,2'-oxybis(1-chloropropane)[2]	108-60-1	10	10	10	330
3-Methyl & 4-Methylphenol[3]	108-39-4/106-44-5	10	10	10	330
N-Nitroso-di-n-propylamine	621-64-7	10	10	10	330
Hexachloroethane	67-72-1	10	10	10	330
Nitrobenzene	98-95-3	10	10	10	330
Isophorone	78-59-1	10	10	10	330
2-Nitrophenol	88-75-5	10	10	10	330
2,4-Dimethylphenol	105-67-9	10	20	10	330
Benzoic acid	65-85-0	50	100	100	1600
Bis(2-chloroethoxy)methane	111-91-1	10	10	10	330
2,4-Dichlorophenol	120-83-2	10	10	10	330
1,2,4-Trichlorobenzene	120-82-1	10	10	10	330
Naphthalene	91-20-3	10	10	10	330
4-Chloroaniline	106-47-8	10	10	20	330
Hexachlorobutadiene	87-68-3	10	10	10	330
4-Chloro-3-methylphenol	59-50-7	10	10	10	330
2-Methylnaphthalene	91-57-6	10	10	10	330
Hexachlorocyclopentadiene	77-47-4	50	50	50	1600
2,4,6-Trichlorophenol	88-06-2	10	10	10	330
2,4,5-Trichlorophenol	95-95-4	10	10	10	330
2-Chloronaphthalene	91-58-7	10	10	10	330
2-Nitroaniline	88-74-4	50	50	50	1600
Dimethyl phthalate	131-11-3	10	10	10	330
Acenaphthylene	208-96-8	10	10	10	330
2,6-Dinitrotoluene	606-20-2	10	10	10	330
3-Nitroaniline	99-09-2	50	50	50	1600
Acenaphthene	83-32-9	10	10	10	330
2,4-Dinitrophenol	51-28-5	50	50	50	1600
4-Nitrophenol	100-02-7	50	50	50	1600
Dibenzofuran	132-64-9	10	10	10	330

Table 1 (continued)

Primary Standard[1] and Standard Reporting Limits

Analyte	CAS Number	Standard Reporting Limits			
		Aqueous µg/L	Air (ug)		Low Soil/Sediment µg/kg
			Filter	XAD	
2,4-Dinitrotoluene	121-14-2	10	10	10	330
Diethylphthalate	84-66-2	10	10	10	330
4-Chlorophenyl phenyl ether	7005-72-3	10	10	10	330
Fluorene	86-73-7	10	10	10	330
4-Nitroaniline	100-01-6	50	50	50	1600
4,6-Dinitro-2-methylphenol	534-52-1	50	50	50	1600
N-Nitrosodiphenylamine[4]	86-30-6	10	10	10	330
Azobenzene[5]	103-33-3	10	10	10	330
4-Bromophenyl phenyl ether	101-55-3	10	10	10	330
Hexachlorobenzene	118-74-1	10	10	10	330
Pentachlorophenol	87-86-5	50	50	50	1600
Phenanthrene	85-01-8	10	10	10	330
Anthracene	120-12-7	10	10	10	330
Carbazole	86-74-8	10	10	10	330
Di-n-butyl phthalate	84-74-2	10	10	20	330
Fluoranthene	206-44-0	10	10	10	330
Pyrene	129-00-0	10	10	10	330
Butyl benzyl phthalate	85-68-7	10	10	10	330
3,3'-Dichlorobenzidine	91-94-1	50	50	50	1600
Benzo(a)anthracene	56-55-3	10	10	10	330
Bis(2-ethylhexyl)phthalate	117-81-7	10	10	20	330
Chrysene	218-01-9	10	10	10	330
Di-n-octylphthalate	117-84-0	10	10	10	330
Benzo(b)fluoranthene	205-99-2	10	10	10	330
Benzo(k)fluoranthene	207-08-9	10	10	10	330
Benzo(a)pyrene	50-32-8	10	10	10	330
Indeno(1,2,3-cd)pyrene	193-39-5	10	10	10	330
Dibenz(a,h)anthracene	53-70-3	10	10	10	330
Benzo(g,h,i)perylene	191-24-2	10	10	10	330

1 The primary standard is the standard normally used at TestAmerica Knoxville. Additional standards, such as the Appendix IX standard may be necessary to include all target analytes required for some clients.

2 2,2'oxybis(1-chloropropane) is also known as bis(2-chloroisopropyl)ether.

3 3-methylphenol and 4-methylphenol co-elute and cannot be distinguished by this method.

4 N-nitrosodiphenylamine decomposes in the injection port to form diphenylamine. Therefore these two compounds cannot be distinguished.

5 Azobenzene is formed by decomposition of 1,2-diphenylhydrazine. If 1,2-diphenylhydrazine is requested, it will be analyzed as azobenzene.

Table 2

Appendix IX[1] Analyte Reporting Limits

Analyte	CAS Number	Standard Reporting Limits			
		Aqueous µg/L	Air (ug)		Low Soil/Sediment µg/kg
			Filter	XAD	
2-Picoline	109-06-8	NA	10	10	NA
N-Nitrosomethylethylamine	10595-95-6	10	10	10	330
Methyl methanesulfonate	66-27-3	10	10	10	330
N-Nitrosodiethylamine	55-18-5	10	10	10	330
Ethyl methanesulfonate	62-50-0	10	10	10	330
Pentachloroethane	76-01-7	50	10	10	1600
Acetophenone	98-86-2	10	10	10	330
3-Methylphenol (syn: m-cresol)[3]	108-39-4	10	10	10	330
N-Nitrosopyrrolidine	930-55-2	10	10	10	330
N-Nitrosomorpholine	59-89-2	10	10	10	330
o-Toluidine	95-53-4	20	10	10	660
N-Nitrosopiperidine	100-75-4	10	10	10	330
2,6-Dichlorophenol	87-65-0	10	10	10	330
Hexachloropropene	1888-71-7	100	10	10	3300
n-Nitrosodi-n-butylamine	924-16-3	10	10	10	330
Isosafrole	120-58-1	20	10	10	660
1,2,4,5-Tetrachlorobenzene	95-94-3	10	10	10	330
Safrole	94-59-7	20	10	10	660
1-chloronapthalene	90-13-1	10	10	10	330
1,3-Dinitrobenzene	99-65-0	20	10	10	660
Pentachlorobenzene	608-93-5	10	10	10	330
1-Naphthylamine	134-32-7	10	10	10	330
2-Naphthylamine	91-59-8	10	10	10	330
2,3,4,6-Tetrachlorophenol	58-90-2	50	10	10	1600
5-Nitro-o-toluidine	99-55-8	20	NA	NA	660
Diphenylamine[2]	122-39-4	10	10	10	330
Phenacetin	62-44-2	20	10	10	660
4-Aminobiphenyl	92-67-1	50	10	10	1600
Pentachloronitrobenzene	82-68-8	50	20	50	1600
2-secbutyl-4,6-dinitrophenol (Dinoseb)	88-85-7	50	10	10	1600
Benzidine	92-87-5	100	100	100	3300
p-(Dimethylamino)azobenzene	60-11-7	20	10	10	660
3,3'-Dimethylbenzidine (syn: o-tolidine)	119-93-7	50	50	50	1600
2-Acetylaminofluorene	53-96-3	100	10	10	3300
7,12-Dimethylbenz(a)anthracene	57-97-6	20	10	10	660
3-Methylcholanthrene	56-49-5	20	10	10	660

1 This Appendix IX standard is a subset of the Appendix IX analyte reference list.

2 N-nitrosodiphenylamine decomposes in the injection port to form diphenylamine. Therefore these two compounds cannot be distinguished.

3 3-methylphenol and 4-methylphenol co-elute and cannot be distinguished by this method.

Table 3

Additional Analyte Reporting Limits

Compound	CAS Number	Standard Reporting Limits	
		Aqueous ug/L	Soil ug/Kg
Benzaldehyde	100-52-7	10	330
Caprolactam	105-60-2	10	330
1,1-Biphenyl	92-52-4	10	330
Atrazine	1912-24-9	10	330

Table 4

Typical Instrumental Conditions

Mass Range	35-550 amu
Sampling (Scan Time)	2 (e.g. 2.86 scans/second). Must produce a minimum of 5 scans across each peak of interest in the calibration.
Initial Column Temperature/Hold Time	40°C for 0.3 minutes
Column Temperature Program	20°C/min to 120 ^{o}C hold 0.5 min
	17°C/min to 150 ^{o}C hold 0.75 min
	35°C/min to 300 ^{o}C hold 0.75 min
	75°C/min to 325 ^{o}C hold
Final Column Temperature/Hold Time	325°C (until after benzo(g,h,i)perylene has eluted)
Injector Temperature	250°C
Interface Temperature	280°C
Source Temperature	240°C
Quadrupole Temperature	150 ^{o}C
Injector	split / splitless
Sample Volume	1 µl
Carrier Gas	Helium at 30 cm/sec
Column Flow Rate (and Mode)	2 ml/min (constant flow)
Split Ratio	10:1

Table 5

DFTPP Key Ions and Ion Abundance Criteria

Mass	Ion Abundance Criteria
68	<2% of mass 69
69	present
70	<2% of mass 69
197	<2% of mass 198
198	Base peak, or present
199	5 - 9% of mass 198
365	>1.0% of mass 198
441	< 150% mass 443
442	Base peak, or present
443	15 - 24% of mass 442

Note: All ion abundances must be normalized to m/z 198, the nominal base peak, even though the ion abundance of m/z 442 may be the base peak.

Table 6

Analytes in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions, Primary Standard[1]

Analyte	Minimum RF	Primary	Secondary	Tertiary
1,4-Dichlorobenzene-d4 (Internal Standard 1)		**152**	**150**	**115**
1,4-Dioxane	**-**	**88**	**58**	
N-nitrosodimethylamine	**-**	**74**	**42**	43
Pyridine	**-**	**79**	**52**	51
2-Fluorophenol (Surrogate Standard)	**-**	**112**	**64**	**63**
Phenol-d5 (Surrogate Standard)	**-**	**99**	42	**71**
Aniline	**-**	**93**	66	92
Phenol	**0.800**	**94**	65	66
Bis(2-chloroethyl)ether	**0.700**	**93**	**63**	95
2-Chlorophenol	**0.800**	**128**	**64**	130
1,3-Dichlorobenzene	**-**	**146**	**148**	**111,** 113
1,4-Dichlorobenzene	**-**	**146**	**148**	**111,** 113
Benzyl Alcohol	**-**	**108**	**79**	**77**
1,2-Dichlorobenzene	**-**	**146**	**148**	**111,** 113
2-Methylphenol	**0.700**	**108**	**107**	**79**
2,2'-oxybis(1-chloropropane)	**0.010**	**45**	77	79, **41, 121**
3 and 4-Methylphenol	**0.600**	**108**	**107**	79, **77**
N-Nitroso-di-n-propylamine	**0.500**	**70**	**42**	101, **43**
Hexachloroethane	**0.300**	**117**	**201**	**119**
Naphthalene-d8 (Internal Standard 2)		**136**	68	54
Nitrobenzene-d5 (Surrogate Standard)	**-**	**82**	**128**	**54**
Nitrobenzene	**0.200**	**77**	**123**	65, **51**
Isophorone	**0.400**	**82**	95	138, 39
2-Nitrophenol	**0.100**	**139**	**65**	109**, 39**
2,4-Dimethylphenol	**0.200**	**107**	**121**	**122**
Benzoic Acid	**-**	**122**	**105**	**77**
Bis(2-chloroethoxy)methane	**0.300**	**93**	95	123, **63**
2,4-Dichlorophenol	**0.200**	**162**	**164**	98, **63**
1,2,4-Trichlorobenzene	**-**	**180**	**182**	145
$^{13}C_6$- Naphthalene (field surrogate)	**-**	**134**	133	
Naphthalene	**0.700**	**128**	129	127
$^{13}C_3$- Naphthalene (field surrogate)	**-**	**131**	130	
4-Chloroaniline	**0.010**	**127**	129	65
Hexachlorobutadiene	**0.010**	**225**	**223**	**227**
4-Chloro-3-methylphenol	**0.200**	**107**	144	**142, 77**
2-Methylnaphthalene	**0.400**	**142**	**141**	**115**
Acenaphthene-d10 (Internal Std. 3)		**164**	**162**	**160**
Hexachlorocyclopentadiene	**0.050**	**237**	**235**	272**, 239**
2,4,6-Trichlorophenol	**0.200**	**196**	**198**	200**, 97**
2,4,5-Trichlorophenol	**0.200**	**196**	**198**	200**, 97**
2-Fluorobiphenyl (Surrogate Standard)	**-**	**172**	171	170
2-Chloronaphthalene	**0.800**	**162**	164	**127**
2-Nitroaniline	**0.010**	**65**	**92**	**138**
Dimethylphthalate	**0.010**	**163**	194	164
Acenaphthylene	**0.900**	**152**	151	153

Table 6 (continued)
Analytes in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions, Primary Standard

Analyte	Minimum RF	Primary	Secondary	Tertiary
2,6-Dinitrotoluene	**0.200**	**165**	**63**	**89**
3-Nitroaniline	**0.010**	**138**	108	**92, 65**
Acenaphthene	**0.900**	**153**	**152**	**154**
2,4-Dinitrophenol	**0.010**	**184**	**63**	**154**
Dibenzofuran	**0.800**	**168**	**139**	84
4-Nitrophenol	**0.010**	**109**	**139**	**65**
2,4-Dinitrotoluene	**0.200**	**165**	**63**	**89**
Diethylphthalate	**0.010**	**149**	177	204, 150
Fluorene	**0.900**	**166**	**165**	167
4-Chlorophenylphenylether	**0.400**	**204**	206	**141**
4-Nitroaniline	**0.010**	**138**	**92**	**108, 65**
Phenanthrene-d10 (Internal Std. 4)		**188**	94	80
2,4,6-Tribromophenol (Surrogate Std.)	**-**	**330**	**332**	**62**
4,6-Dinitro-2-methylphenol	**0.010**	**198**	53	121
N-Nitrosodiphenylamine	**0.010**	**169**	**168**	167
Azobenzene	**-**	**77**	182	105, 51
4-Bromophenylphenylether	**0.100**	**248**	**250**	**141**
Hexachlorobenzene	**0.100**	**284**	**142**	248, **286,282**
Pentachlorophenol	**0.050**	**266**	**264**	**268**
Phenanthrene	**0.700**	**178**	179	176
Anthracene	**0.700**	**178**	179	176
Carbazole	**0.010**	**167**	166	139
Di-n-butylphthalate	**0.010**	**149**	150	104
Fluoranthene	**0.600**	**202**	101	100
Chrysene-d12 (Internal Standard 5)		**240**	120	236
Pyrene	**0.600**	**202**	101	100
Terphenyl-d14 (Surrogate Standard)	**-**	**244**	122	212
Butylbenzylphthalate	**0.010**	**149**	**91**	206
Benzo(a)anthracene	**0.800**	**228**	229	226
3,3'-Dichlorobenzidine	**0.010**	**252**	**254**	126
Chrysene	**0.700**	**228**	226	229
Bis(2-ethylhexyl)phthalate	**0.010**	**149**	167	279
Di-n-octylphthalate	**0.010**	**149**	167	43
Perylene-d12 (Internal Standard 6)		**264**	260	**263,** 265
Benzo(b)fluoranthene	**0.700**	**252**	253	125, 126
Benzo(k)fluoranthene	**0.700**	**252**	253	125, 126
Benzo(a)pyrene	**0.700**	**252**	253	125, 126
Indeno(1,2,3-cd)pyrene	**0.500**	**276**	138	277
Dibenz(a,h)anthracene	**0.400**	**278**	139	279
Benzo(g,h,i)perylene	**0.500**	**276**	138	277, 137

[1] Ions in bold font are characteristic ions >30% relative intensity. Other ions are *borderline* or less than 30%.

Table 7

Analytes in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions, Appendix IX Standard[1]

Analyte (IS)	Minimum RF	Primary	Secondary	Tertiary
1,4-Dichlorobenzene-d4 (Internal Standard 1)		**152**	**150**	**115**
N-Nitrosomethylethylamine	-	**88**	**43**	**42**
Methyl methanesulfonate	-	**80**	**79**	*65*
N-Nitrosodiethylamine	-	**102**	**42**	**44**
Ethyl methanesulfonate	-	**79**	**109**	97
Pentachloroethane	-	**167**	**117**	**119**
Acetophenone	**0.010**	**105**	**77**	120, 51
N-Nitrosopyrrolidine	-	**100**	**41**	**42**
N-Nitrosomorpholine	-	**56**	**86**	**116**
o-Toluidine	-	**106**	**107**	77
Naphthalene-d8 (Internal Standard 2)		**136**	68	54
N-Nitrosopiperidine	-	**42**	**114**	**55**
2,6-Dichlorophenol	-	**162**	**63**	**164**
Hexachloropropene	-	**213**	**211**	**215**
n-Nitrosodi-n-butylamine	-	**84**	**57**	**41**
Isosafrole	-	**162**	**104**	**131**
1,2,4,5-Tetrachlorobenzene	**0.010**	**216**	**214**	**218**
Acenaphthene-d10 (Internal Std. 3)		**164**	**162**	**160**
Safrole	-	**162**	**104**	**131**
1-chloronapthalene	-	**162**	**127**	*164*
1,3-Dinitrobenzene (syn:m-dinitrobenzene)	-	**168**	**75**	**76,50**
Pentachlorobenze	-	**250**	**248**	**252**
1-Naphthylamine	-	**143**	**115**	116
2-Naphthylamine	-	**143**	**115**	116
2,3,4,6-Tetrachlorophenol	**0.010**	**232**	**230**	**234**
5-Nitro-o-toluidine	-	**152**	**77**	**106**
Phenanthrene-d10 (Internal Std. 4)		**188**	94	80
Diphenylamine	-	**169**	**168**	*167*
Phenacetin	-	**108**	**109**	**179**
4-Aminobiphenyl	-	**169**	168	170
Pentachloronitrobenzene	-	**237**	295	**142, 214**
2-secbutyl-4,6-dinitrophenol (Dinoseb)	-	**211**	**163**	*147*
Benzidine	-	**184**	92	185
p-(Dimethylamino)azobenzene	-	**120**	**225**	**77**
3,3'-Dimethylbenzidine (syn: o-tolidine)	-	**212**	211	213
Chrysene-d12 (Internal Standard 5)		**240**	120	*236*
2-Acetylaminofluorene	-	**181**	**180**	**223**
7,12-Dimethylbenz(a)anthracene	-	**256**	**241**	**239**
Perylene-d12 (Internal Standard 6)		**264**	260	**263,** 265
3-Methylcholanthrene	-	**268**	**252**	**253**

[1] Ions in bold font are characteristic ions >30% relative intensity. Other ions are *borderline* or less than 30%.

Table 8

Additional Analyte in Approximate Retention Time Order, Minimum Response Factor and Characteristic Ions

Compound	Minimum RF	Primary	Secondary	Tertiary
Benzaldehyde	**0.01**	**105**	**106**	**77**
Caprolactam	**0.01**	**55**	**56**	**84**
1,1-Biphenyl	**0.01**	**154**	**153**	**152**
Atrazine	**0.01**	**200**	**215**	**173**

Table 9

LCS and Matrix Spike Analytes

Analyte	Spiking Level ug/ml (extract)
Pyridine	200
N-nitrosodimethylamine	100
Aniline	100
Phenol	100
Bis(2-chloroethyl)ether	100
2-Chlorophenol	100
1,3-Dichlorobenzene	100
1,4-Dichlorobenzene	100
Benzyl alcohol	100
1,2-Dichlorobenzene	100
2-Methylphenol	100
2,2'-oxybis(1-chloropropane)	100
3-Methyl & 4-Methylphenol	100
N-Nitroso-di-n-propylamine	100
Hexachloroethane	100
Nitrobenzene	100
Isophorone	100
2-Nitrophenol	100
2,4-Dimethylphenol	100
Benzoic acid	100
Bis(2-chloroethoxy)methane	100
2,4-Dichlorophenol	100
1,2,4-Trichlorobenzene	100
Naphthalene	100
4-Chloroaniline	100
Hexachlorobutadiene	100
4-Chloro-3-methylphenol	100
2-Methylnaphthalene	100
Hexachlorocyclopentadiene	100
2,4,6-Trichlorophenol	100
2,4,5-Trichlorophenol	100
2-Chloronaphthalene	100
2-Nitroaniline	100
Dimethyl phthalate	100
Acenaphthylene	100
2,6-Dinitrotoluene	100
3-Nitroaniline	100
Acenaphthene	100
2,4-Dinitrophenol	200
4-Nitrophenol	200
Dibenzofuran	100

Table 9 (continued)

LCS and Matrix Spike Analytes

Analyte	Spiking Level ug/ml (extract)
2,4-Dinitrotoluene	100
Diethylphthalate	100
4-Chlorophenyl phenyl ether	100
Fluorene	100
4-Nitroaniline	100
4,6-Dinitro-2-methylphenol	200
N-Nitrosodiphenylamine	100
Azobenzene	100
4-Bromophenyl phenyl ether	100
Hexachlorobenzene	100
Pentachlorophenol	200
Phenanthrene	100
Anthracene	100
Carbazole	100
Di-n-butyl phthalate	100
Fluoranthene	100
Pyrene	100
Butyl benzyl phthalate	100
3,3'-Dichlorobenzidine	100
Benzo(a)anthracene	100
Bis(2-ethylhexyl)phthalate	100
Chrysene	100
Di-n-octylphthalate	100
Benzo(b)fluoranthene	100
Benzo(k)fluoranthene	100
Benzo(a)pyrene	100
Indeno(1,2,3-cd)pyrene	100
Dibenz(a,h)anthracene	100
Benzo(g,h,i)perylene	100

Table 10

8270E Surrogate Compounds

Surrogate Compounds	Spiking Level, ug/mL in extract
Nitrobenzene-d5	75
2-Fluorobiphenyl	75
Terphenyl-d14	75
Phenol-d5	75
2-Fluorophenol	75
2,4,6-Tribromophenol	75
$^{13}C_6$- Naphthalene (field surrogate)	100

Table 11

Typical Calibration Levels, Primary Standard, µg/mL

Analyte	Conc 1	Conc 2	Conc 3	Conc 4	Conc 5	Conc 6	Conc 7	Conc 8
1,4-Dioxane	-	5	10	25	40	60	120	200
Pyridine	-	10	20	50	80	120	240	400
N-nitrosodimethylamine	-	5	10	25	40	60	120	200
Aniline	-	5	10	25	40	60	120	200
Phenol	-	5	10	25	40	60	120	200
Bis(2-chloroethyl)ether	-	5	10	25	40	60	120	200
2-Chlorophenol	-	5	10	25	40	60	120	200
1,3-Dichlorobenzene	-	5	10	25	40	60	120	200
1,4-Dichlorobenzene	-	5	10	25	40	60	120	200
Benzyl alcohol	-	5	10	25	40	60	120	200
1,2-Dichlorobenzene	-	5	10	25	40	60	120	200
2-Methylphenol	-	5	10	25	40	60	120	200
2,2'-oxybis(1-chloropropane)[1]	-	5	10	25	40	60	120	200
3 & 4-Methylphenol	-	5	10	25	40	60	120	200
N-Nitroso-di-n-propylamine	-	5	10	25	40	60	120	200
Hexachloroethane	-	5	10	25	40	60	120	200
Nitrobenzene	-	5	10	25	40	60	120	200
Isophorone	-	5	10	25	40	60	120	200
2-Nitrophenol	-	-	10	25	40	60	120	200
2,4-Dimethylphenol	-	5	10	25	40	60	120	200
Benzoic acid	-	-	-	50	80	120	240	400
Bis(2-chloroethoxy)methane	-	5	10	25	40	60	120	200
2,4-Dichlorophenol	-	5	10	25	40	60	120	200
1,2,4-Trichlorobenzene	-	5	10	25	40	60	120	200
Naphthalene	2	5	10	25	40	60	120	200
4-Chloroaniline	-	5	10	25	40	60	120	200
Hexachlorobutadiene	-	5	10	25	40	60	120	200
4-Chloro-3-methylphenol	-	5	10	25	40	60	120	200
2-Methylnaphthalene	2	5	10	25	40	60	120	200
Hexachlorocyclopentadiene	-	-	10	25	40	60	120	200
2,4,6-Trichlorophenol	-	5	10	25	40	60	120	200
2,4,5-Trichlorophenol	-	5	10	25	40	60	120	200
2-Chloronaphthalene	-	5	10	25	40	60	120	200
2-Nitroaniline	-	-	10	25	40	60	120	200
Dimethyl phthalate	-	5	10	25	40	60	120	200
Acenaphthylene	2	5	10	25	40	60	120	200
3-Nitroaniline	-	-	-	25	40	60	120	200
Acenaphthene	2	5	10	25	40	60	120	200
2,4-Dinitrophenol	-	-	-	50	80	120	240	400
4-Nitrophenol	-	-	-	50	80	120	240	400
Dibenzofuran	-	5	10	25	40	60	120	200
2,4-Dinitrotoluene	-	-	10	25	40	60	120	200

Table 11 (continued)

Typical Calibration Levels, Primary Standard, µg/mL

Analyte	Conc 1	Conc 2	Conc 3	Conc 4	Conc 5	Conc 6	Conc 7	Conc 8
2,6-Dinitrotoluene	-	-	10	25	40	60	120	200
Diethylphthalate	-	5	10	25	40	60	120	200
4-Chlorophenyl phenyl ether	-	5	10	25	40	60	120	200
Fluorene	2	5	10	25	40	60	120	200
4-Nitroaniline	-	-	-	25	40	60	120	200
4,6-Dinitro-2-methylphenol	-	-	-	50	80	120	240	400
N-Nitrosodiphenylamine	-	5	10	25	40	60	120	200
Azobenzene[2]	-	5	10	25	40	60	120	200
4-Bromophenyl phenyl ether	-	5	10	25	40	60	120	200
Hexachlorobenzene	-	5	10	25	40	60	120	200
Pentachlorophenol	-	-	-	50	80	120	240	400
Phenanthrene	2	5	10	25	40	60	120	200
Anthracene	2	5	10	25	40	60	120	200
Carbazole	-	5	10	25	40	60	120	200
Di-n-butyl phthalate	-	5	10	25	40	60	120	200
Fluoranthene	2	5	10	25	40	60	120	200
Pyrene	2	5	10	25	40	60	120	200
Butyl benzyl phthalate	-	-	10	25	40	60	120	200
3,3'-Dichlorobenzidine	-	-	-	50	80	120	240	400
Benzo(a)anthracene	2	5	10	25	40	60	120	200
Bis(2-ethylhexyl)phthalate	-	-	10	25	40	60	120	200
Chrysene	2	5	10	25	40	60	120	200
Di-n-octylphthalate	-	-	10	25	40	60	120	200
Benzo(b)fluoranthene	2	5	10	25	40	60	120	200
Benzo(k)fluoranthene	2	5	10	25	40	60	120	200
Benzo(a)pyrene	2	5	10	25	40	60	120	200
Indeno(1,2,3-cd)pyrene	2	5	10	25	40	60	120	200
Dibenz(a,h)anthracene	2	5	10	25	40	60	120	200
Benzo(g,h,i)perylene	2	5	10	25	40	60	120	200

Table 12
Typical Calibration Levels, Appendix IX Analyte, ug/mL

Analyte	Conc 1	Conc 2	Conc 3	Conc 4	Conc 5	Conc 6	Conc 7
N-Nitrosomethylethylamine	5	10	25	40	60	120	200
Methyl methanesulfonate	5	10	25	40	60	120	200
N-Nitrosodiethylamine	5	10	25	40	60	120	200
Ethyl methanesulfonate	5	10	25	40	60	120	200
Pentachloroethane	5	10	25	40	60	120	200
Acetophenone	5	10	25	40	60	120	200
N-Nitrosopyrrolidine	-	10	25	40	60	120	200
N-Nitrosomorpholine	-	10	25	40	60	120	200
o-Toluidine	5	10	25	40	60	120	200
N-Nitrosopiperidine	5	10	25	40	60	120	200
2,6-Dichlorophenol	-	10	25	40	60	120	200
Hexachloropropene	-	10	25	40	60	120	200
n-Nitrosodi-n-butylamine	-	10	25	40	60	120	200
Isosafrole	5	10	25	40	60	120	200
1,2,4,5-Tetrachlorobenzene	5	10	25	40	60	120	200
Safrole	-	10	25	40	60	120	200
1-chloronaphthalene	5	10	25	40	60	120	200
1,3-Dinitrobenzene	-	10	25	40	60	120	200
Pentachlorobenzene	5	10	25	40	60	120	200
1-Naphthylamine	5	10	25	40	60	120	200
2-Naphthylamine	5	10	25	40	60	120	200
2,3,4,6-Tetrachlorophenol	-	10	25	40	60	120	200
5-Nitro-o-toluidine	-	10	25	40	60	120	200
diphenylamine	5	10	25	40	60	120	200
Phenacetin	-	10	25	40	60	120	200
4-Aminobiphenyl	5	10	25	40	60	120	200
Pentachloronitrobenzene	-	10	25	40	60	120	200
2-secbutyl-4,6-dinitrophenol (Dinoseb)	-	10	25	40	60	120	200
Benzidine	-	-	50	80	120	240	400
p-(Dimethylamino)azobenzene	-	10	25	40	60	120	200
3,3'-Dimethylbenzidine (syn:o-tolidine)	-	10	25	40	60	120	200
2-Acetylaminofluorene	-	10	25	40	60	120	200
7,12-Dimethylbenz(a)anthracene	-	10	25	40	60	120	200
3-Methylcholanthrene	-	10	25	40	60	120	200

Table 13
Typical Calibration Levels, Additional Analyte, ug/mL

Benzaldehyde	5	10	25	40	60	120	200
Caprolactam		10	25	40	60	120	200
1,1-Biphenyl	5	10	25	40	60	120	200
Atrazine		10	25	40	60	120	200

Table 14

Initial demonstration recovery and precision limits for aqueous matrices

Analyte	Spiking concentration µg/L	Limit for Relative Standard Deviation	*Limit for average recovery, %
Pyridine	200	±20	40-115
N-nitrosodimethylamine	100	±20	50-111
Aniline	100	±20	40-130
Phenol	100	±20	62-103
Bis(2-chloroethyl) ether	100	±20	67-108
2-Chlorophenol	100	±20	63-103
1,3-Dichlorobenzene	100	±20	65-103
1,4-Dichlorobenzene	100	±20	65-102
Benzyl alcohol	100	±20	40-114
1,2-Dichlorobenzene	100	±20	67-102
2-Methylphenol	100	±20	61-102
Bis(2-chloroisopropyl) ether	100	±20	63-138
3-Methyl & 4-Methylphenol	100	±20	61-101
N-Nitrosodi-n-propylamine	100	±20	40-108
Hexachloroethane	100	±20	62-106
Nitrobenzene	100	±20	65-109
Isophorone	100	±20	68-100
2-Nitrophenol	100	±20	62-120
2,4-Dimethylphenol	100	±20	45-100
Benzoic acid	100	±20	40-135
Bis(2-chloroethoxy)methane	100	±20	64-104
2,4-Dichlorophenol	100	±20	67-107
1,2,4-Trichlorobenzene	100	±20	67-104
Naphthalene	100	±20	65-105
4-Chloroaniline	100	±20	41-106
Hexachlorobutadiene	100	±20	59-100
4-Chloro-3-methylphenol	100	±20	65-108
2-Methylnaphthalene	100	±20	64-104
Hexachlorocyclopentadiene	100	±20	40-100
2,4,6-Trichlorophenol	100	±20	65-109
2,4,5-Trichlorophenol	100	±20	68-107
2-Chloronaphthalene	100	±20	68-103
2-Nitroaniline	100	±20	68-121
Dimethyl phthalate	100	±20	70-107
Acenaphthylene	100	±20	61-112
2,6-Dinitrotoluene	100	±20	69-132
3-Nitroaniline	100	±20	59-105
Acenaphthene	100	±20	60-100
2,4-Dinitrophenol	200	±20	40-170
4-Nitrophenol	200	±20	50-120
Dibenzofuran	100	±20	71-100

Table 14 (continued)

Initial demonstration recovery and precision limits for aqueous matrices

Analyte	Spiking concentration µg/L	Limit for Relative Standard Deviation	*Limit for average recovery, %
2,4-Dinitrotoluene	100	±20	69-126
Diethyl phthalate	100	±20	65-119
4-Chlorophenyl phenyl ether	100	±20	75-107
Fluorene	100	±20	63-105
4-Nitroaniline	100	±20	70-114
2-Methyl-4,6-dinitrophenol	200	±20	47-150
N-Nitrosodiphenylamine	100	±20	66-111
Azobenzene	100	±20	67-115
4-Bromophenyl phenyl ether	100	±20	83-123
Hexachlorobenzene	100	±20	72-104
Pentachlorophenol	200	±20	64-114
Phenanthrene	100	±20	60-106
Anthracene	100	±20	57-114
Carbazole	100	±20	72-110
Di-n-butyl phthalate	100	±20	72-113
Fluoranthene	100	±20	64-112
Pyrene	100	±20	70-110
Benzylbutyl phthalate	100	±20	65-114
3,3'-Dichlorobenzidine	100	±20	40-110
Benz(a)anthracene	100	±20	57-115
Bis(2-ethylhexyl) phthalate	100	±20	67-119
Chrysene	100	±20	52-114
Di-n-octylphthalate	100	±20	71-123
Benzo(b)fluoranthene	100	±20	57-125
Benzo(k)fluoranthene	100	±20	44-130
Benzo(a)pyrene	100	±20	44-129
Indeno(1,2,3-cd)pyrene	100	±20	51-123
Dibenzo(a,h)anthracene	100	±20	54-131
Benzo(ghi)perylene	100	±20	52-126

* Recovery limits based on historical data may be obtained from QA and used in lieu of above recovery limits.

Figure 2: Tailing Factor Calculation

Report Date: 09-Oct-2018 09:35:42 Chrom Revision: 2.3 09-Aug-2018 15:33:44

Preliminary Report

Peak Tailing Report

TestAmerica Knoxville

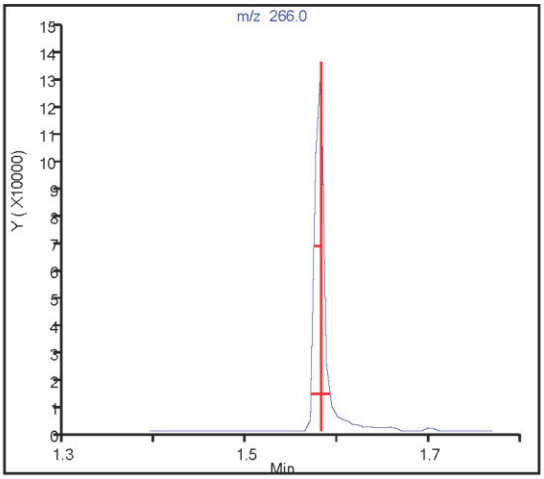
Data File:	\\ChromNA\Knoxville\ChromData\MA\20180815-9074.b\DFTPP.D				
Injection Date:	15-Aug-2018 11:22:30	Instrument ID:	MA		
Lims ID:	DFTPP				
Client ID:					
Operator ID:	403884	ALS Bottle#:	1	Worklist Smp#:	1
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	8270_MA	Limit Group:	MSS - 8270C - ICAL		

14 Pentachlorophenol_T, Detector: MS SCAN

Peak Tailing Factor =
BackWidth/FrontWidth @ 10% Peak Height

Back Width = 0.010 (min.)
Front Width = 0.011 (min.)

Tailing Factor = 0.9, Max. Tailing < 5.00
Passed



18 Benzidine_T, Detector: MS SCAN

Peak Tailing Factor =
BackWidth/FrontWidth @ 10% Peak Height

Back Width = 0.009 (min.)
Front Width = 0.010 (min.)

Tailing Factor = 0.8, Max. Tailing < 3.00
Passed

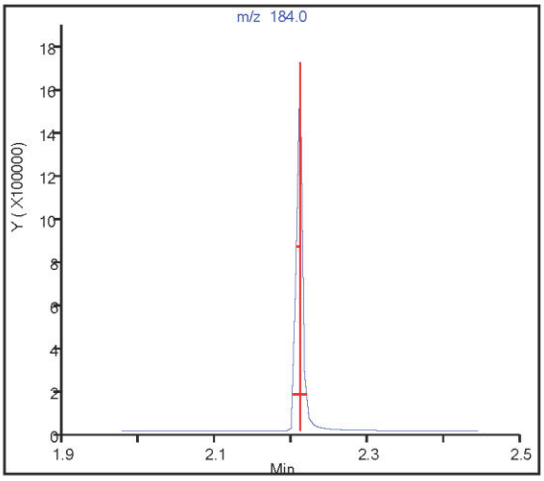


Figure 3: Example of Benzo (b) fluoranthene and Benzo (k) fluoranthene Resolution Calculation

Report Date: 09-Oct-2018 09:35:00 Chrom Revision: 2.3 09-Aug-2018 15:33:44

Preliminary Report

Resolution Report

TestAmerica Knoxville

Data File:	\\ChromNA\Knoxville\ChromData\MA\20180815-9074.b\CCVIS.D				
Injection Date:	15-Aug-2018 11:32:30	Instrument ID:	MA		
Lims ID:	CCVIS				
Client ID:					
Operator ID:	403884	ALS Bottle#:	2	Worklist Smp#:	2
Injection Vol:	1.0 ul	Dil. Factor:	1.0000		
Method:	8270_MA	Limit Group:	MSS - 8270C - ICAL		

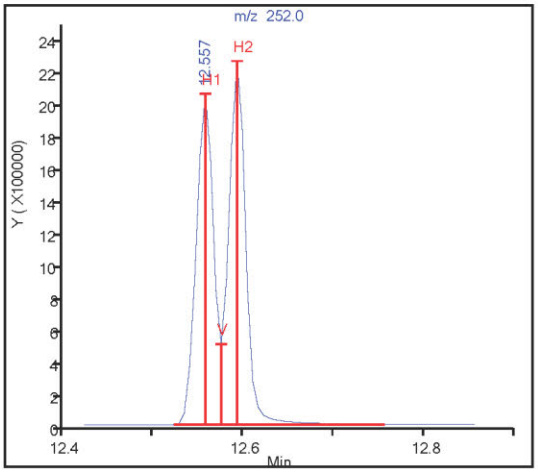
122 Benzo[b]fluoranthene - 123 Benzo[k]fluoranthene

SW-846 Method

Version D: %R = (V / ((H1 + H2)/2)) * 100

V (Valley Height) = 501864
H1(122 Benzo[b]fluoranthen) = 2060584
H2(123 Benzo[k]fluoranthen) = 2265513

Version D: %R = 23.2 <= 50.0
Passed



EUROFINS STANDARD OPERATING PROCEDURE

VOST ANALYSIS

STANDARD OPERATING PROCEDURE

TITLE: VOST ANALYSIS

(SUPERSEDES: KNOX-MS-0011, Rev. 14)

Approvals (Signature/Date):

Anna Barlozhetskaya — Date — Prepared by:	
David Wiles — Date — Technical Specialist	Lewis Osborne — Date — Health & Safety Manager / Coordinator
Kevin McGee — Date — Quality Assurance Manager	Kevin Woodcock — Date — Laboratory Director

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1. SCOPE AND APPLICATION

1.1. This method is applicable to the determination of volatile organic compounds in air or gaseous emissions collected on adsorbents commonly referred to as VOST tubes. The list of standard analytes and reporting limits are located in Table 1.

1.2. This procedure is based upon methods 0030, 0031, 5041A, TO-1, TO-2, and 8260B.

1.3. The approximate working range is 10 to 2000 ng. This method can be used to quantify most volatile organic compounds that have boiling points below 200°C and are insoluble or slightly soluble in water. This method is most successfully applied to the analysis of non-polar organic compounds with boiling points between 30°C and 100°C. (Refer to section 1 of methods 0030, 0031, 5041A, TO1, and TO2 for discussion of application of certain analytes to this method.) Volatile water-soluble compounds can be included in this analytical technique; however, for more soluble compounds, quantitation limits are approximately ten times higher because of poor purging efficiency.

1.3.1. Analysis in Selected Ion Monitoring Mode (SIM) for select analytes will have a lower working range. Analytes and reporting limits are listed in Table 1A.

2. SUMMARY OF METHOD

2.1. Pairs or individual VOST sample tubes are spiked with surrogates via a flash vaporization device. Volatile compounds are introduced into the gas chromatograph by thermally desorbing the analytes from the VOST tube via heater (clamshell or autosampler) and into the purge and trap device. The components are separated via the chromatograph and detected using a mass spectrometer, which is used to provide both qualitative and quantitative information.

2.2. VOST samples are purged directly.

2.3. In the purge and trap process, an inert gas is purged through the VOST tube heated to a temperature of approximately 220 ^{o}C ($\pm$ 10°C) and the volatile components are transferred to the vapor phase. The vapor is swept through the purge and trap device to a sorbent column (trap), where the volatile components are trapped. After purging is completed, the trap is then heated and back-flushed with inert gas to desorb the components onto a gas chromatographic column. The gas chromatographic column is then heated to elute the components that are detected with a mass spectrometer.

2.4. Qualitative identifications are confirmed by analyzing standards under the same conditions used for samples and comparing the resultant mass spectra and GC retention times. Each identified component is quantified by relating the MS response for an appropriate selected ion produced by that compound to the MS response for another ion produced by an internal standard.

2.4.1. Qualitative identification in SIM mode may provide a lesser degree of confidence in the compound identification

3. DEFINITIONS

3.1. Tenax® or Tenax® GC - A porous polymer solid adsorbent, used for trapping organic compounds.

3.2. Batch: The batch is a set having up to 20 samples of the same matrix processed using the same procedures and reagents within the same time period. Using this method, each BFB analysis will normally start a new batch.

3.2.1. The Quality Control batch must contain a matrix spike/spike duplicate (MS/MSD), a Laboratory Control Sample (LCS) (and Laboratory Control Sample Duplicate (LCSD) if there is no MS/MSD), and a method blank.

3.3. Method Blank: A method blank consisting of all reagents added to the same matrix as the samples must be analyzed with each batch of samples. The method blank is used to identify any background interference or contamination of the analytical system that may lead to the reporting of elevated concentration levels or false positive data.

3.4. Laboratory Control Sample and Duplicate (LCS/D): Laboratory Control Samples are well characterized, laboratory generated samples used to monitor the laboratory's day-to-day performance of routine analytical methods. The LCS/D, spiked with a group of target compounds representative of the method analytes, is used to monitor the accuracy of the analytical process, independent of matrix effects. Ongoing monitoring of the LCS/D results provides evidence that the laboratory is performing the method within accepted QC guidelines for accuracy and precision. The LCS/D should be analyzed on the same matrix as the samples. The limits for LCS/D are determined at least annually for each VOST matrix. See also section 9.2.

3.5. Surrogates: Surrogates are organic compounds which are similar to the target analytes in chemical composition and behavior in the analytical process, but which are not normally found in environmental samples. Each standard, sample, blank, and LCS is spiked with surrogate standards. Surrogate spike recoveries must be evaluated by determining whether the concentration (measured as percent recovery) falls within the required recovery limits. The surrogates are listed in Table 3. The limits for surrogates are determined at least annually for each VOST matrix. See also section 9.2.

3.6. Calibration Check Compound (CCC): CCCs are a representative group of compounds that are used to evaluate initial calibrations and continuing calibrations. Relative percent difference for the initial calibration and % drift for the continuing calibration response factors are calculated and compared to the specified method criteria. The CCC's and their criteria are listed in Table 7.

3.7. System Performance Check Compounds (SPCC): SPCCs are compounds that are sensitive to system performance problems and are used to evaluate system performance and sensitivity. A response factor from the continuing calibration is calculated for the SPCC compounds and compared to the specified method criteria. The SPCC's and their criteria are listed in Table 6.

3.8. Internal Standards (IS): Internal Standards are compounds added in the analysis of every standard, QC sample, client sample or extract at a known concentration prior to analysis for the purpose of quantitation. Internal standards are used as the basis for quantitation of target compounds by GC/MS. The internal standards and their parameters are listed in Table 2. See section 11.6.1 for internal standard criteria. The internal standard can also serve as an indicator for purging efficiency.

3.9. Additional definitions can be found in the Eurofins Knoxville Quality Assurance Manual (QAM), current revision.

4. INTERFERENCES

4.1. Method interferences may be caused by contaminants in solvents, reagents, glassware, and other processing apparatus that lead to discrete artifacts. All of these materials must be routinely demonstrated to be free from interferences under conditions of the analysis by running laboratory method blanks as described in the Quality Control section of this procedure. The use of ultra high purity gases, pre-purged purified reagent water, and approved lots of purge and trap grade methanol will greatly reduce introduction of contaminants. In extreme cases the purging vessels may be pre-purged to isolate the instrument from laboratory air contaminated by solvents used in other parts of the laboratory.

4.2. Samples can be contaminated by diffusion of volatile organics (particularly methylene chloride and fluorocarbons) into the sample through the VOST ferrules and enclosures during shipment and storage. A field blank prepared and carried through the sampling and handling protocol can serve as a check on such contamination. VOST tubes should be shipped within the glass vials in which they are received from the vendor.

4.3. Matrix interferences may be caused by non-target contaminants that are co-extracted from the sample. The extent of matrix interferences will vary considerably from source to source depending upon the nature and diversity of the site being sampled. See section 9.3 under surrogate recoveries.

4.4. At least one pair of blank VOST tubes should be included with the shipment to serve as trip blanks. These are treated like field blanks except that the end caps are not removed during storage. These are analyzed to monitor the potential contamination, which may occur during storage and shipment.

4.5. Cross-contamination can occur whenever high-level and low-level samples are analyzed sequentially or in the same purge position on an autosampler. Whenever an unusually concentrated sample is analyzed, it should be followed by one or more blanks to check for cross-contamination. The purge and trap system may require extensive bake-out and cleaning after a high-level sample.

4.6. In-house tubes used for blanks and QC should be pre-conditioned in an oven and purged with nitrogen. Tubes should be closely monitored for breakdown products and contamination. Acceptability is documented by passing the QC criteria for which the VOST tube is analyzed for. It is strongly recommended NOT to re-use Anasorb® 747 tubes. For this reason, whenever Anasorb® 747 is used, the client is asked to supply additional unopened tubes.

5. SAFETY

5.1. Employees must abide by the policies and procedures in the Corporate Environmental Health and Safety Manual, Radiation Safety Manual and this document.

5.2. Specific Safety Concerns or Requirements

5.2.1. The gas chromatograph and mass spectrometer contain zones that have elevated temperatures. The analyst needs to be aware of the locations of those zones, and must cool them to room temperature prior to working on them.

5.2.2. The mass spectrometer is under deep vacuum. The mass spectrometer must be brought to atmospheric pressure prior to working on the source. Depending on the type of work involved, either turn the power to the instrument off, or disconnect it from its source of power.

5.2.3. Primary Materials Used: The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. **The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Methanol	Flammable Poison Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.
1– Exposure limit refers to the OSHA regulatory exposure limit.			

5.2.4. Chemicals that have been classified as carcinogens, or potential carcinogens, under OSHA include acrylonitrile, benzene, carbon tetrachloride, chloroform, 1,2-dibromo-3-chloropropane, 1,4-dichlorobenzene, and vinyl chloride.

5.3. Exposure to chemicals must be maintained **as low as reasonably achievable**; therefore, unless they are known to be non-hazardous, all samples should be opened, transferred, and prepared in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers will be kept closed unless transfers are being made.

5.4. The preparation of standards and reagents will be conducted in a fume hood with the sash closed as far as the operations will permit.

5.5. All work must be stopped in the event of a known or potential compromise to the health and safety of an associate. The situation must be reported **immediately** to a laboratory supervisor.

6. EQUIPMENT AND SUPPLIES

6.1. Microsyringes: 10 µL and larger.

6.2. Vials: 20 and 40 mL with screw caps and Teflon liners.

6.3. Volumetric flasks: 10 mL, 50 mL and 100 mL class A with ground-glass stoppers.

6.4. Disposable Pasteur pipettes.

6.5. Gases:

6.5.1. Helium: Ultra high purity.

6.5.2. Nitrogen: Ultra high purity, from cylinders, bulk tank, or gas generators, may be used as an alternative to helium for purge gas.

6.5.3. Compressed air: Used for instrument pneumatics.

6.5.4. Liquid nitrogen: Used for cryogenic cooling if necessary.

6.6. VOST flash vaporization device: a heater capable of maintaining the chamber temperature of approximately 180 ^{o}C ($\pm$ 10°C), with a helium or nitrogen flow rate of approximately 100 mL/min.

6.7. Clamshell or autosampler heating device capable of maintaining the temperature of 220 ^{o}C that desorbs the VOST sample into the purge and trap device.

6.8. Purge and Trap Device: The purge and trap device consists of the sample purger, the trap, the desorber and the transfer line to the GC.

6.8.1. Sample Purger: The recommended purging chamber is designed to accept 25 mL samples with a water column at least 3 cm deep. The purge gas must pass through the water column as finely divided bubbles. Alternative sample purge devices may be used provided equivalent performance is demonstrated.

6.8.2. Trap: A variety of traps may be used, depending on the target analytes required. For most purposes the Vocarb 3000 trap is suitable. Other traps, such as Vocarb 4000, or Tenax/Silica gel/charcoal may be used if the QC criteria are met.

6.8.3. Desorber: The desorber should be capable of rapidly heating the trap to 260°C. Many such devices are commercially available.

6.9. Gas Chromatograph/Mass Spectrometer System:

6.9.1. Gas Chromatograph: The gas chromatograph (GC) system must be capable of temperature programming.

6.9.2. Gas Chromatographic Columns: Capillary columns are used. Some typical columns are listed below:

6.9.2.1. Column 1: 60 m x 0.18 ID Rtx-624 with 1.0 µm film thickness.

6.9.2.2. Column 2: 20 m x 0.18 ID DB-624 with 1.0 µm film thickness.

6.9.3. Mass Spectrometer: The mass spectrometer must be capable of scanning 35-300 AMU every two seconds or less, using 70 volts electron energy in the electron impact mode and capable of producing a mass spectrum that meets the required criteria when 50 ng of 4-Bromofluorobenzene (BFB) are injected onto the gas chromatograph column inlet.

6.9.4. GC/MS interface: In general, direct column interface to the mass spectrometer is used, but any interface (such as jet separators) that achieves all acceptance criteria may be used.

6.10. Data System: A computer system that allows the continuous acquisition and storage on machine-readable media of all mass spectra obtained throughout the duration of the chromatographic program. The computer must have software that allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundances versus time or scan number. This type of plot is defined as an Extracted Ion Current Profile (EICP). Software must also be available that allows integrating the abundances in any EICP between the specified time or scan-number limits. Also, for the non-target compounds, software must be available that allows for the comparison of sample spectra against reference library spectra. The most recent release of the NIST/EPA mass spectral library should be used as the reference library. The computer system must also be capable of backing up data for long-term off-line storage. This laboratory utilizes “Agilent ChemStation” for its data acquisition and “Chrom”, developed by Eurofins, as its data processing software.

7. REAGENTS AND STANDARDS

7.1. Reagent Water: High purity water that meets the requirements for a method blank when analyzed (See section 9.4). Reagent water may be purchased as commercial distilled water and prepared by purging with an inert gas overnight. Other methods of preparing reagent water are acceptable.

7.2. Standards

7.2.1. Calibration Standards

7.2.2. Stock Solutions: Stock solutions may be purchased as certified solutions from commercial sources or prepared from pure standard materials as appropriate. These standards are prepared in methanol and stored in Teflon-sealed screw-cap bottles with minimal headspace at less than -10°C.

7.2.2.1. Unopened stock solutions expire according to the manufacturer’s expiration date. Once opened, the stock solution expires on the manufacturer’s expiration date or in 6 months, whichever is shorter. Stock standards prepared from pure standard materials expire 6 months from date of preparation. Stock standards for gases expire one week after opening.

7.2.3. Working standards: A working solution containing the compounds of interest prepared from the stock solution(s) in methanol. These standards are stored in the freezer or as recommended by the manufacturer. Working standards are monitored by comparison to the initial calibration curve. If any of the

calibration check compounds drift in response from the initial calibration by more than 20% then corrective action is necessary. This may include steps such as instrument maintenance, preparing a new calibration verification standard or tuning the instrument. If the corrective actions do not correct the problem then a new initial calibration must be performed.

7.2.3.1. Working standards made from stock solutions shall be replaced after one week. Working standards for gases shall be replaced after one week. Unopened working level solutions prepared by the manufacturer expire according to the manufacturer's expiration date. Once opened, the solution expires in one week or on the manufacturer's expiration date, whichever is sooner.

7.2.3.2. Aqueous Calibration Standards are prepared in reagent water using the secondary dilution standards. These aqueous standards must be prepared daily.

7.2.4. Internal Standards: Internal standards are added to the water sparger for all samples, standards, blank, and QC analyses. Refer to Table 2 (or Table 2A for SIM) for internal standard components.

7.2.5. Surrogate Standards: Refer to Table 3 (or Table 3A for SIM) for surrogate standard components and spiking levels.

7.2.6. Laboratory Control Sample Spiking Solutions: The LCS contains a representative subset of the analytes of interest in Table 1.

7.2.7. Tuning Standard: A standard is made up that will deliver 50 ng of bromofluorobenzene on-column upon injection

7.2.7.1. Note: A tuning standard is not required for SIM analysis.

8. SAMPLE COLLECTION, PRESERVATION AND STORAGE

8.1. Holding time for VOST analysis is 14 days from sample collection.

8.2. Samples must be stored in a volatile-free storage area at less than 10 ^{o}C until analysis. Samples are typically stored at 4 $\pm$ 2°C. This applies to both VOST tubes and condensates. pH preservation is not required. A water holding blank should be stored in the same location as the condensate and monitored on a routine basis. VOST media checks can serve as storage blanks for VOST tubes.

8.3. Sample Collection: Sampling is not performed for this method by Knoxville. For information regarding sample shipping, refer to SOP KNOX-SC-0003, "Sample

Receipt and Log In", current revision. Also see the appropriate methodology for sample collection, such as T01 and method 0031.

9. QUALITY CONTROL

9.1. Initial Demonstration of Capability

9.1.1. For the standard analyte list, the initial demonstration and method detection limit (MDL) studies described in Section 13 must be acceptable before analysis of samples may begin.

9.1.2. For non-standard analytes, a MDL study should be performed and calibration curve generated before analyzing any samples, unless lesser requirements are previously agreed to with the client. In any event, the minimum initial demonstration required is analysis of a standard at the reporting limit and a single point calibration.

9.2. Control Limits: In-house historical control limits must be determined for surrogates, and laboratory control samples (LCS). These limits must be determined at least annually. The recovery limits are mean recovery +/- 3 standard deviations for surrogates and LCS. Precision limits for LCS/LCSD are 0 to mean relative percent difference + 3 standard deviations.

9.2.1. All surrogates and LCS/LCSD must be entered into LIMS (when available) or other database so that accurate historical control limits can be generated.

9.3. Surrogates: Every sample, blank, and QC sample is spiked with surrogates. Surrogate recoveries in samples, blanks, and QC samples must be assessed to ensure that recoveries are within established limits. The surrogate control limits must be within 50 to 150% recovery. Matrix effects may be determined by technical review of the data. Corrective action should be made if the out of control event is suspected to be from leaking. The compounds included in the surrogate spiking solutions are listed in Table 3 (or Table 3A for SIM). If any surrogates are outside limits, the following corrective actions must take place:

- Check all calculations for error.
- Ensure that instrument performance is acceptable.
- Recalculate the data and/or analyze a backup sample if either of the above checks reveals a problem.
- Flag the data as "Estimated Concentration" if neither of the above resolves the problem.

9.3.1. The decision to analyze the backup sample or flag the data should be made in consultation with the client.

9.3.2. If surrogates spiked immediately before analysis cannot be observed with acceptable recovery, the implications for target organic analytes which have been sampled in the field must be assessed very carefully. For example, if there is only one or two target analytes and non-associated surrogates are low, while the surrogate associated with the target analytes (based on internal standard association and retention time) are within limits, there may not be an impact on the data. Chromatographic inspection for trends, interferences, and/or co-elutions must be performed. This must be discussed within the case narrative.

9.4. Method Blanks: For each batch of samples, analyze a method blank. The method blank is analyzed after the calibration standards and before any samples. The method blank consists of a clean VOST tandem tube pair (i.e tenax/tenax charcoal, or tenax/tenax Anasorb® of the same adsorbents as the samples), and reagent water in the purging vessel. Surrogates are added to the VOST tube as described in section 11.5, and internal standards are added to the water. The method blank is carried through the entire analytical procedure. The method blank must not contain any analytes of interest at or above the reporting limit (except common laboratory contaminants, see below) or at or above 10% of the measured concentration of that analyte in the associated samples, whichever is higher.

- If the analyte is a common laboratory contaminant (methylene chloride, acetone, 2-butanone) the data may be reported with qualifiers if the concentration of the analyte is less than five times the reporting limit.

- If there is no target analyte greater than the RL in the samples associated with an unacceptable method blank, the data may be reported with qualifiers. Such action should be done in consultation with the client.

9.4.1. The method blank must have acceptable surrogate recoveries. If surrogate recoveries are not acceptable, the data must be evaluated to determine if the method blank has served the purpose of demonstrating that the analysis is free of contamination. If surrogate recoveries are low and there are reportable analytes in the associated samples, consultation with the client should take place. Poor surrogate recovery in the method blank must be clearly noted in the project narrative.

9.4.2. For samples associated with an unacceptable method blank and reanalysis of the batch is not possible due to limited sample or other constraints, the method blank is reported and appropriate comments must be made in a nonconformance memo and the case narrative to provide further documentation.

9.4.3. Target analytes reported as found in the samples that are also detected in the blank are flagged with a “B” qualifier.

9.5. Laboratory Control Samples (LCS): For each batch of samples, analyze a LCS/LCSD. The LCS is analyzed after the calibration standard, and normally before any samples. The LCS consists of the VOST tandem tube pair (i.e tenax/tenax charcoal, or tenax/tenax Anasorb®) containing the same adsorbents as the samples. Load the VOST with the spiking compounds and surrogates as described in section 11.5. The LCS contains a representative subset of the analytes of interest (see Table 1). The analytes are spiked at the same concentration as the calibration verification standard.

9.5.1. Historical LCS limits are based on the mean recovery +/- 3 standard deviations as described in SOP KNOX-QA-0004, current revision. Marginal exceedances are allowed depending on the number of target analytes requested. The control limits for marginal exceedences are set to mean +/- 4 standard deviations. See the following table for the number of allowed marginal exceedances.

Number of target analytes in LCS	Allowable # of marginal exceedances of LCS control limits
>90	5
71 – 90	4
51 – 70	3
31 – 50	2
11 – 30	1
< 11	0

9.5.2. An LCS is considered to be “out of control” if any target analyte is outside marginal exceedance limits, or if the total number of marginal exceedances is more than the allowed number. A nonconformance memo must be issued and corrective action must occur.

9.5.3. If marginal exceedances are observed, the analyst must review the previous LCS (e.g., review the control chart) for each analyte marginally exceeding the control limits to determine if the marginal exceedance is a consecutive occurrence. If there are two consecutive marginal exceedances for the same analyte, the LCS is considered “out of control” and an NCM must be generated and corrective action taken.

9.5.3.1. When evaluating the control chart, the analyst should also check whether there was more than one out of the last three consecutive

LCSs outside control limits. If more than one out of the last three LCSs was outside the LCS control limits but within the marginal exceedance limits, then the analyst should evaluate the system for non-random systematic trends.

9.5.4. Samples in the same batch as an LCS determined to be "out of control" shall be considered suspect. Since reanalysis of the batch is not possible due to the nature of the VOST analysis, the LCS is reported, a nonconformance memo is initiated and appropriate comments are made in a narrative to provide further documentation.

9.5.5. Ongoing monitoring of the LCS provides evidence that the laboratory is performing the method within accepted QC guidelines for accuracy and precision.

9.6. If full analyte spike lists are used, only the control analytes listed in Table 1 are required to be within acceptance limits unless otherwise specified by the client.

9.7. For internal standard recovery acceptance criteria, refer to section 11.6.1.

10. CALIBRATION AND STANDARDIZATION

10.1. Summary: Prior to the analysis of samples and blanks, each GC/MS system must be tuned and calibrated. Hardware tuning is checked through the analysis of the 4-bromofluorobenzene (BFB) to establish that a given GC/MS system meets the standard mass spectral abundance criteria. The GC/MS system must be calibrated initially at a minimum of five concentrations (analyzed under the same BFB electronic settings), to determine the linearity of the response utilizing target calibration standards. Once the system has been calibrated, the calibration must be verified each twelve hour time period for each GC/MS system

10.1.1. Note: A BFB tune is not required for SIM analysis. The mass spectrometer is tuned as needed using perfluorotributylamine (PFTBA) and the instrument data system autotune program. Select the BFB tune optimization profile for the autotune program.

10.2. Recommended Instrument Conditions

10.2.1. General (full scan mode)

Electron Energy:	70 volts (nominal)
Mass Range:	35–300 AMU
Scan Time:	to give at least 5 scans/peak, but not to exceed 2 second/scan
Injector Temperature:	200–250°C

Source Temperature:	According to manufacturer's specifications
Transfer Line	Temperature: 250–300°C
Purge Flow:	30 mL/minute
Carrier Gas	Flow: 15 mL/minute
Make-up Gas Flow:	25–30 mL/minute

10.2.2. SIM mode:

Recommended GC & GC/MS Conditions are the same as 10.2.1 except the mass range is determined by the quantitation and secondary/tertiary ions monitored for each analyte, internal standard, and surrogate. See table 9 for the primary ion for quantitation, and use at least one of the secondary and/or tertiary ions as a monitor ion. Use the retention times from the full-scan analysis to set the MID switchpoints so that each analyte's elution time falls within their respective MID groups. See Figure 1 for example of GC & GC/MS conditions and settings

10.3. Gas chromatograph suggested temperature program

10.3.1. BFB Analysis

Isothermal:	170°C

10.3.2. Sample Analysis

Initial Temperature:	35°C
Initial Hold Time:	4 minutes
Temperature Program:	8°C/minute
Final Temperature:	184°C
Second Temperature Program:	40°C/minute
Final Temperature:	240°C
Final Hold Time:	2.6 minutes

10.4. Instrument Tuning: Each GC/MS system must be hardware-tuned to meet the abundance criteria listed in Table 5 for a maximum of a 50 ng injection or purging of BFB. Analysis must not begin until these criteria are met. These criteria must be met for each twelve-hour time period. The twelve-hour time period begins at the moment of injection of BFB.

10.4.1. The typical approach is to use the average of the peak apex, the scan immediately before the apex, and the scan immediately after the apex, with background subtraction of a single scan. This single scan must be prior to and within 20 scans of the start of the BFB elution but must not be part of the BFB peak. Alternatively the peak apex may be used. Background subtraction is required. If all the criteria in Table 5 are not achieved, the analyst must retune the mass spectrometer and repeat the test until all criteria

are achieved. The performance criteria must be achieved before any samples, blanks, or standards are analyzed

10.4.2. Note: A BFB tune is not required for SIM analysis. The 12-hour period begins at the moment of injection of the first acceptable ICAL point.

10.5. Initial Calibration

10.5.1. A series of at least five initial calibration standards is prepared and analyzed for the target compounds. Typical calibration levels for the VOST purge are: 8, 25, 250, 500, 1000 and 2000 ng. Certain analytes are prepared at higher concentrations due to poor purge performance. Table 5 (or Table 5A for SIM) lists the calibration levels for each analyte. Other calibration levels and purge volumes may be used depending on the capabilities of the specific instrument. However, the same purge volume must be used for calibration and sample analysis, and the low level standard must be at or below the reporting limit. Surrogates are spiked at the same concentration throughout the calibration levels at 150 ng.

10.5.2. All calibration standards, internal standards, and surrogates are spiked into the purge water, not a VOST tube, for calibration.

10.5.3. It may be necessary to analyze more than one set of calibration standards to encompass all of the analytes required for some projects.

10.5.4. Internal standard calibration is used. The internal standards are listed in Table 2 (or Table 2A for SIM). Target compounds should reference the nearest internal standard. Each calibration standard is analyzed and the response factor (RF) for each compound is calculated using the area response of the characteristic ions against the concentration for each compound and internal standard. See equation 1, Section 12, for calculation of response factor.

10.5.5. The % RSD of the calibration check compounds (CCC) must be $\leq$ 30%. Refer to Table 8 for the CCCs.

10.5.5.1. If none of the CCCs are required analytes, project specific calibration specifications must have QA and technical approval.

10.5.6. The average RF must be calculated for each compound. A system performance check is made prior to using the calibration curve. The five system performance check compounds (SPCC) are checked for a minimum average response factor. Refer to Table 7 for the SPCC compounds and required minimum response factors.

10.5.6.1. If none of the SPCCs are required analytes, project specific calibration specifications must have QA and technical approval.

10.5.7. The analyst will evaluate analytes with %RSD > 15% for calibration on a curve.

10.5.7.1. If the average of all the %RSDs in the initial calibration is > 15%, then calibration on a curve must be used for those analytes with %RSD > 15%. Linear or quadratic curve fits may be used. Use of 1/Concentration^2 weighting may be used to improve the accuracy of quantitation at the low end of the curve. The analyst should consider instrument maintenance to improve the linearity of response. The correlation coefficient (coefficient of determination for non-linear curves) must be ≥ 0.990.

10.5.7.1.1. Analyst may elect to drop points from the calibration to improve subsequent quantitation. The rules for dropping points are:

- May drop points below the RL as long as there is a point remaining at or below the RL.
- May drop high points, decreasing linear range.
- May **NOT** drop a point between points.

For more guidance see “”Calibration Curves & Selection of Calibration Points”, NDSC-QA-QP44940, current revision.

10.5.7.1.2. Rules for curve use:

- The r^2 value obtained from Chrom must be >0.990.
- At least 5 points must be used for average or linear curve.
- At least 6 points must be used for a quadratic curve.
- For quadratic curves, the tangent line to the slope of the curve must be continuous and have either only positive or negative slopes (i.e., no parabolas or breaks in the curve).
- Forcing through zero is allowed.
- If “forced through zero” is *not* used, the X and Y-intercept must be below the RL. Chrom uses the

value in the ICAL limit group "ICVZERO" to evaluate the intercept.

10.5.8. A read-back of the low calibration point used in the calibration curve should have a read-back (%D) of no more than 50% for any calibration model. However, common laboratory contaminants (i.e. methylene chloride and acetone) and poor performing compounds (defined by QA and control charts) may have a read-back limit of no more than 80%.

10.5.8.1. A read-back of the non-low level standards of the initial calibration should have a read-back (%D) of no more than 40% for any calibration model. However, common laboratory contaminants (i.e. methylene chloride and acetone) and poor performing compounds (defined by QA and control charts) may have a read-back limit of no more than 50%.

10.5.9. Initial Calibration Verification Standard (2nd Source Standard): A mid-level standard from a second source is analyzed as initial calibration verification (ICV). The ICV shall be analyzed with each initial calibration. The ICV must be within +/- 30% of its expected value. Poorer performing analytes may have an alternate acceptance criterion with QA approval (e.g., ketones < 35% and alcohols <40%). If the criteria are not met, the analyst must first verify the concentrations of the primary and secondary source standards and calculations. If no errors are found, repeat the ICV analysis.

10.5.10. If time remains in the 12-hour period initiated by the BFB injection before the initial calibration, samples may be analyzed. Otherwise, proceed to continuing calibration.

10.5.11. Non-standard analytes are sometimes requested. Upon client approval, it may be acceptable to analyze a single standard at the reporting limit with each continuing calibration rather than a five point initial calibration.

10.6. Continuing Calibration: The initial calibration must be verified every twelve hours.

10.6.1. Continuing calibration begins with analysis of BFB as described in Section 10.4. If the system tune is acceptable, the continuing calibration standard(s) are analyzed. The same procedure as described in section 10.5.2 for spiking is used. The level 4 calibration standard is typically used for continuing calibration.

10.6.1.1. Note: A BFB tune is not required for SIM analysis. The 12-hour period begins at the moment of injection of an acceptable CCV.

10.6.2. The RF data or concentrations from the standards are compared with the average RF or concentrations from the initial five-point calibration to determine the percent drift of the CCC compounds. The calculation is given in Section 12.4.4.

10.6.2.1. The % drift or difference of the CCCs must be ≤ 20% for the calibration verification to be valid. The SPCCs are also monitored. The SPCCs must meet the criteria described in Table 7. In addition, the % drift of each analyte must be ≤ 50%. If none of the CCCs or SPCCs are required analytes, project specific calibration specifications must have QA and technical approval.

10.6.2.2. If any CCC is outside limits, but all the project specific analytes are ≤ 20 % D, then analysis may proceed with project manager/client approval. This must be documented in the project narrative.

10.6.3. If the CCCs and or the SPCCs do not meet the criteria in Section 10.6.2., the system must be evaluated and corrective action must be taken. The BFB tune and continuing calibration must be acceptable before analysis begins. Extensive corrective action such as installation of a different column will require a new initial calibration.

10.6.4. Once the above criteria have been met, sample analysis may begin. **Initial calibration average RFs (or the calibration curve) will be used for sample quantitation, not the continuing calibration RFs.** Analysis may proceed until 12 hours from the injection of the BFB have passed. (A sample purging less than or equal to 12 hours after the BFB is acceptable.)

10.6.4.1. Note: For SIM, the 12-hour clock is from the injection of an acceptable CCV or first point in the initial calibration series

10.6.5. If the retention time for any internal standard in the continuing calibration changes by more than 0.5 minutes from the mid-level initial calibration standard, the chromatographic system must be inspected for malfunctions and corrected.

10.6.6. If the internal standard response in the continuing calibration is more than 200% or less than 50% of the response in the mid-level of the initial calibration standard, the chromatographic system must be inspected for malfunctions and corrected.

11. PROCEDURES

11.1. One time procedural variations are allowed only if deemed necessary in the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variation in procedure, except those specified by project specific instructions, shall be completely documented using a Nonconformance Memo and approved by a Technical Specialist, Project Manager and QA Manager. A description of the procedural variations will be noted in the narrative.

11.2. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

11.3. Preliminary Evaluation: Any information regarding the level of potential contaminants on the VOST from the client is helpful. Alternatively, appropriate information may be determined from sample histories or client information.

11.4. Batch Requirements: All analysis conditions for samples must be the same as for the continuing calibration standards (including purge time, temperature, and flow, desorb time and temperature, column temperatures, multiplier setting etc.).

11.4.1. All samples must be analyzed as part of a batch. The batch is a set of up to 20 samples of the same matrix processed using the same procedures and reagents within the same time period. The batch also must contain a LCS, LCSD, and a method blank.

11.4.1.1. Laboratory generated QC samples (blank, LCS, media checks) do not count towards the maximum 20 samples in a batch. Field QC samples are included in the batch count.

11.5. VOST Analysis Procedure

11.5.1. All samples and standard solutions must be at ambient temperature before analysis.

11.5.2. Place the VOST sample on the flash vaporization device (180 ^{o}C $\pm$ 10°C and 100 ml/min) so that the flow is in the same direction as the sampling event. Note in the TALS worksheet comments any cracks or broken glass on the VOST tube, or appearance of the tube that deviates from the norm, such as high moisture content or yellowed adsorbents.

11.5.3. Inject 250 ng (2.5 ng for SIM) of surrogate standard onto the VOST flash vaporization device. After at least one minute, remove the VOST and cap snugly or place immediately onto the purging device.

11.5.3.1. It is critical that the above steps be performed in a consistent manner to reduce bias.

11.5.4. Place 25 mL of water on the purge and trap device containing 250 ng (2.5 ng for SIM) of internal standards.

11.5.5. Attach the VOST to the purging device so that the flow is in the opposite direction of the sampling event. Place the VOST in the clamshell or autosampler heating device.

11.5.6. Purge the VOST sample, using a purge time of 12 minutes, at $220^{o}C \pm 10^{o}C$.

11.5.7. After purging is complete, desorb the sample from the trap, start the GC temperature program, and begin data acquisition. After desorption, bake the trap to condition it for the next analysis. When the trap is cool, it is ready for the next sample.

11.5.8. Desorb and bake time and temperature are optimized for the type of trap in use. The same conditions must be used for samples and standards.

11.6. Initial review and corrective actions

11.6.1. Any samples that do not meet the internal standard criteria for the continuing calibration must be evaluated for validity.

Note: The samples reference the continuing calibration, not the initial calibration, for the internal standard criteria; see sections 10.6.5 and 10.6.6. If the change in sensitivity is a matrix effect consistent in all three tubes from the same sampling event, analysis of the archive tube is not necessary. The sample in question must be bracketed by acceptable runs and the system must be control (i.e., no leaks were suspected). The decision to analyze a backup tube may also be client-specific. If the change in sensitivity is due to instrumental problems, all affected backup samples must be analyzed after the problem is corrected.

11.6.2. The surrogate standard recoveries are evaluated to ensure that they are within limits. Corrective action for out of control surrogates will normally be to analyze a backup sample. However, if the surrogate standard response is out high and there are no target analytes or tentatively identified compounds, analysis of the archive tube may not be necessary. An out of control surrogate standard response may be due to a matrix effect. The decision to analyze the backup sample (archive tube) or flag the data should be made in consultation with the client.

11.7. Dilutions: The direct purge of VOST tubes onto the GCMS instrumentation uses the entire sample. Using this technique, no dilutions or reanalysis may be performed. It is imperative that communications be well established between the client and the analyst as to the expected amount of analyte on the VOST tubes.

11.8. Values Exceeding Calibration Range: If any analyte(s) exceed the calibration range of the instrument, the analyte(s) must be flagged with an "E". All analytes that saturate the detector of the mass spectrometer must also be flagged with an "e" qualifier. Both of these conditions must be discussed in the project narrative.

11.9. All target analytes that co-elute with target or non-target analytes which saturate the detector of the mass spectrometer must be carefully evaluated for false positives or suppression of ions. If necessary, this condition must be discussed in the project narrative.

11.10. Troubleshooting Guide (Refer to the manufacturer's manual for specific guidance)

11.10.1. Daily Instrument Maintenance: In addition to the checks listed in the instrument maintenance schedule in TestAmerica Knoxville QAM, the following daily maintenance should be performed as necessary.

11.10.1.1. Install new or cleaned injection port liner

11.10.1.2. Install new septum

11.10.1.3. Install new inlet seal

11.10.1.4. Perform/adjust mass calibration (autotune/BFB tune)

11.10.1.5. Increase/decrease EM voltage to desired sensitivity based on internal standard response

11.10.2. Major Maintenance: A new initial calibration is necessary following major maintenance. Major maintenance includes changing the column, repairing the source, changing electronics, replacing the multiplier or replacing trap in the purge and trap.

11.10.3. Minor Maintenance

11.10.3.1. Minor maintenance includes daily instrument maintenance described in 11.10.1, cleaning injector port, replacing filters, changing pump oil, autotuning, cleaning the source, replacing source insulators, replacing or switching filaments, replacing transfer line, change/refill IS/surrogate standard vial, changing seals and o-rings, ballasting pump, replacing fuses, or replacing roughing pumps

11.10.3.2. Replace filters and change pump oil about every 6-12 months

11.10.3.3. A multiplier gain check is performed if sensitivity is still poor and/or analyst suspects that the multiplier is going bad

11.10.3.4. Autotuning is performed if the analyst notices mass misassignments or a drift in the response of analytes or internal standards

11.10.3.5. If minor maintenance does not result in acceptable chromatography, it may be necessary to change the column or clean the source

12. DATA ANALYSIS AND CALCULATIONS

12.1. Refer to section Appendix I for an example data review checklists used to perform and document the review of the data. Using the data review checklist, the analyst also creates a narrative which includes any qualifications of the sample data.

12.2. Qualitative identification: An analyte is identified by retention time and by comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum). Mass spectra for standard reference may be obtained on the user's GC/MS by analysis of the calibration standards or from the NIST Library. Two criteria must be satisfied to verify identification: (1) elution of sample component at the same GC retention time as the standard component; and (2) correspondence of the sample component and the standard component characteristic ions. (Note: Care must be taken to ensure that spectral distortion due to co-elution is evaluated.)

- The sample component retention time must compare to within ± 0.2 min. of the retention time of the standard component. For reference, the standard must be run within the same twelve hours as the sample.

- All ions present in the standard mass spectra at a relative intensity greater than 10% (most abundant ion in the spectrum equals 100%) should be present in the sample spectrum.

- The relative intensities of ions should agree to within ±30% between the standard and sample spectra. (Example: For an ion with an abundance of 50% in the standard spectra, the corresponding sample abundance should be between 20 and 80 percent.)

  - Note: For SIM analysis, since not all of the ions in a compound may be monitored, comparison of the sample mass spectrum with the mass spectrum of a standard of the suspected compound (standard reference spectrum) cannot be performed

12.2.1. If a compound cannot be verified by all the above criteria, but in the technical judgment of the analyst, the identification is correct, then the analyst shall report that identification and proceed with quantitation.

12.3. Tentatively Identified Compounds (TICs): Refer to SOP-KNOX-MS-0014, current revision

12.3.1. Note: A TIC search cannot be performed when data has been acquired in SIM mode.

12.4. Calculations.

12.4.1. Response factor (RF):

$$RF = \frac{A_x C_{is}}{A_{is} C_x}$$

Where:

A_x = Area of the characteristic ion for the compound to be measured

A_{is} = Area of the characteristic ion for the specific internal standard

C_{is} = Amount of the specific internal standard, ng

C_x = Amount of the compound being measured, ng

12.4.2. Standard deviation (SD):

$$SD = \sqrt{\sum_{i=1}^{N} \frac{(Xi - X)^2}{N - 1}}$$

X_i = Value of X at i through N

N = Number of points

X = Average value of X_i

12.4.3. Percent relative standard deviation (%RSD):

$$\%RSD = \frac{\textbf{Standard Deviation}}{\overline{RF_i}} \times 100$$

$\overline{RF_i}$ = **Mean of RF values in the curve**

12.4.4. Percent drift between the initial calibration and the continuing calibration (note: Chrom/TALS uses "% D" in the report header for both % difference and % drift):

$$\%\ D = \frac{C_{found} - C_{expected}}{C_{expected}} \times 100$$

Where

$C_{expected}$ = Known concentration in standard

C_{found} = Measured concentration using selected quantitation method

$$\%Difference = \frac{RF - \overline{RF}}{\overline{RF}} \times 100$$

$\overline{RF}$ = Average Analyte Response Factor from Initial Calibration

RF = Measured Analyte Response Factor from Calibration Verification

12.4.5. Target compound and surrogate concentrations: Concentrations in the sample may be determined from linear or second order (quadratic) curve fitted to the initial calibration points, or from the average response factor of the initial calibration points, as described in section 10.5.9.

12.4.5.1. Calculation of concentration using Average Response Factors

$$C_{pv} = \frac{R_x C_{is}}{R_{is}\overline{RF}}$$

12.4.5.2. Calculation of concentration using Linear fit

$$C_{pv} = A + B\frac{(R_x C_{is})}{R_{is}}$$

C_{pv}= Concentration in purge vessel, ug/L (Amt)

R_x= Response for analyte (area of quantitation ion)

R_{is}= Response for internal standard (area of quantitation ion)

C_{is}= Concentration of internal standard

A= Intercept

B= Slope

12.4.5.3. Calculation of concentration using Quadratic fit

$$C_{pv} = A + B\left(\frac{R_x C_{is}}{R_{is}}\right) + C\left(\frac{R_x C_{is}}{R_{is}}\right)^2$$

C= Curvature

12.4.5.4. Calculation of Concentration for VOST Samples:

$$\text{Concentration, } \mu g = \frac{C_{pv} \cdot V_t}{1000}$$

Where: V_t = Total Volume Purged (ml)

12.4.6. Calculation of TICs: The calculation of TICs (tentatively identified compounds) is identical to the above calculations with the following exceptions:

$\mathbf{A_x}$ = Area in the total ion chromatogram for the compound being measured

$\mathbf{A_{is}}$ = Area of the total ion chromatogram for the nearest internal standard without interference

RF = 1

12.4.7. LCS/LCSD Recovery

$$\textbf{LCS Recovery, \%} = \frac{\boldsymbol{LCS}}{\boldsymbol{SA}} \times 100$$

LCS = LCS result

SA = Spike added

12.4.8. Relative % Difference calculation for the LCS/LCSD

$$\text{RPD} = \frac{|\text{LSCR} - \text{LCSDR}|}{1/2(\text{LCSR} + \text{LCSDR})} \text{ x } 100$$

Where:

RPD = Relative percent difference

LCSR = LCS result

LCSDR = LCSD result

13. METHOD PERFORMANCE

13.1. Method Detection Limit (MDL) - An MDL must be determined for each analyte in each routine matrix prior to the analysis of any samples. The procedure for determination of the method detection limit is given in NDSC-QA-SOP42091, current revision based on 40 CFR Part 136 Appendix B. The result of the MDL determination must support the reporting limit. Current method detection limits are available in the TestAmerica Laboratory Information Management System (TALS).

13.2. Initial Demonstration of Capability – Each analyst must perform an initial demonstration of capability (IDOC) for each target analyte prior to performing the analysis independently. The IDOC is determined by analyzing four replicate spikes (e.g., LCSs) as detailed in TestAmerica Knoxville SOP KNOX-QA-0009. The QC check sample is made up at 100 ng (2.5 ng for SIM) or at the LCS spiking level. (Some compounds will be at higher levels; refer to the calibration standard levels for guidance.)

13.2.1. Four aliquots of the QC check sample are analyzed using the same procedures used to analyze samples, including sample preparation.

13.2.2. Calculate the average recovery and standard deviation of the recovery for each analyte of interest. The %RSD should be $\leq$ 30% for each analyte, and the recovery should be within 50-150%.

13.2.3. If the recovery or precision is outside the limits, the test must be repeated. Only those analytes that did not meet criteria in the first test need to be evaluated. Repeated failure for any analyte indicates the need for the laboratory to evaluate the analytical procedure and take corrective action.

13.3. Training Qualification: The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its use and has the required experience. Refer to SOP KNOX-QA-0009 current revision for further requirements for performing and documenting initial and on-going demonstrations of capability.

14. POLLUTION PREVENTION

14.1. This method does not contain any specific modifications that serve to minimize or prevent pollution

15. WASTE MANAGEMENT

15.1. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this

method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

15.2. The following waste streams are produced when this procedure is carried out.

- Aqueous waste generated from analysis may have a pH of less than 2. This waste will be placed in an acid satellite accumulation container.
- Solvent waste generated from analysis is placed in the flammable waste stream, contained in a steel satellite accumulation container type or flammable solvent container.
- Consumed VOST tubes are placed in the ILW stream.
- Expired Standards are stored in metal closed-top containers.

16. REFERENCES

16.1. SW846, *Test Methods for Evaluating Solid Waste*, Third Edition, Gas Chromatography/Mass Spectrometry for Volatile Organics, Method 8260B, Update III, December 1996.

16.2. Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, TO-1, TO-2.

16.3. SW846, *Test Methods for Evaluating Solid Waste*, Third Edition, Gas Chromatography/Mass Spectrometry for Volatile Organics, Method 5041A, Protocol for Analysis of Sorbent Cartridges from Volatile Organic Sampling Train.

16.4. SW846, *Test Methods for Evaluating Solid Waste*, Third Edition, Gas Chromatography/Mass Spectrometry for Volatile Organics, Method 0031, Volatile Organic Sampling Train.

16.5. US EPA, *Risk Burn Guidance for Hazardous Waste Combustion Facilities*, Appendix B, Sampling and Analysis, July 2001, EPA530-R-01-001.

16.6. Knoxville Quality Assurance Manual (QAM), current revision

16.7. Method 8000C "Determinative Chromatographic Separations", March 2003

16.8. NDSC-QA-SOP43862 Manual Integrations, current revision.

16.9. NDSC-QA-QP44940 Calibration Curves and the Selection of Calibration Points, current revision.

16.10. NDSC-QA-SOP42091 Detection and Quantitation Limits, current revision

16.11. KNOX-QA-0014, Air Sampling Media Tracking and Quality Control, current revision.

16.12. SW846, *Test Methods for Evaluating Solid Waste*, Third Edition, Gas Chromatography/Mass Spectrometry for Volatile Organics, Method 0030, Volatile Organic Sampling Train.

17. MISCELLANEOUS CURRENT REVISION

17.1. Modifications from the reference methods

17.1.1. A retention time window of 0.2 minutes is used for all components since the data system does not have the capability of using the relative retention time units specified in the reference method.

17.1.2. The quantitation and qualifier ions for some compounds have been changed from those recommended in SW-846 in order to improve the reliability of qualitative identification.

17.1.3. This SOP allows for the use of the NIST library in the qualitative identification of an analyte. Method 8260B allows for the use of the mass spectra for standard reference from the user's instrument.

17.1.4. Method 5041A specifies the calibration standards, internal standards and surrogates are spiked onto the VOST tubes. Method 0031 and this SOP have the calibration standards and internal standards spiked into the purge container, not onto the VOST media. Sample surrogates and LCSs are spiked onto the VOST media to measure accuracy.

17.1.5. 5041A specifies that the VOST tubes are desorbed at 180 ^{o}C $\pm$ 10°C. This

SOP allows for desorption of VOST tubes at 220 ^{o}C $\pm$ 10°C to help improve the desorption efficiency of higher boiling point analytes that clients may request.

17.1.6. 8260B indicates that the surrogates are calibrated using a minimum of five different concentrations. The concentration of the surrogates in this SOP is constant throughout the initial calibration event. The EPA has recognized an option for allowing the autosampler to spike the initial calibration standards with surrogates in the same manner as the samples are spiked.

17.2. Appendix I: Example Data Review Checklist

17.3. Appendix II: Tables

Appendix I: Example Data Review Checklist

Eurofins Knoxville GC/MS Initial Calibration Review/Narrative Checklist
Methods: 8260B--KNOX-MS-0015 Rev 20 and VOST—KNOX-MS-0011 Rev 15

Instrument:			TALS Batch / Event #	8260B LL	8260B	Scanned ☐
Analysis Date:			List 1:	/	/	
Chrom WL #			List 2:	/	/	
			Other:	/	/	

Chrom Worklist/Peak Review	*1st*	*Comments*	*2nd*
1. Re-read each limit group [method editor-limit groups]			
2. Verify LOD [method editor -> edit -> MDL]			
3. Are the reagents & init./final vol. correct [Sample & Run Reagents]			
4. First levels "unlock/clear" or "unlock/clear by sublist" as appropriate?			
5. Are the Cal Levels & groups correct in WL?			
6. Did the BFB meet the tune criteria (NA for SIM) [F8]			
7. Were all standards injected within 12 hr of BFB (or 1st injection for SIM? [F7]			
8. Was the high point std checked for saturation [flags + visible inspection: $8.4x10^6$]			
9. If manual integrations were performed, are they appropriate with proper reason given?			
10. Were all peaks identified automatically? If not, list analytes: _____		*Modify method for detection must be attempted and all points reprocessed. Any non-detected peaks must be verified in each affected sample.*	
11. Elution order checked on isomeric pairs?			
• chlorobenzene-d5 and 1,1,1,2-tetrachloroethane			
• trichlorofluoromethane and Freon 113			
• hexane and vinyl acetate			
• cis- and trans- isomers			
• 1,1,1-TCA and CCL4			
• ethyl benzene / m/p-xylene / o-xylene			
• n-propylbenzene / 2-chlorotoluene / 4-chlorotoluene			
• 1,3,5-trimethylbenzene / 1,2,4-trimethylbenzene / secbutylbenzene			
• 1,3- , 1,4- , and 1,2-dichlorobenzene			
• 1,2,4 and 1,2,3 -trichlorobenzene			
12. ICAL start/end date/time correct on summary? [F6]			
13. Are ≥ 5 levels of each compound/surrogate active? [F6]			
14. Is low level standard at or below RL & points consecutive? [F6]			
15. Is %RSD ≤30% for all CCC's? [F6]			
16. Do the average RFs for SPCC's meet min. RF? [F6]			
17. Was a linear or quadratic fit used for analytes > 15% RSD? [F6]			
18. If curves were used, is correlation coefficient ≥0.990? [F6]			
19. At least 6 consecutive points used for quadratic curves? [F6]			
20. For quadratic: is a tangent's slope to the curve entirely positive or negative and continuous? [Cntrl-C, details]			
21. Is the intercept < RL for each curve? [Cntrl-C, details]			
22. Is the readback for each point within criteria? [F6-Drift] (<40% for all points, except low point < 50 %)			
23. Was the ICV± 30% recovery? [F8-icv]		ICV out, smp ND (NCM#_____)	
1st level reviewer:	**Date:**	**2nd level reviewer:**	**Date:**

TALS MLG Review	1st	**Comments**	2nd
24. Upload ICAL & confirm graphics uploaded [Sample List Tab]			
25. All points are in the most recent active calibration event #? [Calibration ID # in the sample results tab & Calibration Events] [Calibration Events - 'Fix ICAL Linkage' if needed]			
26. Runs linked to BFB? [QC Links]			
27. Run Data Review Checker and acknowledge findings.			
28. If criteria not met, was a NCM generated?			
29. After review in TALS, approve the calibrations in TALS			
30. After verifying TALS is correct, lock method in Chrom <resolve errors>			
31. Checklist scanned & attached properly?			
1st level reviewer:	**Date:**	**2nd level reviewer:**	**Date:**
Comments:			

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Appendix I: Example Data Review Checklist (continued)

Eurofins Knoxville GC/MS CCAL/Batch Review/Narrative Checklist
Methods: 8260B--Knox-MS-0015 Rev 20 and VOST—KNOX-MS-0011 Rev 15

8260BLL ☐ 8260B ☐

Instrument			ICAL Chrom WL #	ICAL TALS Batch / Event #	Scanned ☐
Analysis Date:		List 1:			
CCAL Chrom WL #		List 2:			
CCAL TALS Batch #		Other:			
Prep batches:					

CCV Chrom/Worklist Review	1st	*Comments/NCM #*	2nd
1. Are the reagents & init/final volumes correct? (Verify reagents & amt. injected) [WL Sample Reagent Tab]			
2. Are all required calibration standards in worklist?			
3. Did the BFB meet tune criteria? (NA for SIM) [F8]			
4. Was the CCAL compared to the most recent & correct ICAL for each CCV? (verify ICAL batch #, start/end Cal date & time) [F8]			
5. Elution order checked on isomeric pairs/coeluters?			
• chlorobenzene-d5 and 1,1,1,2-tetrachloroethane			
• trichlorofluoromethane and Freon 113			
• hexane and vinyl acetate			
• cis- and trans- isomers			
• 1,1,1-TCA and CCL4			
• ethyl benzene / m/p-xylene / o-xylene			
• n-propylbenzene / 2-chlorotoluene / 4-chlorotoluene			
• 1,3,5-trimethylbenzene / 1,2,4-trimethylbenzene / secbutylbenzene			
• 1,3- , 1,4- , and 1,2-dichlorobenzene			
• 1,2,4 and 1,2,3 -trichlorobenzene			
6. Manual integrations properly performed, correctly ID'd, baseline clearly identified, and correct reason given?		*Note: manual selections should be updated and all data reprocessed*	
7. Were all peaks identified automatically? *If not, list analytes:*		*Note: any non-detected peaks must be verified in each affected sample.*	
8. Is %RSD ≤ 20% for all CCC's? *[F8] or TALS sample tab*		☐ CCV high, sample ND (NCM#_____)	
9. Do the RFs for SPCC's meet min. RF? [F8]			
10. Is the %D or drift ≤50% for all other compounds? [F8]		☐ CCV high, sample ND (NCM#_____)	
11. Are the internal standard retention times within limits for each CCV? (±30 seconds of the mid-level ICAL standard) [F8-istd]			
12. Are the internal standard responses within limits for each CCV? (50-200% of the mid-level ICAL standard) [F8-istd]			
13. Has the retention time been updated to the method?			

Sample Worklist/Chrom review	*1st*	*Comments/NCM #*	*2nd*
13. For solid and methanol extractions, were the prep batches dates/times/weights/volumes correct and 2nd level reviewed?			
14. Verify initial weights/volumes in Worklist			
15. Were all samples injected within 12 hrs. of first BFB? [F7]			
16. Have the sample ID's and dilution factors been confirmed (check sequence, autosampler positions, etc.)?			
17. Are all analytes in the method blank/instrument blank < RL?		☐ MB CLC <5x RL (NCM#_____) ☐ MB Rpt ND (NCM#_____) ☐ MB-Rpt. 10 x (NCM#_____) ☐ MB-insuff samp (NCM#_____) ☐ MB-insuff samp - CONSUMED (NCM#_____) ☐ MB RX/HT out (NCM#_____)	
18. Method blank Surrogate recoveries within QC limits? [F8] or [Batch Results SUR Tab]		☐ Surr-MB (1) high (NCM#_____) + (2) smp OK (NCM#_____) or (3) Insuff. sample (NCM#_____) or (4) CONSUMED (NCM#_____)	
19. MS/MSD done per batch? *('NA' for air samples)*		☐ MS/MS/DUP- insufficient vol (2) (NCM#_____)	

* Such action must be taken in consultation with client.

Appendix I: Example Data Review Checklist (continued)

Eurofins Knoxville GC/MS CCAL/Batch Review/Narrative Checklist
Methods: 8260B--Knox-MS-0015 Rev 20 and VOST—KNOX-MS-0011 Rev 15

20.LCS criteria met for IDA and natives? [Chrom-F8] [TALS-Sample Results Tab] Number of target analytes in LCS / # marginal exceedances of LCS control limits allowed >90 / 5 71 - 90 / 4 51 - 70 / 3 31 - 50 / 2 11 - 30 / 1 < 11 / 0		□ LCS/D-Insuff smp (NCM#_____) □ LCS/D-Insuff smp - CONSUMED (NCM#_____) □ LCS/D %R High < RL in smp (1+2-5) (NCM#_____) □ LCS/D out-RX HT out (NCM#_____) □ LCS/D-%RPD (%R OK) (NCM#_____) □ Marg. Exceed. w/in ME limits & Random (NCM#_____)	
21.All runs - peaks ID'd correctly and false positives removed? Sample / Reason / Sample / Reason		□ Interf-Chrom: (NCM#_____) □ "cn" (see narrative): (NCM#_____)	
22.Manual integrations properly performed, correctly ID'd, baseline clearly identified, and correct reason given?		□ "cn" (see narrative): (NCM#_____)	
23.Are surrogate recoveries within QC limits? [Batch Results SUR Tab] If no, list samples, reason and NCM # Sample / Reason / Sample / Reason		□ Surr-High-ND (1,8) (NCM#_____) □ Surr-Incorrect Spike amt (NCM#_____) □ Surr-Insuff Smp (1) insuff smp (NCM#_____) or (4) CONSUMED (NCM#_____) + (2) low bias (NCM#_____) or (3) high bias (NCM#_____) □ Surr-Insuff Smp - CONSUMED (NCM#_____) □ Surr-Matrix (1-4) (NCM#_____) □ Surr-Rpt per Client (released w/o further investigation)* (NCM#_____) □ Surr-RX concur (NCM#_____) □ Surr-RX pass (RX outside HT, but was within limits) (NCM#_____) □ Surr-Spike Omitted Insuff Smp (NCM#_____) □ NCM#: **140-6061**: Ph >10 surr DBFM out	
24.Are internal standards within QC limits? [Batch Results IS Tab] If no, list samples, reason and NCM # Sample / Reason / Sample / Reason		□ ISTD- Matrix (NCM#_____) □ ISTD- DL (NCM#_____) □ ISTD-No RX/RR [insuff sample] (NCM#_____) □ ISTD-No RX/RR [insuff sample- CONSUMED] (NCM#_____) □ ISTD- non-targets (NCM#_____) □ ISTD- RX/RA concur (NCM#_____) □ NCM#: **140-5756**; Samples bracketed by acceptable runs*.	
TALS Review	***1st***	***Comments/NCM #***	***2nd***
25.Graphics uploaded?			
26.Sample special instructions verified?			
27.Is the calibration event # correct for each CCV/samples? [TALS Sample Results tab]			
28.For initial analysis with elevated RL's, explain: *List diluted samples and reason:* Sample / Reason / Sample / Reason		□ RL – Dil Screen (NCM#_____) □ RL – Dil Non-targets (NCM#_____) □ RL – Dil Targets (NCM#_____) □ RL – Final Vol (NCM#_____) □ RL – Init Vol (matrix) (NCM#_____) □ RL – Insuff. Smp (NCM#_____) □ RL – VOA,Dil,Foaming (NCM#_____)	
29.Was pH ≤ 2 for all water samples? [Noted on run log - transcribed to TALS worksheet tab]		□ Preserv-VOA pH>2 (<7 days) (NCM#_____) □ HT-Preserv-VOA pH>2 (8-14 days) (NCM#_____)	
30.Suffixes assigned properly (DL/RE)? [Sample List Tab]			
31.Each job has QC created (CCV,MB,LCS)? [Sample List Tab]			
32.Analytes over calibration range set to secondary & dilutions scheduled for analysis? [Conditions Review Tab] Sample / Reason / Sample / Reason		□ ICAL-Range Exceed; Min Dil 1 – client OK'd * (NCM#_____) 2 – dil for other cmpds (NCM#_____) 3 – sample consumed (NCM#_____) □ ICAL-Range Exceed; *VOST ONLY*: Saturation + sample consumed (NCM#_____)	
33.For dilutions, diluted analytes set to primary, others to "Acceptable"? [Sample Results Tab]			
34.Sample prep and analyses done within preparation and analytical			

* Such action must be taken in consultation with client.

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Appendix I: Example Data Review Checklist (continued)

Eurofins Knoxville GC/MS CCAL/Batch Review/Narrative Checklist
Methods: 8260B--Knox-MS-0015 Rev 20 and VOST—KNOX-MS-0011 Rev 15

holding time (HT)?			
35.If MS/MSD was done on this client's sample or for reported batch QC, were the MS/MSD recoveries and RPDs within laboratory generated QC limits?		□ MS/MSD - %R out, LCS OK □ MS/MSD - high targets □ MS/MSD – spk/surr diluted out □ MS/MSD/Dup - % RPD	
36.Verify reagents have not expired [Reagents Tab]			
37.Samples not reported set to "Acceptable" or "Rejected" [Sample Results Tab]			
38.Water samples received w/no headspace? Samples: _____		□ Headspace-Lim Vol (> 6 mm bubble) (NCM#_____)	
39.Encore/Terracore issues OK? _____		□ Encore-Effervesced 5035 (NCM#_____) □ Encore-not sealed (NCM#_____) □ See HT on job checklist	
40.BFB/CCV linked to all samples? [QC Links]			
41.Samples linked to correct MB & LCS/D & MS/D? [QC Links]			
42.Correct ICV's linked to all samples? [QC Links]			
43.Run Data Review Checker and acknowledge findings.			
44.Runs set to 1st level review?		Runs set to 2nd level review?	
45.QC checker run for batch and items addressed			
46.Checklist scanned & attached properly?			

1st level:	Date	2nd level:	Date
Comments:			
Example calculation:			

* Such action must be taken in consultation with client.

Appendix I: Example Data Review Checklist (continued)

Eurofins Knoxville GC/MS Job Review/Narrative Checklist
Methods: 8260B--Knox-MS-0015 Rev 20 and VOST—KNOX-MS-0011 Rev 15

Job #:_____

Method:	**8260B LL** ☐	**8260B** ☐

TALS Analytical Batch #'s:

ICAL Instrument:						
Batch #:						

CCAL batch #'s:						

Prep methods

Prep batch #'s:						

Job / Reports Review	*1st*	*Comments/NCM/Narrative notes*	*2nd*
1.QC checker run for job and items addressed			
2.Were all client special project requirements met?		☐ Non-routine analyte-no MDL: (NCM_____)	
3.Sample prep and analyses done within analytical holding time? *If no, list samples and NCM #:* Sample Reason Sample Reason _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____ _____		☐ HT Init Analy: (NCM#_____) ☐ HT Insuff time: (NCM#_____) ☐ HT Re-Analysis: (NCM#_____) ☐ HT Receipt: (NCM#_____) ☐ HT RePrep: (NCM#_____) ☐ HT Rct;VOA Freeze (>48 hr): (NCM#_____)	
1.Appropriate NCM's on the right are assigned to the job?		☐ NCM#: **140-6074**: VOST-0030 T & T/C ☐ NCM#: **140-6139:** Broken VOST tube ☐ NCM#: **140-6076**: Waste ☐ NCM#: **140-6081**: Micro-trap VOST ☐ NCM#: **140-6080**: Methanol VOST (20 mL) ☐ NCM#: **140-6066:** Impingers ☐ NCM#: **140-6116:** Refrigerants	
2.All NCM's are complete, free of grammatical/spelling errors, and correct references to batches/samples/analytes?		List all other NCM's with job:	
3.Run deliverable & assemble report.			
4.All "E" values have "DL" runs? (if no, NCM #)		If 'no', create NCM on analytical batch	
5.Data Summaries correct (L2 & L4)?			
6.Forms II-V & VIII correct (L4)?			
7.ICV present per ICAL (L4)?			
8.Checklists (ICAL & batch DRC) attached to Job (L4)?			

1st Level:	**Date:**	**2nd Level:**	**Date:**

* Such action must be taken in consultation with client.

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Appendix II: Tables

Table 1
Reporting Limits

Compound	CAS Number	Reporting Limits (ng)
Dichlorodifluoromethane	75-71-8	50
Chloromethane	74-87-3	50
Bromomethane	74-83-9	50
1,3-Butadiene	106-99-0	50
Vinyl chloride	75-01-4	50
Chloroethane	75-00-3	50
Vinyl Bromide	593-60-2	50
Trichlorofluoromethane	75-69-4	50
2-Chloropropane	75-29-6	50
Freon 113 (1,12-Trichloro,1,2,2-trifluoroethane)	76-13-1	50
Carbon Disulfide	75-15-0	25
Acetone	67-64-1	100
Acrylonitrile	107-13-1	500
Iodomethane	74-88-4	50
Acetonitrile	75-05-8	1000
Methylene chloride	75-09-2	25
Hexane	110-54-3	50
1,1-Dichloroethene	75-35-4	25
1,1-Dichloroethane	75-34-3	25
trans-1,2-Dichloroethene	156-60-5	25
2,2-Dichloropropane	590-20-7	25
cis-1,2-Dichloroethene	156-59-2	25
1,2-Dichloroethene (Total)	540-59-0	50
Chloroform	67-66-3	25
Bromochloromethane	74-97-5	25
1,2-Dichloroethane	107-06-2	25
Dibromomethane	74-95-3	25
2-Butanone	78-93-3	100
1,1,1-Trichloroethane	71-55-6	25
Carbon tetrachloride	56-23-5	25
1,1-Dichloropropene	563-58-6	25
Bromodichloromethane	75-27-4	25
1,2-Dichloropropane	78-87-5	25
1,3-Dichloropropane	142-28-9	25
cis-1,3-Dichloropropene	10061-01-5	25
Trichloroethene	79-01-6	25
Dibromochloromethane	124-48-1	25
1,2-Dibromoethane	106-93-4	25

Table 1 (continued)
Reporting Limits

Compound	CAS Number	Reporting Limits (ng)
1,2,3-Trichloropropane	96-18-4	25
1,1,2-Trichloroethane	79-00-5	25
Benzene	71-43-2	25
trans-1,3-Dichloropropene	10061-02-6	25
Bromoform	75-25-2	25
4-Methyl-2-pentanone	108-10-1	100
2-Hexanone	591-78-6	100
Tetrachloroethene	127-18-4	25
Toluene	108-88-3	25
1,1,2,2-Tetrachloroethane	79-34-5	25
Chlorobenzene	108-90-7	25
1,1,1,2-Tetrachloroethane	630-20-6	25
Ethylbenzene	100-41-4	25
Styrene	100-42-5	25
m- and p-Xylenes	136777-61-2	50
o-xylene	95-47-6	25
Total xylenes	1330-20-7	75
Isopropylbenzene	98-82-8	25
cis-1,4-dichloro-2-butene	1476-11-5	50
Bromobenzene	108-86-1	25
n-Propylbenzene	103-65-1	25
2-Chlorotoluene	95-49-8	25
Trans-1,4-dichloro-2-butene	110-57-6	50
4-Chlorotoluene	106-43-4	25
1,3,5-Trimethylbenzene	108-67-8	25
tert-Butylbenzene	98-06-6	25
1,2,4-Trimethylbenzene	95-63-6	25
sec-butylbenzene	135-98-8	25
1,3-Dichlorobenzene	541-73-1	25
1,4-Dichlorobenzene	106-46-7	25
1,2-Dichlorobenzene	95-50-1	25
4-Isopropyltoluene	99-87-6	25
n-Butylbenzene	104-51-8	25
1,2-Dibromo-3-chloropropane	96-12-8	50
1,2,4-Trichlorobenzene	120-82-1	25
Napthalene	91-20-3	25
Hexachlorobutadiene	87-68-3	25
1,2,3-Trichlorobenzene	87-61-6	25

Table 1A –
Reporting Limit for SIM Analytes

Compound	CAS Number	Reporting Limits (ng)
Chlorobenzene	75-05-8	0.10
Tetrachloroethene	107-13-1	0.10

Table 2
Internal Standards

	Standard Concentration (ng)	Quantitation ion
Fluorobenzene	250	96
Chlorobenzene-d5	250	119
1,4-Dichlorobenzene-d4	250	152

Note: A concentration of 250ng of the internal standard is added to the water sparger.

Table 2A
Internal Standards (SIM)

	Standard Concentration (ng)	Quantitation ion	Secondary ion
Chlorobenzene-d5	2.5	117	82
1,4-Dichlorobenzene-d4	2.5	152	150

Note: A concentration of 2.5ng of the internal standard is added to the water sparger

Table 3

Surrogate Standards

Surrogate Compounds	Standard Concentration (ng)
1,2-Dichloroethane-d_4	250
Dibromofluoromethane	250
Toluene-d_8	250
4-Bromofluorobenzene	250

Note: A concentration of 250ng of the surrogate standard is added to the sample on the adsorbent.

Table 3A

Surrogate Standards (SIM)

Surrogate Compounds	Standard Concentration (ng)
Toluene-d_8	2.5
4-Bromofluorobenzene	2.5

Note: A concentration of 2.5 ng of the surrogate standard is added to the sample on the adsorbent.

Table 5

Suggested Calibration Levels (ng)*

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
Dichlorodifluoromethane	-	25	125	250	500	1000	2000
Chloromethane	-	25	125	250	500	1000	2000
Bromomethane	-	25	125	250	500	1000	2000
1,3-Butadiene	-	25	125	250	500	1000	2000
Vinyl chloride	10	25	125	250	500	1000	2000
Chloroethane	10	25	125	250	500	1000	2000
Vinyl Bromide	10	25	125	250	500	1000	2000
Trichlorofluoromethane	10	25	125	250	500	1000	2000
2-Chloropropane	-	25	125	250	500	1000	2000
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	-	25	125	250	500	1000	2000
Carbon Disulfide	10	25	125	250	500	1000	2000
Acetone	-	100	500	1000	2000	4000	8000
Acrylonitrile	-	250	1250	2500	5000	10000	20000
Iodomethane	10	25	125	250	500	1000	2000
Acetonitrile		250	1250	2500	5000	10000	20000
Methylene chloride	-	25	125	250	500	1000	2000
Hexane	-	25	125	250	500	1000	2000
1,1-Dichloroethene	10	25	125	250	500	1000	2000
1,1-Dichloroethane	10	25	125	250	500	1000	2000
trans-1,2-Dichloroethene	10	25	125	250	500	1000	2000
2,2-Dichloropropane	10	25	125	250	500	1000	2000
cis-1,2-Dichloroethene	10	25	125	250	500	1000	2000
Chloroform	10	25	125	250	500	1000	2000
Bromochloromethane	-	25	125	250	500	1000	2000
1,2-Dichloroethane	10	25	125	250	500	1000	2000
Dibromomethane	10	25	125	250	500	1000	2000
2-Butanone	-	100	500	1000	2000	4000	8000
1,1,1-Trichloroethane	10	25	125	250	500	1000	2000
Carbon tetrachloride	10	25	125	250	500	1000	2000
Bromodichloromethane	10	25	125	250	500	1000	2000

Table 5 (continued)

Suggested Calibration Levels (ng)*, continued

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
1,2-Dichloropropane	10	25	125	250	500	1000	2000
cis-1,3-Dichloropropene	10	25	125	250	500	1000	2000
Trichloroethene	10	25	125	250	500	1000	2000
Dibromochloromethane	-	25	125	250	500	1000	2000
1,2-Dibromoethane	10	25	125	250	500	1000	2000
1,2,3-Trichloropropane	10	25	125	250	500	1000	2000
1,1,2-Trichloroethane	10	25	125	250	500	1000	2000
Benzene	10	25	125	250	500	1000	2000
trans-1,3-Dichloropropene	10	25	125	250	500	1000	2000
Bromoform	-	25	125	250	500	1000	2000
4-Methyl-2-pentanone	-	100	500	1000	2000	4000	8000
2-Hexanone	-	100	500	1000	2000	4000	8000
1,3-Dichloropropane	10	25	125	250	500	1000	2000
Tetrachloroethene	10	25	125	250	500	1000	2000
Toluene	10	25	125	250	500	1000	2000
1,1,2,2-Tetrachloroethane	-	25	125	250	500	1000	2000
Chlorobenzene	10	25	125	250	500	1000	2000
Ethylbenzene	10	25	125	250	500	1000	2000
1,1,1,2-Tetrachloroethane	10	25	125	250	500	1000	2000
Styrene	10	25	125	250	500	1000	2000
m/p Xylenes	10	25	125	250	500	1000	2000
o-xylene	10	25	125	250	500	1000	2000
Isopropylbenzene	10	25	125	250	500	1000	2000
Cis-1,4-dichloro-2-butene	-	25	125	250	500	1000	2000
Bromobenzene	10	25	125	250	500	1000	2000
n-Propylbenzene	10	25	125	250	500	1000	2000
2-Chlorotoluene	10	25	125	250	500	1000	2000
Trans-1,4-dichloro2-butene	-	25	125	250	500	1000	2000
4-Chlorotoluene	10	25	125	250	500	1000	2000
1,3,5-Trimethylbenzene	10	25	125	250	500	1000	2000

Table 5 (continued)

Suggested Calibration Levels (ng)*, continued

Compound	Level 1	Level 2	Level 3	Level 4	Level 5	Level 6	Level 7
tert-Butylbenzene	10	25	125	250	500	1000	2000
1,2,4-Trimethylbenzene	10	25	125	250	500	1000	2000
sec-butylbenzene	10	25	125	250	500	1000	2000
1,3-Dichlorobenzene	10	25	125	250	500	1000	2000
1,4-Dichlorobenzene	10	25	125	250	500	1000	2000
1,2-Dichlorobenzene	10	25	125	250	500	1000	2000
4-Isopropyltoluene	10	25	125	250	500	1000	2000
n-Butylbenzene	10	25	125	250	500	1000	2000
1,2-Dibromo-3-chloropropane	-	25	125	250	500	1000	2000
1,2,4-Trichlorobenzene	-	25	125	250	500	1000	2000
Napthalene	-	25	125	250	500	1000	2000
Hexachlorobutadiene	-	25	125	250	500	1000	2000
1,2,3-Trichlorobenzene	-	25	125	250	500	1000	2000

* The low point must be at or below the reporting limit

Table 5A
Typical Calibration Levels (ng) - (SIM)

Compound	**Level 1**	**Level 2**	**Level 3**	**Level 4**	**Level 5**	**Level 6**
Tetrachloroethene	0.1	0.25	0.625	2.5	12.5	25
Chlorobenzene	0.1	0.25	0.625	2.5	12.5	25
Toluene-d8 (Surrogate)	2.5	2.5	2.5	2.5	2.5	2.5
4-Bromofluorobenzene (Surrogate)	2.5	2.5	2.5	2.5	2.5	2.5

Table 6

BFB Key Ion Abundance Criteria (Not required for SIM)

Mass	Ion Abundance Criteria
50	15% to 40% of Mass 95
75	30% to 60% of Mass 95
95	Base Peak, 100% Relative Abundance
96	5% to 9% of Mass 95
173	Less Than 2% of Mass 174
174	Greater Than 50% of Mass 95
175	5% to 9% of Mass 174
176	Greater Than 95%, But Less Than 101% of Mass 174
177	5% to 9% of Mass 176

Table 7

SPCC and Minimum Response Factors

Compound	Min. RF
Chloromethane	0.100
1,1-Dichloroethane	0.100
Bromoform	0.100
1,1,2,2-Tetrachloroethane	0.300
Chlorobenzene	0.300

Table 8

CCC Criteria

Compound	Max. %RSD for Initial Calibration	Max. %D for Continuing Calibration
Vinyl Chloride	≤30	≤20
1,1-Dichloroethene	≤30	≤20
Chloroform	≤30	≤20
1,2-Dichloropropane	≤30	≤20
Toluene	≤30	≤20
Ethylbenzene	≤30	≤20

Table 9

Characteristic Ions

Compound	IS Group	Primary*	Secondary	Tertiary
1,2-Dichloroethane-d_4 (Surrogate)	1	65	102	
Dichlorodifluoromethane	1	85	87	50, 101,103
Chloromethane	1	50	52	49
Vinyl chloride	1	62	64	61
Bromomethane	1	94	96	79
1-3-Butadiene	1	39	54	
Chloroethane	1	64	66	49
Vinyl Bromide	1	106	105	79
Trichlorofluoromethane	1	101	103	66
2-Chloropropane	1	43	63	78
Freon 113 (1,1,2-trichloro-1,2,2-trifluoroethane)	1	151	153	101
1,1-Dichloroethene	1	96	61	98
Carbon disulfide	1	76	78	
Acetone	1	43	58	
Acrylonitrile	1	53	52	51
Iodomethane	1	142	127	141
Acetonitrile	1	41	40	
Methylene chloride	1	84	49	51, 86
Hexane	1	57	43	
trans-1,2-Dichloroethene	1	96	61	98
1,1-Dichloroethane	1	63	65	83
cis-1,2-Dichloroethene	1	96	61	98
2-Butanone	1	43	72**	
Chloroform	1	83	85	47
1,2-Dichloroethane	1	62	64	98
Dibromomethane	1	93	174	95, 172, 176
Dibromofluoromethane (Surrogate)	1	113	111	
1,1,1-Trichloroethane	1	97	99	117
Carbon tetrachloride	1	117	119	121
Benzene	1	78	52	77
Trichloroethene	1	130	95	97, 132
1,2-Dichloropropane	1	63	65	41
Bromodichloromethane	1	83	85	129
cis-1,3-Dichloropropene	1	75	77	39
trans-1,3-Dichloropropene	2	75	77	39
1,1,2-Trichloroethane	2	97	83	85, 99

Table 9

Characteristic Ions (continued)

Compound	IS Group	Primary*	Secondary	Tertiary
Chlorodibromomethane	2	129	127	131
Bromoform	2	173	171	175, 252
Tetrachloroethene	2	164 (166-SIM)	166	131
Toluene-d_8 (Surrogate)	2	98	70	100
4-Bromofluorobenzene (Surrogate)	3	95	174	176
Toluene	2	91	92	65
4-Methyl-2-pentanone	1	43	58	57, 100
2,2-Dichloropropane	1	77	41	97
Bromochloromethane	1	128	130	49
1,1-Dichloropropene	1	75	77	110
2-Hexanone	2	43	58	57, 100
Chlorobenzene	2	112	114	77
Ethylbenzene	2	106	91	
Xylenes	2	106	91	
Styrene	2	104	103	78, 51, 77
Dichlorobenzene (all isomers)	3	146	148	111
1,1,2,2-Tetrachloroethane	2	83	85	131, 133
1,1,1,2-Tetrachloroethane	2	131	133	119
1,2-Dibromo-3-chloropropane	3	157	155	75
Isopropylbenzene	2	105	120	
cis-1,4-Dichloro-2-butene	2	53	88	
1,3-Dichloropropane	2	76	78	41
1,2-Dibromoethane	2	107	109	
Bromobenzene	2	156	158	77
n-Propylbenzene	3	91	120	
1,2,3-Trichloropropane	3	110	75	
2-Chlorotoluene	3	91	126	
trans-1,4-Dichloro-2-butene	3	53	88	124
1,3,5-Trimethylbenzene	3	105	120	
4-Chlorotoluene	3	91	126	
tert-Butylbenzene	3	119	91	134
1,2,4-Trimethylbenzene	3	105	120	
sec-Butylbenzene	3	105	134	
p-isopropyltoluene	3	119	134	91
n- Butylbenzene	3	91	92	134

Table 9 (continued)

Characteristic Ions

Compound	IS Group	Primary*	Secondary	Tertiary
1,2,4-Trichlorobenzene	3	180	182	145
Hexachlorobutadiene	3	225	223	227
Naphthalene	3	128	129	127
1,2,3-Trichlorobenzene	3	180	182	145

* The primary ion should be used for quantitation unless interferences are present, in which case a secondary ion may be used

** m/z 43 may be used for quantitation of 2-Butanone, but m/z 72 must be present for positive identification.

Table 10

VOST Analyte List Comparison Table

Compound	CAS Number	Listed in Table 1	Method 5041A	Method 0031	Risk Burn Guidance 07/01	Boiling Point ºC [1]
Dichlorodifluoromethane	75-71-8	X			X	-30
Chloromethane	74-87-3	X	X	NA	X	-24
Bromomethane	74-83-9	X	X	XX	X	4
Vinyl chloride	75-01-4	X	X	XX	X	-14
Vinyl Bromide	593-60-2	X		XX		16
Chloroethane	75-00-3	X	X	XX	X	12
Trichlorofluoromethane	75-69-4	X	X	X	X	24
Carbon Disulfide	75-15-0	X	X	X	X	46
Acetone	67-64-1	X	X	NA	X	56
Acrylonitrile	107-13-1	X	X	X	X	77
Iodomethane	74-88-4	X	X		X	43[2]
Chloroprene	126-99-8			X		59
Acetonitrile	75-05-8	X			X	82
Methylene chloride	75-09-2	X	X	X	X	40
1,1-Dichloroethene	75-35-4	X	X	X	X	32
1,1-Dichloroethane	75-34-3	X	X	X	X	57
trans-1,2-Dichloroethene	156-60-5	X	X	X	X	48
2,2-Dichloropropane	590-20-7	X				69
cis-1,2-Dichloroethene	156-59-2	X			X	60
1,2-Dichloroethene (Total)	540-59-0	X				48, 60
Chloroform	67-66-3	X	X	X	X	61[2]
Bromochloromethane	74-97-5	X				68
1,2-Dichloroethane	107-06-2	X	X	X	X	84
Dibromomethane	74-95-3	X	X	X	X	97
2-Butanone	78-93-3	X			X	80
1,1,1-Trichloroethane	71-55-6	X	X	X	X	74
Carbon tetrachloride	56-23-5	X	X	X	X	77
1,1-Dichloropropene	563-58-6	X				NL
Bromodichloromethane	75-27-4	X	X	X	X	90
1,2-Dichloropropane	78-87-5	X	X	X	X	97
1,3-Dichloropropane	142-28-9	X				120
cis-1,3-Dichloropropene	10061-01-5	X	X	**	X	104
Trichloroethene	79-01-6	X	X	X	X	87
Dibromochloromethane	124-48-1	X	X	X	X	120
1,2-Dibromoethane	106-93-4	X				132
1,2,3-Trichloropropane	96-18-4	X	X	*	X	156
1,1,2-Trichloroethane	79-00-5	X	X	X	X	114
Benzene	71-43-2	X	X	X	X	80
trans-1,3-Dichloropropene	10061-02-6	X	X	**	X	112
Bromoform	75-25-2	X	X	*	X	149[2]

Table 10 (continued)

VOST Analyte List Comparison Table, continued

Compound	CAS Number	Listed in Table 1	Method 5041A	Method 0031	Risk Burn Guidance 07/01	Boiling Point °C [1]
4-Methyl-2-pentanone	108-10-1	X				117
2-Hexanone	591-78-6	X				127
Tetrachloroethene	127-18-4	X	X	X	X	121
Toluene	108-88-3	X	X	X	X	111
1,1,2,2-Tetrachloroethane	79-34-5	X	X	*	X	146
Chlorobenzene	108-90-7	X	X		X	132[2]
1,1,1,2-Tetrachloroethane	630-20-6	X				130
Ethylbenzene	100-41-4	X	X	*	X	136
Styrene	100-42-5	X	X	*	X	145
m- and p-Xylenes	136777-61-2	X				139
o-xylene	95-47-6	X				144
Total xylenes	1330-20-7	X	X	*	X	140
Isopropylbenzene	98-82-8	X				151
Bromobenzene	108-86-1	X				155
n-Propylbenzene	103-65-1	X				159
2-Chlorotoluene	95-49-8	X				159
4-Chlorotoluene	106-43-4	X				162
1,3,5-Trimethylbenzene	108-67-8	X				165
tert-Butylbenzene	98-06-6	X				169
1,2,4-Trimethylbenzene	95-63-6	X				169
sec-butylbenzene	135-98-8	X				173
1,3-Dichlorobenzene	541-73-1	X		*		173
1,4-Dichlorobenzene	106-46-7	X		*		173
1,2-Dichlorobenzene	95-50-1	X		*		180
4-Isopropyltoluene	99-87-6	X				176-178
n-Butylbenzene	104-51-8	X				183
1,2-Dibromo-3-chloropropane	96-12-8	X				195
1,2,4-Trichlorobenzene	120-82-1	X				214
Napthalene	91-20-3	X				218
Hexachlorobutadiene	87-68-3	X				210
1,2,3-Trichlorobenzene	87-61-6	X				219

NA - Identified in Method 0031 as one of several compounds for which Method 0031 is not applicable.

XX - Identified in Section 1.4 and Table 1 of Method 0031 as high volatility organic compounds, 0031 may be applied if extra care is taken (e.g., use of SLO-SMVOC).

* - Identified in Method 0031, Section 1.5 as analytes where Method 0030 has been used inappropriately since these compounds will not be collected quantitatively at the upper temperature limit for the operation of the SMVOC train.

** - Listed as 1,3-dichloropropene CAS#542-75-6 (which is a mixture of isomers)

NL - Boiling point is not listed in any of the references.

[1] Boiling points listed are from Chemfinder.com, unless otherwise noted.

[2] Boiling point from Webbook.NIST.gov.

FIGURE 1 – Example GC and GC/MS Conditions for SIM.

```
                              TOPLEVEL PARAMETERS
                              -------------------

Method Information For: C:\MSDCHEM\1\METHODS\SIM.M
Method Sections To Run:

  ( ) Save Copy of Method With Data
  ( ) MSTOP              Pre-Run Cmd/Macro  =
  ( ) Instrument Control Pre-Run Cmd/Macro  =
  ( ) Data Analysis      Pre-Run Cmd/Macro  =
  (X) Data Acquisition
  ( ) Data Analysis
  ( ) MSTOP              Post-Run Cmd/Macro =
  ( ) Instrument Control Post-Run Cmd/Macro =
  ( ) Data Analysis      Post-Run Cmd/Macro =
Method Comments:
  VOST/CONDENSATE SIM METHOD

                              END OF TOPLEVEL PARAMETERS
                              --------------------------



                              INSTRUMENT CONTROL PARAMETERS
                              -----------------------------

==============================================================================
                               6890 GC METHOD
==============================================================================

OVEN
   Initial temp:  35 'C (On)                Maximum temp:  230 'C
   Initial time:  2.00 min                  Equilibration time:  0.10 min
   Ramps:
      #  Rate  Final temp  Final time
      1 17.00      124        2.25
      2 21.00      200        1.00
      3   0.0(Off)
   Post temp:  0 'C
   Post time:  0.00 min
   Run time:  14.10 min

FRONT INLET (SPLIT/SPLITLESS)            BACK INLET (UNKNOWN)
   Mode:  Split
   Initial temp:  200 'C (On)
   Pressure:  21.66 psi (On)
   Split ratio:  30:1
   Split flow:  41.0 mL/min
   Total flow:  45.1 mL/min
   Gas saver:  On
   Saver flow:  15.0 mL/min
   Saver time:  10.00 min
   Gas type:  Helium

COLUMN 1                                 COLUMN 2
   Capillary Column                         Capillary Column
   Model Number:  Agilent 121-1324          Model Number:  Agilent 121-1324
   DB-624, 0.18mm * 20m * 1um               DB-624, 0.18mm * 20m * 1um
   Max temperature:  260 'C                 Max temperature:  260 'C
   Nominal length:  19.0 m                  Nominal length:  20.0 m
   Nominal diameter:  180.00 um             Nominal diameter:  180.00 um
   Nominal film thickness:  10.00 um        Nominal film thickness:  10.00 um
   Mode:  constant flow                     Mode:  (see column 1)
   Initial flow:  0.7 mL/min                Nominal initial flow:  0.8 mL/min
   Nominal init pressure:  22.64 psi        Nominal init pressure:  22.64 psi

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```

FIGURE 1 – Example GC and GC/MS Conditions for SIM (continued)

```
   Average velocity:  31 cm/sec
   Inlet:  Front Inlet
   Outlet:  MSD
   Outlet pressure:  ambient

FRONT DETECTOR ()

SIGNAL 1
   Data rate:  20 Hz
   Type:  test plot
   Save Data:  Off
   Zero:  0.0 (Off)
   Range:  0
   Fast Peaks:  Off
   Attenuation:  0

COLUMN COMP 1
   (No Detectors Installed)

THERMAL AUX 1
   Use:  MSD Transfer Line Heater
   Description:
   Initial temp:  250 'C (On)
   Initial time:  0.00 min
      #  Rate  Final temp  Final time
      1   0.0(Off)

   Average velocity:  39 cm/sec
   Inlet:  Front Inlet
   Outlet:  MSD
   Outlet pressure:  vacuum

BACK DETECTOR ()

SIGNAL 2
   Data rate:  20 Hz
   Type:  test plot
   Save Data:  Off
   Zero:  0.0 (Off)
   Range:  0
   Fast Peaks:  Off
   Attenuation:  0

COLUMN COMP 2
   (No Detectors Installed)

POST RUN
   Post Time: 0.00 min

TIME TABLE
   Time       Specifier                    Parameter & Setpoint

                          7673 Injector

     Front Injector:
        Sample Washes                 0
        Sample Pumps                  6
        Injection Volume            1.0 microliters
        Syringe Size               10.0 microliters
        Nanoliter Adapter           Off
        PostInj Solvent A Washes      0
        PostInj Solvent B Washes      0
        Viscosity Delay               0 seconds
        Plunger Speed              Fast

     Back Injector:
        Sample Washes                 0
        Sample Pumps                  6
        Injection Volume            1.0 microliters
        Syringe Size               10.0 microliters
        Nanoliter Adapter           Off
        PostInj Solvent A Washes      0
        PostInj Solvent B Washes      0
        Viscosity Delay               0 seconds
        Plunger Speed              Fast

 Column 1 Inventory Number : DB-624
 Column 2 Inventory Number :

                          MS ACQUISITION PARAMETERS

General Information
------- -----------

Tune File                 : bfb.u
Acquistion Mode           : SIM

Method: SIM.M             Tue Aug 18 15:56:11 2015            Page: 2
```

FIGURE 1 – Example GC and GC/MS Conditions for SIM (continued)

```
MS Information
-- -----------

Solvent Delay              : 5.00 min

EM Absolute                : False
EM Offset                  : 0
Resulting EM Voltage       : 1541.2

[Sim Parameters]

GROUP 1
Group ID                   : 3
Resolution                 : Low
Plot 1 Ion                 : 98.0
Ions/Dwell In Group        (  Mass,  Dwell) (  Mass,  Dwell)
                           (  98.0,     50) ( 100.0,     50)

GROUP 2
Group ID                   : B
Resolution                 : Low
Group Start Time           : 5.80
Plot 1 Ion                 : 131.0
Ions/Dwell In Group        (  Mass,  Dwell) (  Mass,  Dwell) (  Mass,  Dwell)
                           ( 131.0,     40) ( 164.0,     40) ( 166.0,    200)

GROUP 3
Group ID                   : 4
Resolution                 : Low
Group Start Time           : 6.40
Plot 1 Ion                 : 112.0
Ions/Dwell In Group        (  Mass,  Dwell) (  Mass,  Dwell) (  Mass,  Dwell)
                           (  77.0,     50) (  82.0,     25) ( 112.0,    200)
                           ( 114.0,     50) ( 117.0,     25)

GROUP 4
Group ID                   : C
Resolution                 : Low
Group Start Time           : 7.60
Plot 1 Ion                 : 95.0
Ions/Dwell In Group        (  Mass,  Dwell) (  Mass,  Dwell)
                           (  95.0,     50) ( 174.0,    100)

GROUP 5
Group ID                   : 6
Resolution                 : Low
Group Start Time           : 8.50
Plot 1 Ion                 : 152.0
Ions/Dwell In Group        (  Mass,  Dwell) (  Mass,  Dwell)
                           ( 150.0,     50) ( 152.0,     50)

[MSZones]

MS Quad                    : 150 C   maximum 200 C
MS Source                  : 230 C   maximum 250 C

                              END OF MS ACQUISITION PARAMETERS

PostRun InstCntl macro(s) exist: msacq2.mac


                            END OF INSTRUMENT CONTROL PARAMETERS
                            -------------------------------------


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EUROFINS STANDARD OPERATING PROCEDURE

ANION ANALYSIS BY METHOD 300.0/9056/9056A

STANDARD OPERATING PROCEDURE

TITLE: ANION ANALYSIS BY ION CHROMATOGRAPHY

(SUPERSEDES: KNOX-WC-0005, Rev. 17)

Approvals (Signature/Date):

Jerrod Perales — Date: 6/20/23 Prepared by:	
Don Wasmund — Date: 6-26-23 Technical Specialist	Lewis Osborne — Date: 6-22-23 Health & Safety Manager / Coordinator
Kevin McGee — Date: 6/22/23 Quality Assurance Manager	Kevin Woodcock — Date: 6/27/23 Laboratory Director

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1. Scope and Application

1.1. This procedure describes the determination of fluoride, chloride, nitrite as N, bromide, nitrate as N, ortho-phosphate as P and sulfate in drinking water, surface water, mixed domestic and industrial wastewaters, groundwater and soil, solids or waste (after extraction) based on methods 300.0A, 9056 and 9056A. Iodide may also be a target analyte.

1.2. This procedure also describes the determination of anions in stack gas emission samples collected using the isokinetic sampling train (Method 0050) or the midget impinger sampling train (Method 0051) based on methods 9056, 9056A, 9057 and 26A.

1.3. Aqueous stack samples for hydrogen sulfate or sulfate, which are derived from USEPA Method 8 or USEPA CTM-13 (NCASI Method 8A), may be analyzed by this procedure.

1.4. This procedure may also be used to determine total halogens for waste samples prepared using the current version of SOP KNOX-WC-0016.

1.5. Refer to Section 12 for anion reporting limits.

2. Summary of Method

2.1. An aliquot of prepared sample is introduced into the ion chromatograph. The sample is pumped through three different ion exchange columns and into a conductivity detector. The first two columns, including a pre-column or guard column and a separator column, are packed with low-capacity, strongly basic anion exchange resin. Ions are separated into discrete bands based on their affinity for the exchange sites of the resin. The last column is a suppressor column that reduces the background conductivity of the eluent to a low or negligible level and converts the anions in the sample to their corresponding acids.

2.2. The separated anions in their acid form are measured using an electrical conductivity cell. Anions are identified based on their retention times as compared to those of known standards. Quantitation is accomplished by measuring the peak response and comparing it to a calibration curve generated from known standards.

3. Definitions

Definitions can be found in the Eurofins Knoxville Quality Assurance Manual (QAM).

4. Interferences

4.1. Interferences can be caused by substances with retention times that are similar to and overlap those of the anion of interest. Large amounts of an anion can interfere with the peak resolution of an adjacent anion. Sample dilution and/or fortification can be used to solve most interference problems associated with retention times. The water dip or negative peak that elutes near, and can interfere with, the

fluoride peak may be diminished by the addition of concentrated eluent to each standard and sample.

4.2. Method interferences may be caused by contaminants in the reagent water, reagents, glassware and other sample processing apparatus that lead to discrete artifacts or an elevated baseline in the ion chromatograms.

4.3. Any anion that is not retained by the column or only slightly retained will elute in the area of fluoride and therefore, interfere with the fluoride quantitation. Some organic anions, notably formate, lactate and acetate, are known to elute early on the AS22 chromatogram, and may interfere with fluoride.

4.4. Acetate typically elutes after fluoride on the AS22 column. The retention times of anions can differ when large amounts of acetate are present. Therefore, this method is not recommended for leachates of solid samples when acetic acid is used for pH adjustment, without the use of matrix spikes to confirm anion identity.

4.5. Samples that are suspected to contain particles larger than 0.45 µm and reagent solutions that contain particles larger than 0.20 µm require filtration to prevent damage to instrument columns and flow systems.

4.6. Excessive amounts of anions other than chloride may cause interferences in samples by “tailing” and other well known chromatographic effects.

4.7. Some organic waste samples contain high concentrations of organic anions, and may cause coelution with one or more target analytes. Dilution, matrix spiking, and review of peak shapes may be used to discern interference from organic ions.

4.8. Carbonate elutes immediately after nitrate on the AS22 column, and may cause interference to nitrate quantification when the concentration of nitrate is near the reporting limit.

5. Safety

5.1. Employees must abide by the policies and procedures in the Eurofins Environmental Health and Safety Manual and this document.

5.2. Procedures shall be carried out in a manner that protects the health and safety of all associates. Exposure to chemicals and samples will be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples must be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation, when possible. Solvent and waste containers will be kept closed unless transfers are being made. The preparation of all standards, reagents and glassware cleaning procedures that involve solvents will be conducted in a fume hood with the sash closed as far as the operations will permit.

5.3. Specific safety concerns or requirements

5.3.1. Sodium fluoride is highly toxic.

5.3.2. Exercise caution when using syringes with attached filter assemblies. Application of excessive force has, upon occasion, caused a filter disc to burst during the process

5.4. Primary Materials Used: The following is a list of the materials used in this method, which have a serious or significant hazard rating. **NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table.** A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material (1)	Hazards	Exposure Limit (2)	Signs and symptoms of exposure
Potassium Nitrate	Oxidizer	None	Causes irritation to the respiratory tract, skin and eyes. Symptoms may include coughing, shortness of breath. Symptoms include redness, itching, and pain.
Sodium Fluoride	Poison	2.5 mg/m^3-TWA as F	**Highly Toxic.** Causes severe irritation to the respiratory tract, symptoms may include coughing, sore throat, and labored breathing. Causes irritation, with redness and pain. Solutions are corrosive. Eye irritant! May cause irritation and serious eye damage. Effects may not appear immediately.
Sodium Hydroxide	Corrosive Poison	2 ppm, 5 mg/m^3	This material will cause burns if it comes into contact with the skin or eyes. Inhalation of Sodium Hydroxide dust will cause irritation of the nasal and respiratory system.
Sulfuric Acid	Corrosive Oxidizer Dehydrator	1 mg/m^3-TWA	Inhalation produces damaging effects on the mucous membranes and upper respiratory tract. Symptoms may include irritation of the nose and throat, and labored breathing. Symptoms of redness, pain, and severe burn can occur. Contact can cause blurred vision, redness, pain and severe tissue burns. Can cause blindness.
1 – Always add acid to water to prevent violent reactions.			
2 – Exposure limit refers to the OSHA regulatory exposure limit.			

5.5. All work must be stopped in the event of a known or potential compromise to the health and safety of any associate. The situation must be reported **immediately** to a laboratory supervisor.

6. Equipment and Supplies

6.1. Balance: Analytical, capable of accurately weighing to the nearest 0.0001 g.

6.2. Ion Chromatograph: Analytical system complete with ion chromatograph and all required accessories including analytical columns, compressed gases and detectors. Typical instruments include Thermofisher Dionex models 22153-60316 and 22176-60004.

6.3. Primary Anion guard column: Used to protect the separator column. If omitted from the system the retention times will be shorter. Dionex AG22 column P/N 064139, or equivalent.

6.4. The separation shown in Figure 1 was generated using a Dionex AS22 column (P/N 064141). A different column may be used if comparable resolution of the peaks is obtained, and the requirements of Section 13.2 can be met.

6.5. Anion suppressor device: Dionex AERS 500 Carbonate Electrolytically Regenerated Suppressor for Carbonate Eluents (4 mm) (P/N 0085029) or other equivalent suppressor.

6.6. Detector: Conductivity cell-approximately 1.25 µL internal volume, Dionex, or equivalent.

6.7. Chromeleon Chromatography Software or equivalent. To be used as a data collection device. The data is exported to the Test America Laboratory System (TALS) and processed using Chrom software developed internally.

6.8. Assorted laboratory glassware (pipettes, volumetric flasks, etc.).

7. Reagents and Standards

7.1. Reagent grade chemicals shall be used in all tests. Unless otherwise indicated, it is intended that all reagents conform to the specifications of the Committee on Analytical Reagents of the American Chemical Society, where such specifications are available. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination.

7.2. Reagent water: Distilled or deionized water, free of the anions of interest. Water should contain particles no larger than 0.20 microns.

7.3. Eluent stock solution: Prepare 1000 mL concentrated eluent stock solution by dissolving 11.76 g sodium bicarbonate and 47.7 g sodium carbonate in 1000 mL reagent water. This stock is good for 6 months. Record in TALS as [85ELUENTAS22_NNNNN]. Attach TALS label.

7.3.1. Prepare the anion eluent solution by diluting 10 mL of the stock solution to 1 liter reagent water. Record stock dilution as solution ID/100 in batch information.

7.4. Polypropylene pellets (Fairfield Polyfill) or equivalent.

7.5. Mineral Oil (USP), Walgreen's or equivalent.

7.6. Stock solutions, 1000 mg/L: All stock solutions of the target analytes are commercially available. Typically, ERA is the source of the calibration standards and Spex is the source for the second source standards. Environmental Express or Inorganic Ventures may be used as alternate vendors. The stability of

commercially available stock solutions is determined by the vendor expiration date.

7.7. Sodium thiosulfate pentahydrate: Fisher S445-500, or equivalent.

7.8. Sodium thiosulfate, 2.0N: Dissolve 24.8 grams sodium thiosulfate pentahydrate in 100 mL deionized water. The solution expires one year from date of preparation.

7.9. Sodium hydroxide, 10N: Fisher SS255-1. Expiration per manufacturer.

7.10. Sodium hydroxide, 0.5N: Dilute 5 milliliters NaOH, 10N to 100 mL. Expires in one year, or when 10N expires.

7.11. Working standards: Prepare a minimum of six working standards (more are better), using commercial stock solutions (1000 mg/L). Working Standards below 50 ppm expire in one week, except those that contain nitrate, nitrite and phosphate, which expire in 48 hours. Typical calibration levels for SW-9056 are shown below, but the analyst may choose different calibration levels as long as the requirements of Section 10 are met. All nine levels do not need to be used, and the analyst should choose to drop one or more standards from either end of the curve for each analyte to obtain the best calibration, while still supporting the reporting limit for the analyte. No standard may be dropped from the middle of the curve. Six standards are required to use a quadratic fit to the data.

7.11.1. Typical Calibration Standard Concentrations for Water/Solid Samples

Analyte	**L1** (mg/L)	**L2** (mg/L)	**L3** (mg/L)	**L4** (mg/L)	**L5** (mg/L)	**L6** (mg/L)	**L7** (mg/L)	**L8** (mg/L)	**L9** (mg/L)
Fluoride	0.05	0.1	0.5	1	2.5	5	10	15	20
Chloride	0.05	0.1	0.5	1	2.5	5	10	15	20
Nitrite as N	0.05	0.1	0.5	1	2.5	5	10	15	20
Bromide	0.05	0.1	0.5	1	2.5	5	10	15	20
Nitrate as N	0.05	0.1	0.5	1	2.5	5	10	15	20
o-Phosphate as P	0.05	0.1	0.5	1	2.5	5	10	15	20
Sulfate	0.05	0.1	0.5	1	2.5	5	10	15	20
Iodide	0.05	0.1	0.5	1	2.5	5	10	15	20

7.11.2. Typical Calibration Standard Concentrations for Stack Gas Samples

Analyte	**L1** (mg/L)	**L2** (mg/L)	**L3** (mg/L)	**L4** (mg/L)	**L5** (mg/L)	**L6** (mg/L)	**L7** (mg/L)
Fluoride	0.050	0.075	0.10	0.25	0.50	1.0	2.0
Chloride	0.050	0.075	0.10	0.25	0.50	1.0	2.0
Nitrite	0.050	0.075	0.10	0.25	0.50	1.0	2.0
Bromide	0.050	0.075	0.10	0.25	0.50	1.0	2.0
Nitrate	0.050	0.075	0.10	0.25	0.50	1.0	2.0

7.11.3. Typical Laboratory Control Sample (LCS) Concentrations

Analyte	**LCS Concentration**			
	Water (mg/L)	**Solid (mg/kg)**	**Waste (mg/kg)**	**Stack Gas (mg/L)**
Fluoride	2.5-5.0	50	500	0.75
Chloride	2.5-5.0	50	500	0.75
Nitrite as N	2.5-5.0	50	500	0.75
Bromide	2.5-5.0	50	500	0.75
Nitrate as N	2.5-5.0	50	500	0.75
ortho-Phosphate as P	2.5-5.0	NA	500	NA
Sulfate	2.5-5.0	50	500	5.0
Iodide	2.5-5.0	50	500	0.75

7.11.4. Typical Sources for Standards

Analyte	**Calibration Standards**	**ICV/LCS**
Fluoride	ERA	Spex or Env Exp
Chloride	ERA	Spex or Env Exp
Nitrite as N	ERA	Spex or Env Exp
Bromide	ERA	Spex or Env Exp
Nitrate as N	ERA	Spex or Env Exp
ortho-Phosphate as P	ERA	Spex or Env Exp
Sulfate	ERA	Spex or Env Exp
Iodide	ERA	Spex or Env Exp

8. Sample Collection, Preservation and Storage

8.1. Sampling is not performed for this method by Eurofins Knoxville. For information regarding sample shipping, refer to SOP KNOX-SC-0003, “Sample Receipt and Log In”, current revision.

8.2. Samples should be collected in plastic or glass bottles. The volume collected should be sufficient to ensure a representative sample, allow for replicate analyses, if required, and minimize waste disposal. Typically, a 250 mL sample is sufficient.

8.3. Sample preservation and holding times for the anions that can be determined by this method for water samples are as follows:

Analyte	Preservation	Holding Time
Fluoride	None	28 days
Chloride	None	28 days
Bromide	None	28 days
ortho-Phosphate as P	1 to 6°C	48 hours
Sulfate	1 to 6°C	28 days
Nitrate/Nitrite as N	1 to 6°C	28 days
Nitrite as N	1 to 6°C	48 hours
Nitrate as N	1 to 6°C	48 hours
Iodide	None	28 days

8.4. Soil and waste leachates and total halogen digestates should follow the same preservation and holding times as the water samples. Waste materials must meet the holding times specified in section 8.3 unless a different holding time is specified by a QAPP, except for ortho-phosphate, nitrite and nitrate. These should be analyzed as soon as possible.

8.5. Stack gas samples collected for analysis by EPA Methods 9056/9057/26A, EPA Method 8 or NCASI Method 8A can be stored for up to 28 days before analysis. Stack gas samples may be stored at room temperature and need not be cooled.

8.6. Method 26A/0050 recommends that sodium hydroxide impinger samples be treated in the field with sodium thiosulfate to convert entrained hypochlorite to chloride. The laboratory recommends that the samples be treated in the lab with sodium thiosulfate to avoid over-use of sodium thiosulfate and introduction of excess interferences such as a large sodium peak in front of the first anion elutions. Refer to Section 11.3.5.

9. Quality Control

9.1. Appendix III provides a summary of quality control requirements including type, frequency, acceptance criteria and corrective action.

9.2. Batch definition: Preparation and QC batch definitions are provided in the QAM.

9.3. Method Blank (MB): One method blank must be processed with each preparation batch. The method blank consists of reagent grade water that has been taken through the entire preparation and analytical process. The method blank is used to identify any system and process interferences or contamination of the analytical system that may lead to the reporting of elevated analyte concentrations or false positive data. Refer to Appendix III for the acceptance criteria for each method and matrix.

9.4. Laboratory Control Sample (LCS): The LCS consists of reagent grade water containing known amounts of target analytes. The LCS is prepared from a

separate source from the material used to prepare the calibration standards. One LCS must be processed with each preparation batch and must be carried through the entire analytical procedure. The LCS is used to monitor the accuracy of the analytical process. On-going monitoring of the LCS results provides evidence that the laboratory is performing the method within acceptable accuracy and precision guidelines. If the result is outside control limits, the system is out of control and corrective action must occur. Control limits of 90-110% recovery must be applied. In-house control limits will be evaluated against the default limits of 90-110% and the CCV control limits. Corrective action will be repreparation and reanalysis of the batch unless the client agrees that other corrective action is acceptable.

9.4.1. If a MS/MSD is not possible due to limited sample volume, then a laboratory control sample duplicate (LCSD) will be prepared and analyzed. The RPD of the LCS/LCSD must be less than or equal to 20%.

NOTE: The laboratory control sample and matrix spike sample must be spiked identically.

9.5. Matrix Spike/Matrix Spike Duplicate (MS/MSD) for Water, Solid and Waste Samples: A matrix spike is a field sample to which known concentrations of target analytes have been added. A matrix spike duplicate is a second aliquot of the same sample (spiked identically as the MS) prepared and analyzed along with the sample and matrix spike One MS/MSD pair must be processed with each preparation batch and must be carried through the entire analytical procedure. (Some client specific DQO's may require the use of sample duplicates in addition to MS/MSD's.) The MS/MSD results are used to determine the effect of a matrix on the precision and accuracy of the analytical process. Due to the potential variability of the matrix of each sample, these results may have immediate bearing only on the specific sample spiked.

Note: When method 300.0 is requested, one matrix spike is prepared and analyzed per 10 samples.

9.5.1. If the MS/MSD recovery or RPD falls outside the acceptance range, the recovery of the target analytes must be in control for the LCS. Refer to Appendix III for the acceptance criteria for each method and matrix.

9.5.2. If the native analyte concentration in the MS/MSD exceeds four times the spike level for that analyte, the recovery data are reported with a flag ("4": MS, MSD: The analyte present in the original sample is greater than 4 times the matrix spike concentration; therefore, control limits are not applicable.)

9.5.3. If the recovery of the LCS is within control limits, then the laboratory operation is in control and the results may be accepted.

9.5.4. If the recovery of the LCS is outside control limits, corrective action must be taken. Corrective action may include repreparation and reanalysis of the batch.

9.5.5. If a MS/MSD is not possible due to limited sample volume, then a laboratory control sample duplicate (LCSD) will be prepared and analyzed. The RPD of the LCS/LCSD must be less than or equal to 20%.

9.6. Matrix Spike/Matrix Spike Duplicates for Stack Gas Samples: For demonstration of analytical method performance on stack gas samples, matrix spikes are analyzed with each similar type of impinger sample. Acceptable recoveries of these spikes demonstrate that quantitation from this particular stack gas matrix is accurate and acceptable. Impinger samples containing 0.1N H_2SO4 and 0.1N NaOH may display suppressed conductivity detector responses. The suppression is a matrix effect causing poor method performance and possibly giving unreliable data unless it is removed. Therefore, samples are diluted in the lab to modify the matrix for an enhanced anion response. The samples may be analyzed at increasing dilutions along with matrix spikes until matrix spikes recover from the sample within laboratory control limits. The unspiked sample result is reported from this dilution.

9.6.1. Samples are grouped by matrix (0.1N H_2SO_4 or 0.1N NaOH) and by similar chromatography. One MS is performed for each group of similar samples. One MS/MSD is performed for each batch.

9.6.2. When possible, for samples with positive results for anions, report results from a dilution whereby the original sample results are above the method detection limit and the MS/MSD recoveries are within control limits.

9.6.3. For samples in which anions are not detected, report results from a dilution which provides the lowest possible reporting limit, as well as MS/MSD recoveries within control limits.

9.6.4. Samples are analyzed in duplicate upon client request.

9.6.5. Reagent and field blanks are typically the most difficult samples to analyze due to the high normality of the sulfuric acid and sodium hydroxide reagents. High dilutions, and therefore, elevated reporting limits may be necessary to obtain matrix spike recovery results within laboratory control limits. As these samples typically do not contain anions, provide the lowest possible reporting limit. Successively dilute and spike these samples until anions are recovered at a level that shows that anions would be detected at the reporting limit if it were present.

9.6.6. Refer to Appendix III for the acceptance criteria for each method and matrix.

9.7. Sample Duplicates: A sample duplicate is a second aliquot of an environmental sample taken from the same sample container that is processed identically with the first aliquot of that sample. The results are compared to determine the sample homogeneity and the precision of the analytical process. Due to the potential variability of the matrix of each sample, these results may have immediate bearing only on the specific sample analyzed in duplicate. Refer to Appendix III for the acceptance criteria for each method and matrix.

10. Calibration and Standardization

10.1. Establish ion chromatographic operating parameters equivalent to those indicated in Table 2.

10.2. For each analyte of interest, prepare a minimum of six calibration standards. Refer to Section 7.11 for typical standard concentrations and preparation information.

10.3. Analyze the calibration standards using an appropriate injection volume (e.g., 50 uL). The results are used to prepare a calibration curve for each analyte. While peak area is the default, peak height may be used if more accurate sample results would result based on sample matrix effects on peak shape.

10.3.1. Linear or quadratic fits are allowed for all methods. For linear regression, the correlation coefficient (r) must be ≥ 0.995; the coefficient of variation (r^2) must be ≥ 0.990. A minimum of six calibration standards are required for quadratic curve fits and the coefficient of variation (r^2) must be ≥ 0.990.

10.3.2. Readback: All points above the LOQ (RL) must have a read back error of ≤ 30%. The calibration point at the LOQ (RL) may have a read back error of ≤50%.

10.4. Initial Calibration Verification (ICV/ICB): Calibration accuracy is verified by analyzing a second source initial calibration verification standard (ICV). The ICV result must fall within 10% of the true value for the target analytes. An initial calibration blank (ICB) is analyzed after the ICV to monitor low level accuracy and system cleanliness. The ICB result must be ≤10% of the LLOQ for target analytes . If either the ICV or ICB fail to meet criteria, reanalyze the ICV/ICB. If the reanalysis of either the ICV or ICB fail to meet criteria, terminate the analysis, correct the problem and recalibrate the instrument. The ICV and the ICB are analyzed immediately after the ICAL, and must be linked to each analytical batch that is derived from the ICAL they are associated with.

10.5. Continuing Calibration Verification (CCV/CCB): Continuing calibration is verified by analyzing a calibration standard after every ten client samples (i.e., field samples, matrix spikes and duplicate samples). The CCV must fall within +/- 10% of the true value for target analytes. A CCB is analyzed immediately following the CCV to monitor low level accuracy and system cleanliness. The CCB result must be ≤10% of the LLOQ (RL) for target analytes.

10.6. Samples must be bracketed by acceptable CCV/CCBs. If the analyst notes that a CCV failed and can document the reason for failure (e.g., broken vial, matrix carryover from the previous sample, etc.), then a second CCV may be analyzed along with a CCB without any adjustments to the instrument. If both the CCV and CCB meet the criteria, then the preceding samples have been successfully bracketed. If adjustments to the instrument are performed before the repeat CCV, then the preceding samples have not been successfully bracketed, but analysis may continue.

10.7. If routine corrective action procedures fail to produce a second consecutive (immediate) calibration verification within acceptance criteria, then the laboratory has to demonstrate performance after corrective action with two consecutive successful calibration verifications. If the laboratory has not demonstrated acceptable performance, sample analyses must not occur until a new initial calibration curve is established and verified.

10.8. Samples bracketed by an unacceptable CCV may be reported when the acceptance criteria for the CCV is exceeded high and the anions of interest are not detected in the samples.

10.9. Refer to Eurofins policy NDSC-QA-QP44940 “Calibration Curves and Selection of Calibration Points”, current revision, for definitions and calculations using the different curve models.

11. Procedure

11.1. Data Entry into TALS: Preparative information is added within the preparation batches.

11.1.1. For air sampling trains, this is only used to record the impinger sample volume. The initial amount is recorded as “1 sample” and the final amount is recorded as the measured impinger volume in mL. The impinger volumes are recorded manually in the Source Air Analysis Sample Information Log, and the data are typed into the worksheet of the prep batch in TALS. The logbook page with the raw data is scanned and added to the prep batch as an external prep worksheet.

11.1.2. For soils and wastes, prep dilution data is first recorded on the Wet Chemistry Sample Preparation Information Log. It is manually entered into the worksheet of the DI Leach prep batch. The sample weight is entered as the initial amount in grams, and the total volume is entered as the final amount in milliliters. The logbook page with the raw data is scanned and added to the prep batch as an external prep worksheet.

11.1.3. For oxygen bomb combustion, dilutions are recorded in the form of “initial amount” and “final amount” in the MeOH Prep batch. The combusted sample amount is entered as the “initial amount” and the final volume is entered as the “final amount” in the worksheet of the

Method 5050 batch. When the sample is weighed, it is directly entered into the appropriate "initial amount" in either the MeOH Prep batch or the Method 5050 batch. There are no log books used.

11.1.4. The only initial amount/final amount data that should ever appear in the worksheet of the analytical batch is 10 mL to 10 mL, which is entered into the Chrom worklist. All Chrom worklists for IC use the voa water sample fraction designation in order to allow input of both the initial volume and final volume data. Bench dilutions are applied in the Chrom worklist as dilution factors, not by entering different initial and final volumes.

Note: If final volume data is not entered in Chrom, TALS will apply a final amount of 1 mL in some cases. This will cause fraction error; e.g., 10 mL initial amount to 1 mL final amount generates a multiplier of 10 that is applied to the final result.

11.1.5. Data review must include a complete recalculation from the chromatographic result to the final result to ensure that the correct multiplicative factors are applied. All initial and final amounts from the prep batch(s) must be used.

11.2. Sample Preparation for Solid/Soil Samples:

11.2.1. Add an amount of reagent water equal to ten times the weight of solid material taken as a sample (typically 10 g sample to 100 mL reagent water). Mix for thirty minutes using a magnetic stirring device or shaker table. Record the sample preparation information in the Wet Chemistry Sample Preparation Information Log and the worksheet of the DI Leach prep batch as described in section 11.1.2.

11.2.2. Filter the sample extract using a 0.45 um membrane type filter. This filtering device can be the type that attaches directly to the end of the syringe.

11.2.3. Prepare method blanks and LCSs using polypropylene pellets as the matrix.

11.2.4. Spike the LCS, LCSD, MS and MSD samples with 0.5 mL of 1000 mg/L anion solution. Only the project specific anions need to be spiked. The spike level will be 50 mg/kg for a 10 gram sample aliquot. Mix by swirling matrix and spike together.

11.3. Sample Preparation for Solid or Liquid Waste Samples:

11.3.1. Prepare containers for sample analysis for anions in waste. Use 125 mL polyethylene bottles or snap cap containers for the preparation step. Rinse the container with 10mL of DI water; discard the water.

11.3.2. Weigh matrix for one method blank and two laboratory control samples (LCS). These require 0.5 grams "Polypropylene pellets" and 0.5 grams mineral oil to comprise a one gram sample matrix. For the client samples, sample duplicates, MS and MSD, weigh 1.00 ± 0.002 g of sample into 125 mL polyethylene bottle, unless otherwise specified in project instructions.

11.3.3. Spike the LCS, LCSD, MS and MSD samples with 0.5 mL of 1000 mg/L anion solution. Only the project specific anions need to be spiked. The spike level will be 500 mg/kg for a 1.00 gram sample aliquot. Mix by swirling matrix and spike together.

11.3.4. To all client and QC sample aliquots, add fresh 2.00 mL buffer concentrate, then add deionized water (DI H_2O) to the 100mL mark; cap tightly and mix gently. Vent once, and then close the cap tightly. Shake vigorously using a platform shaker for 15 minutes. Remove from the platform shaker and allow to settle for 30 minutes

11.3.5. Record the sample preparation information in the Wet Chemistry Sample Preparation Information Log and the worksheet of the DI Leach prep batch as described in section 11.1.2.

11.3.6. For the IC analysis, collect an aliquot from the center of the preparation, and then filter the aliquot through a 0.45 micron membrane filter.

11.4. Sample Preparation for Stack Gases

11.4.1. Check the sample pH using pH strips, and then measure the sample volumes. Record the pH and sample volumes on the Source Air Analysis Sample Information logbook. The data are entered into the worksheet of the prep batch in TALS. The logbook page with the raw data is scanned and added to the prep batch as an external prep worksheet (Section 11.1.1). Check the liquid level in each sample and determine if any sample was lost during shipment. If leakage is suspected, an estimate of the volume lost may be determined from the difference between the initial and final solution levels. The client should be notified to determine if this value is to be used to correct the analytical results.

11.4.2. Perform a 1/2 dilution of each Front Half (CH_2SO_4) stack gas sample using eluent solution. Use a minimum 1/5 dilution for Back Half (NaOH) fractions. Note: Stack gas samples must be partially neutralized with 10 N NaOH (dropwise) and diluted in buffer solution in order to remove or reduce matrix interferences from the H_2SO_4 impinger solutions. Use the lower calibration range (Section 7.11.2) for stack gas samples to provide the lowest possible reporting limit. Samples derived from NCASI Method 8A (sulfate or sulfuric acid) do not require dilution to adjust the matrix and may be analyzed using a standard anion curve.

11.4.3. For H_2SO_4 impinger solutions, dilute with eluate solution.

Note: Sodium hydroxide (NaOH) should not be added to the front half (H2SO4) samples prior to analysis as it interferes in peak determination and manual integration of fluoride.

Note: Analysis of NaOH impingers does not interfere with fluoride determination provided the samples are diluted at least 5X (1/5).

11.4.4. For sodium hydroxide impinger samples that were not treated in the field with sodium thiosulfate, adjust the pH to ≥9 by adding NaOH (10N) drop wise after the sample is diluted with eluent solution. Treat the samples with sodium thiosulfate by adding 20 µL sodium thiosulfate (1.0N). This provides enough thiosulfate to convert the residual hypochlorite derived from 5.67 Cl2 in the prepared sample aliquot. Each dilution is prepared separately, and the thiosulfate only needs to be sufficient to convert 10 mL at 2 mg/L, or 0.020 mg. There is 280 times as much thiosulfate as needed to convert the hypochlorite in each aliquot prepared for analysis.

11.4.5. When analyzing samples for anions collected by Method 0050, Method 26A or other alternate procedures, prepare separate laboratory method blanks for front half (acidic fraction) samples and back half (basic fraction) samples. The preparation should incorporate all reagents used to prepare a sample of the relevant fraction. For instance, front half blanks need to incorporate the sodium hydroxide solution used to neutralize the sample, and back half samples need thiosulfate addition.

11.5. Table 2 summarizes the typical operating conditions for the ion chromatograph. Included in this table are estimated retention times that can be generally achieved by this method. Other columns, chromatographic conditions, or detectors may be used if the criteria for initial demonstration of capability are met.

11.6. Check system calibration daily and, if required, recalibrate as described in Section 10.

11.7. Load the autosampler and inject a fixed amount of well mixed sample, using the same volume of sample as was used for the standards. The injection loop is flushed thoroughly using each new sample. Use the same size loop for standards and samples.

11.8. The width of the retention time window used to make identifications is based upon measurements of actual retention time variations of the initial calibration standards. Alternately, the retention time window may be determined using three continuing calibration verification standards that have been analyzed on three successive days. Three times the standard deviation of a retention time is used to calculate a suggested window size for each analyte. The retention time study must be completed for each new column upon installation. Five percent of the average

retention time may be used as a default value. However, the experience of the analyst should weigh heavily in the interpretation of chromatograms.

11.9. If the resulting chromatogram fails to produce adequate resolution, or if identification of specific anions is questionable, fortify the sample with an appropriate amount of standard and reanalyze. If necessary, dilute the sample to improve peak shape and resolution.

Note: Retention time is dependent on concentration at high column loading of some analytes. Nitrate and sulfate exhibit the greatest amount of change, although all anions are affected to some degree. In some cases this peak shift may produce poor resolution or identification.

11.10. Should more complete resolution be needed between peaks, the eluent can be diluted. This will spread out the run but will also cause the later eluting anions to be retained longer. The analyst must determine to what extent the eluent should be diluted. This dilution is not considered a deviation from the method.

11.11. To avoid the water dip for samples, add concentrated eluent to undiluted samples.

11.12. If a sample analyte concentration exceeds the calibration range, the sample may be diluted to fall within the range. Dilute the sample with an appropriate amount of eluent solution and reanalyze.

11.13. If highly contaminated samples are expected, it is acceptable to analyze blanks at any point in the run.

11.14. One time procedural variations are allowed only if deemed necessary in the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variation in procedure, except those specified by project specific instructions, shall be completely documented using a Nonconformance Memo and approved by a Technical Specialist, Project Manager and QA Manager. If contractually required, the client shall be notified.

11.15. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

12. Data Analysis and Calculations

12.1. Refer to Appendix II for example data review checklists used to perform and document the review of the data. Using the data review checklist, the analyst also creates a narrative which includes any qualifications of the sample data.

12.2. Aqueous and Solid Samples

12.2.1. Aqueous Sample Concentration:

$$\text{Result (mg/L)} = \text{Raw Concentration (mg/L)} \times \text{DF}$$

12.2.2. Solid or Waste Sample Concentration:

$$\text{Result (mg/kg)} = \text{Raw Concentration (mg/L)} \times \text{DF} \times \left(\frac{\text{Final Leachate Volume (L)}}{\text{Sample Weight (kg)}}\right)$$

12.2.3. Report Nitrite as N, Nitrate as N and ortho-Phosphate as P.

12.2.4. The reporting limits for the following analytes are based on a 50 µL injection volume:

Analyte	**Water RL (mg/L)**	**Solid RL (mg/kg)**	**Waste RL (mg/kg)**
Fluoride	1.0	10	100
Chloride	1.0	10	100
Nitrite as N	0.5	5	50
Bromide	1.0	10	100
Nitrate as N	0.5	5	50
ortho-Phosphate as P	1.0	10	100
Sulfate	1.0	10	100
Iodide	1.0	10	100

12.3. Stack Gas Samples

12.3.1. Total µg protonated anion (HX) per sample:

$$M_{HX} = S \times V_S \times \frac{MW_{HX}}{MW_X} \times DF$$

Where:

M_{HX} = Mass of protonated anion in sample, ug
S = Sample result in µg/mL
V_S = Total volume of sample, mL
MW_{HX} = Molecular weight of protonated anion, µg / µg-mole
MW_X = Molecular weight of anion, µg / µg-mole
DF = Bench dilution factor

12.3.2. Total µg halogen per sample:

$$M_{X2} = S \times V_2 \times DF$$

Where:

M_{X2} = Mass of halogen in sample, µg
S = Sample result in µg/mL
V_2 = Total volume of sample, mL
DF = Bench dilution factor

12.3.3. Total µg anion per sample:

$$M_A = S \times V_S \times DF$$

Where:

M_A = Mass of anion in sample, ug

12.3.4. The results for the stack gas samples are reported as described below:

FH Sulfuric Acid Impingers	BH Sodium Hydroxide Impingers
Hydrogen Fluoride	Hydrogen Fluoride
Hydrogen Chloride	Chlorine
Hydrogen Bromide	Bromine
Nitrite as HNO_2	Nitrite as HNO_2
Nitrate as HNO_3	Nitrate as HNO_3
ortho-Phosphate as H_3PO_4	ortho-Phosphate as H_3PO_4
Iodide	Iodide

12.3.5. Sulfate determined in aqueous impinger solutions may be reported as H_2SO_4 or sulfate, depending on the client's request.

12.3.6. Please note that the halogen fluorine (F) is not expected to be present in stack gas as diatomic fluorine (F_2). Fluorine reacts with water vapor in a favored reaction that forms HF: $2F_2 + 2H_2O \rightarrow 4HF + O_2$. Therefore, the results from the H_2SO_4 impingers and the NaOH impingers are reported as HF, and no F_2 is expected in the samples.

12.3.7. Please note that results for iodine (I) in the H_2SO_4 and NaOH impinger samples are reported as the halide ion I^-; no correction has been made for HI or I_2. Since other species of iodine are likely to contribute to the concentration of iodide in these samples (i.e., I_3^-, IO_3^-, ICl_2^-), all results are reported as I^- without regard for the specific form introduced to the impinger.

13. Method Performance

13.1. Method Detection Limit (MDL) - An MDL must be determined for each analyte in each routine matrix prior to the analysis of any samples. The procedure for determination of the method detection limit is given in the SOP NDSC-QA-SOP42091, current revision based on 40 CFR Part 136 Appendix B. The result of the MDL determination must support the reporting limit. Current method detection limits are available in the TestAmerica Laboratory Information Management System (TALS).

13.2. Initial Demonstration of Capability - Each analyst must perform an initial demonstration of capability (IDOC) for each target analyte prior to performing the analysis independently. The IDOC is determined by analyzing four replicate spikes (e.g., LCSs) as detailed in SOP KNOX-QA-0009. The mean recovery of four replicates containing all analytes must be within 90-110% recovery and <10% RSD. For EPA Method 300.0, the MDL is also a part of the initial demonstration of capability. The MDL will be collected for the demonstration of method capability and when new initial demonstrations of capability are required for this method.

13.3. Linear Calibration Range (also referred to as Linear Dynamic Range): The linear calibration range must be established by acceptable initial calibration as defined in section 10.

13.4. The ICV/ICB must meet the acceptance criteria listed in Section 10.4.

13.5. Training Qualification: The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its use and has the required experience.

14. Pollution Prevention

14.1. This method does not contain any specific modifications that serve to minimize or prevent pollution.

15. Waste Management

15.1. All waste will be disposed of in accordance with federal, state and local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Eurofins Environmental Health and Safety Manual for "Waste Management and Pollution Prevention."

15.2. The following waste stream is produced when this procedure is carried out:

- Alkaline and/or acidic waste generated by the analysis will be collected and placed in poly satellite accumulation containers.

16. References

16.1. Eurofins Knoxville Quality Assurance Manual (QAM), current revision.

16.2. Method 300.0, "Determination of Inorganic Anions by Ion Chromatography", Environmental Monitoring Systems Laboratory, Office of Research and Development, U.S. Environmental Protection Agency, Cincinnati, Ohio, Revision 2.1, August 1993.

16.3. Modifications to 40 CFR Part 136, Section 136.6: Guidelines Establishing Test Procedures for the Analysis of Pollutants Under the Clean Water Act; Analysis and Sampling Procedures, Environmental Protection Agency, Federal Register / Vol. 77, No. 97 / Friday, May 18, 2012 / Rules and Regulations.

16.4. SW-846, Method 9056, "Determination of Inorganic Anions by Ion Chromatography", Revision 0, September 1994.

16.5. SW-846, Method 9056A, "Determination of Inorganic Anions by Ion Chromatography", Revision 1, February 2007.

16.6. SW-846, Method 9057, "Determination of Chloride from HCl/Cl_2 Emission Sampling Train (Method 0050 and 0051) by Anion Chromatography," Revision 0, December 1996.

16.7. Method 26A, "Determination of Hydrogen Halide and Halogen Emissions from Stationary Sources-Isokinetic Method," 40CFR, Pt. 60, App. A (7/1/94 edition).

16.8. Method CTM-13, (NCASI Method 8A), "Determination of Sulfuric Acid Vapor or Mist and Sulfur Dioxide Emissions from Kraft Recovery Furnaces."

16.9. Method 8, "Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions from Stationary Sources," 40CFR, Pt. 60, App. A-4, 8/25/2016.

16.10. Eurofins SOP NDSC-QA-SOP42091, "Detection and Quantitation Limits", current revision.

16.11. Eurofins Policy NDSC-QA-QP44940, "Calibration Curves and the Selection of Calibration Points", current revision.

16.12. Eurofins SOP NDSC-QA-SOP43862, "Manual Integrations", current revision.

17. Miscellaneous

17.1. Modifications/Interpretations from reference methods:

17.1.1. For samples analyzed by method 9056, the calibration standards are not analyzed from the highest to lowest concentration, as stated in the method.

17.1.2. Method 9056 states to analyze an MS/Duplicate pair. This procedure allows for the use of MS/MSD pair and/or an LCS/LCSD pair to assess the precision and accuracy of the analysis.

17.1.3. Method 9056 references the use of standards based on total ion concentration. Eurofins Knoxville reports anion results for Nitrate, Nitrite and ortho-Phosphate as Nitrate as N, Nitrite as N and ortho-Phosphate as P, respectively, as stated in Method 300.0.

17.1.4. Method 9056A states that the method blank must be ≤10% of the LLOQ, the regulatory limit or the lowest client sample result in the batch for each analyte. These criteria do not apply M26A sampling train samples. For these, the blank must be less than 1/2 LLOQ (RL) or ≤10% of the lowest client sample result in the batch for each analyte. These criteria do not apply to oxygen bomb combustion preparations. For these, the blank must be less than the LLOQ (RL) or ≤10% of the lowest client sample result in the batch for each analyte.

17.1.5. Method 9056A states to analyze an MS/Duplicate pair or a laboratory duplicate to characterize precision. This procedure allows for the use of MS/MSD pair, a laboratory duplicate when analytes are found in the

sample, and/or an LCS/LCSD pair to assess the precision and accuracy of the analysis.

17.1.6. Method 300.0 states that only linear calibration curves may be used. However, this SOP cites the Final Rule modifying 40 CFR 136 issued May 18, 2012, which allows the use of quadratic least squares fits to model calibration curves.

17.1.7. Method 300.0 states that MDLs will be performed every 6 months. MDL checks are performed quarterly.

17.1.8. Method 300.0 states the method blank should not contain any analyte of interest above the MDL. This SOP states the method blank should not contain any analyte of interest above one-half of the reporting limit.

17.1.9. Method 26A/0050 recommends that samples be preserved in the field with sodium thiosulfate. If this preservation is needed, the laboratory recommends that the samples be preserved in the lab with sodium thiosulfate to avoid over-preservation.

17.1.10. Method 26A states to analyze a calibration curve both before and after sample analysis. This procedure describes a single calibration prior to sample analysis as described in Method 9057.

17.1.11. The matrix matching of calibration standards for H_2SO_4 and NaOH impingers described in methods 9057 and 26A have not been included in this procedure. This is due to the typical dilution of the impinger solution resulting from condensation during sample collection, which results in a lower concentration of acid/base in the samples.

17.1.12. Method 26A states to analyze all samples in duplicate. This procedure only requires each sample to be analyzed once unless specified by the client.

17.1.13. Method 9057 states that the MS/MSD recoveries must be within 10%. This procedure allows the recoveries to be 75-125% recovery.

17.1.14. Based on correspondence from MICE, the CCV criteria were changed to $\pm$ 10%. See Appendix VI.

17.1.15. Samples derived from CTM-13 (NCASI Method 8A) are analyzed by ion chromatography (an allowed option in Method 8) instead of by titration.

17.1.16. Section 9.2.2 of Method 300.0 is parsed below with comments regarding the procedures used to meet these requirements in parenthesis.

- “Linear Calibration Range (LCR) - The LCR must be determined initially and verified every six months or whenever a significant change in instrument response is observed or expected. The initial

demonstration of linearity must use sufficient standards to insure that the resulting curve is linear." (As allowed in 40 CFR Part 136.6, Section b.4.x, a minimum six point quadratic curve is used in lieu of a linear calibration model.)

- "The verification of linearity must use a minimum of a blank and three standards. If any verification data exceeds the initial values by ±10%, linearity must be reestablished." (Since a nonlinear calibration function is being used, calibration accuracy is verified by the analysis of an initial calibration verification standard, ICV, and initial calibration blank, ICB, each day samples are analyzed. The ICV result must fall within 10% of the true value for the target analytes.)
- "If any portion of the range is shown to be nonlinear, sufficient standards must be used to clearly define the nonlinear portion." (As required in 40 CFR Part 136.6, Section b.4.x, a minimum of six calibration standards are required for quadratic curve fits. Knoxville also requires that the coefficient of variation (r^2) must be > 0.990).

17.2. Appendix I: Sodium Thiosulfate Addition to 0.1N Sodium Hydroxide Impingers

17.3. Appendix II: Example Data Review Checklist

17.4. Appendix III: Eurofins Knoxville Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria, and Corrective Action

17.5. Appendix IV: Table 2, Typical Instrument Operating Parameters

17.6. Appendix V: Figure 1, Example chromatogram

17.7. Appendix VI: Correspondence from MICE concerning the CCV criteria.

Appendix I: Sodium Thiosulfate Addition to 0.1N Sodium Hydroxide Impingers

Sodium Thiosulfate Addition to 0.1N Sodium Hydroxide Impingers: In the Field or In the Lab?

In an effort to optimize service to our customers, TestAmerica has reviewed the sampling and analysis objectives regarding Method 0050 (also Method 26A) to provide recommendations of best practice. The particular issue before us is the addition of sodium thiosulfate ($Na_2S_2O_3$) to the sodium hydroxide (NaOH) impinger composite to achieve the complete conversion of the impinger species to chloride (Cl^-). Some additional development of the issue is helpful.

Both Method 0050 (from SW-846) and Method 26A (from CFR 40) include procedures for the recovery of the NaOH impingers in the field instructing the stack sampling technicians to add $Na_2S_2O_3$ to the sample composite. Method 0050 prescribes the addition in Section 7.6.13, and Method 26 places the requirement in Section 8.2.4. Specifically, the instructions say to add 25 mg of $Na_2S_2O_3$ to the composite for every ppm of halogen anticipated to be in the stack gas. The fact that this instruction is ambiguous is obvious since these measurements have to be made first in order to know the ppm in the stack gas. Additionally, the volume of stack gas actually pulled through the impinger train defines the absolute amount of $Na_2S_2O_3$ required to treat the samples. All of this simply to say that a stack sampling technician is probably <u>not</u> going to be equipped with either the information or the tools to establish the ppm levels of chlorine in the stack on site.

Therefore, the amount of $Na_2S_2O_3$ that needs to be added to the samples will not be known until the samples are analyzed. The problem typically manifests itself when samplers attempt to add sodium thiosulfate with no knowledge of the sample needs and place well over the amount needed to convert the contents of the sample. Thiosulfate ($S_2O_3^{2-}$) is an anion just like chloride, and gives a characteristic chromatographic peak downfield of sulfate (SO_4^{2-}). If placed in the samples in milligram quantities, a large chromatographic peak is seen in the samples that typically interfere with chloride (Cl^-). Dilutions are effective in bringing the interference under control, but often dilute out the chloride peak at the same time. We receive samples so loaded with the $Na_2S_2O_3$ that the only anion peak defined after the required dilutions are applied is the superfluous thiosulfate peak. This chemical should <u>not</u> be put into these samples with no knowledge of the required amounts.

How then should the sodium thiosulfate treatment be handled? Note that sodium thiosulfate is <u>not</u> a preservative. It does <u>not</u> serve to prolong the holding time for 0.1N NaOH impingers, nor prevent the loss of chloride. Sodium thiosulfate is a reducing agent applied to these samples to convert an oxidized form of chlorine to chloride. In the impinger during sampling the following hydrolysis reaction takes place to trap the chlorine gas:

$$Cl_2 + H_2O \xrightarrow{NaOH} H^+ Cl^- + H^+ OCl^- \qquad \text{(Equation 1)}$$

The simplified presentation of this reaction is:

$$Cl_2 \xrightarrow{NaOH} Cl^- + OCl^- \qquad \text{(Equation 2)}$$

The products are chloride (Cl^-) and hypochlorite ion (OCl^-). The $Na_2S_2O_3$ is used to convert the hypochlorite (OCl^-) to chloride (Cl^-) as follows:

$$S_2O_3^{2}- + 4OCl^- + 2OH^- \longrightarrow 2SO_4^{2}- + 4Cl^- + H_2O \qquad \text{(Equation 3)}$$

Note that the reaction requires basic conditions to be favored and that [OCl^-] will always be less than or equal to the [Cl^-] in these impingers (Equation 2).

In conclusion, TestAmerica recommends that the lab be instructed to carry out the treatment of 0.1N NaOH impinger composites with sodium thiosulfate. In the controlled environment of the lab, a sufficient amount of reagent can added without applying the huge excesses that are heaped upon these samples in the field when no information of the actual amount needed is known.

Appendix II: Example Data Review Checklist

Eurofins Knoxville Anions by IC Batch Data Review Checklist
Methods: 300.0, 9056 & 9056A; Air Anions by 0050/26A; SOP: KNOX-WC-0005, Rev. 18

Analytical Batch:		**Prep Batch(s):**		**Instrument/Work List:**	/
Analysis Date:		**Job(s):**			
ICAL Date:		**ICAL Batch:**		**ICAL Number:**	
Method Limit Group:	□ IC 0050_26A ICAL □ IC 0050_9056 ICAL □ IC 300_9056_48HR ICAL □ IC 300_9056_28Day ICAL □ IC 9056_TotHAL ICAL □ IC D129_OF & D3177_OF ICAL □ IC 8A ICAL				

Review Items	NA	Y	N	If No, why is data reportable?	2nd ✓
Section 1: Calibration/Instrument Run QC					
1. Calibrated with minimum 5 standards (6 for quad)?					
2. r ≥ 0.995, or r^2 ≥ 0.990					
3. Intercept < low standard response?					
4. Read back error ≤ 30%, at LLOQ ≤ 50%					
5. Was the ICV within 90-110%R?					
6. ICB < 1/2 RL? ICB ≤10% LLOQ for 9056A?					
7. Were CCVs/CCBs run after every 10 samples, and at end of sequence?					
8. Is %D <10% for each CCV?				☐ **CCV - %D, High, Sample ND** (NCM#_____)	
9. If CCV failed, was it rerun only once?				☐ CCV reanalyzed one time; reanalysis within limits	
10. CCB < 1/2 RL? CCB ≤10% LLOQ for 9056A?				☐ **CCB-Out, Samples ND or 10x** (NCM#_____)	
Section 2: Prep Data					
1. Appropriate prep batches created for prep chain?					
2. Batch information complete?					
3. Correct analyst identified?					
4. Worksheet complete?					
5. Reagents tab complete and correct?					
6. Was pH adjustment required for Back Half samples?					
7. External prep data attached to batch as external prep worksheet?					
Section 3: Sample Analysis/Prep QC					
1. LCS/LCSD analytes within 90-110%R?				☐ **LCS/LCSD –Insufficient Sample** (NCM#_____) ☐ **LCS/LCSD - %R High** (NCM#_____)	
2. MB < 1/2 RL? MB ≤10% LLOQ for 9056A				☐ **Method Blank–Report, ND** (NCM#_____) ☐ **Method Blank – Report, 10X** (NCM#_____) ☐ **Method Blank–Insufficient Sample** (NCM#_____)	
3. MS/MSD/DUP run at required frequency?				☐ **MS/MSD/DUP-Insufficient Vol** (NCM#_____)	
4. MS/MSD/DUP within QC limits?				☐ **MS/MSD-%R, LCS Pass** (NCM#_____-optional) ☐ **MS/MSD/DUP-%RPD** (NCM#_____-optional)	
5. Are OR, MS, MSD, & DU linked correctly?					
6. Sample analyses done within holding time (HT)?				☐ **Holding Time-Receipt** (NCM# _____) ☐ **Holding Time- Insufficient Time** (NCM# _____) ☐ [Option-narrate] Analysis requested after HT expired.	
7. Are positive results within the calibration range?					
8. Are ND derived from undiluted runs?				☐ **RL-Dilution, Matrix** (NCM# _____) ☐ **RL-Dilution, Interferents** (NCM# _____)	
Section 4: Raw Data & Chrom/TALS Data Review					
1. Does 1st prep in the chain have original Sample ID as starting point?					
2. Does each additional step in the chain use the output ID of the previous step as the starting point?					
3. Was Worklist built with final prep output ID?					
4. Was Worklist Sample Number used as the sample ID in the Chromeleon sequence before upload?					
5. Was Worklist Sample ID listed in the comment field of the Chromeleon sequence before upload?					
6. Any unexplained triangles in the TALS lists after upload from Chrom?					
Raw Data					
1. Chrom sample information complete and correct? Are any samples linked to unnecessary Method Limit Groups in sample information?					
2. Chrom reagents entered correctly?					
3. Is manual integration complete and correct?					
4. Are unused data clearly identified?					
5. Is out of control QC clearly identified?					
6. Data with a qualifier or flag is repaired with appropriate action taken?					

Appendix II: Example Data Review Checklist, continued

Eurofins Knoxville Anions by IC Batch Data Review Checklist
Methods: 300.0, 9056 & 9056A; Air Anions by 0050/26A; SOP: KNOX-WC-0005, Rev. 18

Section 4: Raw Data & Chrom/TALS Data Review (continued)					
7. TALS Samples Tab					
• LIMS Sample IDs / Containers are correct?					
• Method and matrix are correct?					
• Date and time match raw data?					
• Dilutions are correct?					
• Correct suffix designated (where applicable)?					
8. TALS Worksheet Tab is complete and correct?					
9. TALS Reagent Tab is complete and correct?					
10. TALS QC Links Tab is correct?					
11. TALS Sample Results Tab					
• All unused data are marked Rejected or Accepted?					
• All reported analytes are marked Primary or Secondary?					
12. TALS Batch Information Screen documentation is complete?					
13. TALS Status set to appropriate review level?					
14. Calculations checked for error? *(Document manual calculation checks in worksheet notes. Include all prep factor information from prep batch worksheets and the analytical batch.)*					
15. Are any prep factor data (input-output volumes, etc.) duplicated in prep batches and analytical batches?				If yes, re-check calculations and repair the data.	
16. Is Run Log cover sheet and Chromeleon sequence scanned and attached to batch?					
17. Correct Narrative NCM chosen?					
• Anions in Water				□ **[5909]**	
• Anions in DI Leachates				□ **[5910]**	
• Anions in Soils				□ **[5912]**	
• Anions in Waste				□ **[6307]**	
• Anions in Impinger Solution				□ **[17881]**	
• HCl, Cl2 in Air				□ **[5819]**	
• HCl in Air				□ **[5820]**	
• HF, HCl, Cl2 in Air				□ **[6057]**	
• HF, HCl, HBr, Cl2, Br2 in Air				□ **[6058]**	
• HF, HCl, HNO2,HNO3, Cl2 in Air				□ **[6059]**	
• HF,HCl, HBr,Cl2, Br2, I- in Air				□ **[6060]**	
• Cl-, F-, NO2-, NO3- in Air				□ **[6077]**	
• HF, HCl in Air				□ **[6078]**	
• H2SO4 in Air				□ **[6109]**	
• HF, HCl, HNO3 in Air				□ **[6779]**	
• Sulfate in Air				□ **[6111]**	
• Anions in HBr, Br_2 Only				□ **[11566]**	
• Anions in Air, (generic)				□ **[17913]**	
• Total Chlorine				□ **[5861]**	
• Total Halogens (generic)				□ **[5876]**	
• Total Sulfur				□ **[5896]**	
• Other				□ **[ ]**	

1st Level Review by:	**2nd Level Review by:**

Appendix III: Eurofins Knoxville Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria and Corrective Action

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Anions in Stack Gas by Ion Chromatography (Method 0050/26A)	Initial Calibration (minimum of 5 standards, minimum of 6 standards for quadratic fit)	As needed	Fit of standard curve • $r \geq 0.995$; $r^2 \geq 0.990$	1. Make necessary adjustments. 2. Repeat calibration.
	Initial Calibration Verification (ICV/ICB)	Beginning of analysis sequence	ICV • 90 – 110% recovery ICB • Concentration ≤10% LLOQ (RL)	1. Repeat ICV/CCB. 2. If 1. fails, make adjustments and repeat calibration.
	Continuing Calibration Verification (CCV/CCB)	After every 10 samples and end of sequence.	CCV • 90 – 110% recovery CCB • Concentration ≤10% LLOQ (RL)	1. Repeat CCV/CCB. 2. If 1. fails, make adjustments and repeat CCV/CCBs. 3. Repeat calibration if 1. and 2. fail.
	Laboratory Method Blank	One per batch (maximum 20 samples)	• Concentration < ½ RL	1. Reanalyze method blank. 2. If 1. fails, reanalyze samples associated with unacceptable blank.
	Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)	One LCS per batch (maximum 20 samples). LCSD not required if MSD performed.	• 90 – 110% recovery • ≤ 15% RPD	1. Reanalyze LCS. 2. If 1. fails, reanalyze samples associated with unacceptable LCS.
	Matrix Spike (MS)	One per similar type of impinger sample (maximum 20 samples)	• 75 – 125% recovery	1. Dilute samples until MS is 75-125% R. 2. Flag data. 3. Discuss results in report narrative.
	Matrix Spike Duplicate (MSD)	One per batch (maximum 20 samples)	• 75 – 125% recovery • ≤ 15% RPD	1. Dilute samples until MSD is 75-125% R. 2. Flag data. 3. Discuss results in report narrative.
	Laboratory Duplicate (DUP)	Upon request	• ≤ 10% RPD	1. Flag data. 2. Discuss results in report narrative.

Appendix III: Eurofins Knoxville Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria and Corrective Action, continued

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Anions in Water/Solid/Waste Samples by Ion Chromatography (Methods 9056, 9056A)	Initial Calibration (minimum of 5 standards, minimum of 6 standards for quadratic fit)	As needed	Fit of standard curve • $r \geq 0.995$; $r^2 \geq 0.990$	1.Make necessary adjustments. 2.Repeat calibration.
	Initial Calibration Verification (ICV/ICB)	Beginning of analysis sequence	ICV • 90 – 110% recovery ICB • Concentration ≤10% LLOQ (RL)	1.Repeat ICV/CCB. 2.If 1. fails, make adjustments and repeat calibration.
	Continuing Calibration Verification (CCV/CCB)	After every 10 samples and end of sequence.	CCV • 90 – 110% recovery CCB • Concentration ≤10% LLOQ (RL)	1.Repeat CCV/CCB. 2.If 1. fails, make adjustments and run 2 consecutive passing CCV/CCBs. 3. Repeat calibration if 1. and 2. fail.
	Laboratory Method Blank	One per batch (maximum 20 samples)	• •Concentration ≤ 10% LLOQ (RL)	1.Reanalyze method blank. 2.If 1. fails, reanalyze samples associated with unacceptable blank. UNLESS the blank is less than 10% of the regulatory limit or less 10% of the lowest sample
	Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)	One LCS per batch (maximum 20 samples). LCSD not required if MSD performed.	• 90 – 110% recovery • ≤ 20% RPD	1.Reanalyze LCS. 2.If 1. fails, reanalyze samples associated with unacceptable LCS.
	Matrix Spike (MS)	One per batch (maximum 20 samples)	• 75 – 125% recovery	1.Flag data. 2.Discuss results in report narrative.
	Matrix Spike Duplicate (MSD)	One per batch (maximum 20 samples)	• 75 – 125% recovery • ≤ 20% RPD	1.Flag data. 2.Discuss results in report narrative.
	Laboratory Duplicate (DUP)	Upon request	• ≤ 20% RPD	1.Flag data. 2.Discuss results in report narrative.

Appendix III: Eurofins Knoxville Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria and Corrective Action, continued

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Anions in Water/Solid Samples by Ion Chromatography (Method 300.0)	Initial Calibration (minimum of 5 standards, minimum of 6 standards for quadratic fit)	As needed	Fit of standard curve • $r \geq 0.995$; $r^2 \geq 0.990$	1. Make necessary adjustments. 2. Repeat calibration.
	Initial Calibration Verification (ICV/ICB)	Beginning of analysis sequence	ICV • 90 – 110% recovery ICB • Concentration ≤ 10% LLOQ (RL)	1. Repeat ICV/CCB. 2. If 1. fails, make adjustments and repeat calibration.
	Continuing Calibration Verification (CCV/CCB)	After every 10 samples and end of sequence.	CCV • 90 – 110% recovery CCB • Concentration ≤10% LLOQ (RL)	1. Repeat CCV/CCB. 2. If 1. fails, make adjustments and run 2 consecutive passing CCV/CCBs. 3. Repeat calibration if 1. and 2. fail.
	Laboratory Method Blank	One per batch (maximum 20 samples)	• Concentration ≤ 10% LLOQ (RL)	1. Reanalyze method blank. 2. If 1. fails, reanalyze samples associated with unacceptable blank, UNLESS the blank is less than 10% of the regulatory limit or less 10% of the lowest sample
	Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)	One LCS per batch (maximum 20 samples) LCSD not required if MS performed	• 90 – 110% recovery • ≤ 20% RPD	1. Reanalyze LCS. 2. If 1. fails, reanalyze samples associated with unacceptable LCS.
	Matrix Spike (MS)	One per 10 samples	Accuracy • 90 – 110% recovery	1. Flag data. 2. Discuss results in report narrative.
	Laboratory Duplicate	One per batch (maximum 20 samples) if MS is not analyzed. Recommended when matrix is expected to contain target analytes.	• ≤ 20% RPD	1. Flag data. 2. Discuss results in report narrative.

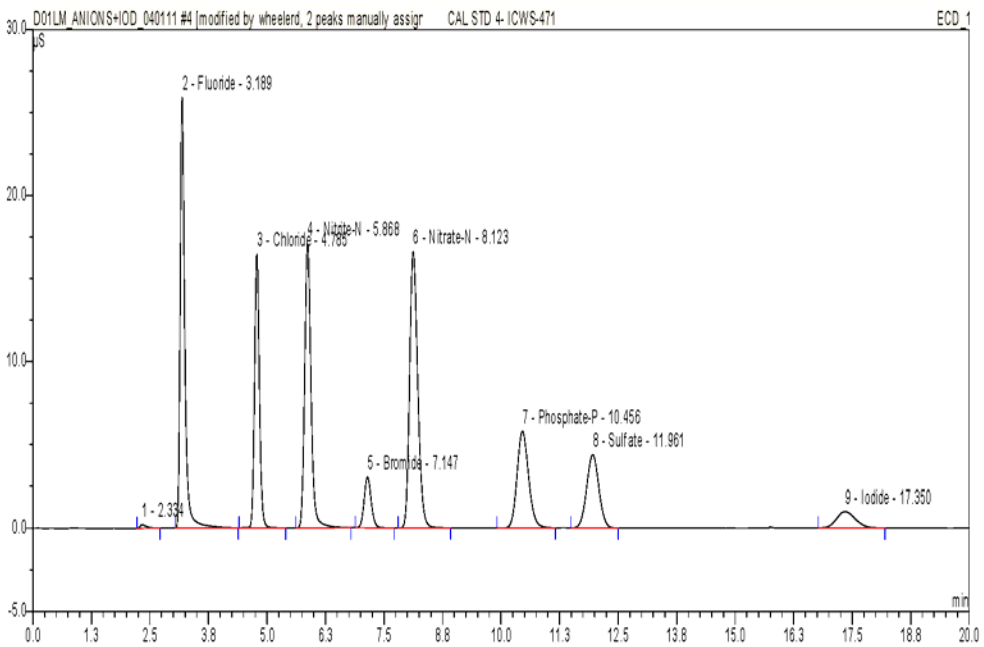
Appendix III: Eurofins Knoxville Summary of Analytical Quality Control Checks, Frequencies, Target Acceptance Criteria and Corrective Action, continued

Parameter/Method	QC Check	Frequency	Target Criteria	Corrective Action
Total Halogens in Waste Samples by Ion Chromatography (Methods 9056, 9056A and SOP KNOX-WC-0016)	Initial Calibration (minimum of 5 standards, minimum of 6 standards for quadratic fit)	As needed	Fit of standard curve • $r \geq 0.995$; $r^2 \geq 0.990$	1. Make necessary adjustments. 2. Repeat calibration.
	Initial Calibration Verification (ICV/ICB)	Beginning of analysis sequence	ICV • 90 – 110% recovery ICB • Concentration ≤10% LLOQ (RL)	1. Repeat ICV/CCB. 2. If 1. fails, make adjustments and repeat calibration.
	Continuing Calibration Verification (CCV/CCB)	After every 10 samples and end of sequence.	CCV • 90 – 110% recovery CCB • Concentration ≤10% LLOQ (RL)	1. Repeat CCV/CCB. 2. If 1. fails, make adjustments and run 2 consecutive passing CCV/CCBs. 3. Repeat calibration if 1. and 2. fail.
	Laboratory Method Blank	One per batch (maximum 20 samples)	Concentration < RL	1. Reanalyze method blank. 2. If 1. fails, reanalyze samples associated with unacceptable blank.
	Laboratory Control Sample/Laboratory Control Sample Duplicate (LCS/LCSD)	One LCS per batch (maximum 20 samples). LCSD not required if MSD performed.	• 80 – 120% recovery • 70 – 130% for Br, I • ≤ 10% RPD	1. Reanalyze LCS. 2. If 1. fails, reanalyze samples associated with unacceptable LCS.
	Matrix Spike (MS)	One per batch (maximum 20 samples)	• 80 – 120% recovery • 70 – 130% for Br, I	1. Flag data. 2. Discuss results in report narrative.
	Matrix Spike Duplicate (MSD)	One per batch (maximum 20 samples)	• 80 – 120% recovery • 70 – 130% for Br, I • ≤ 10% RPD	1. Flag data. 2. Discuss results in report narrative.
	Laboratory Duplicate (DUP)	One per 10 samples or per trial burn	• ≤ 10% RPD	1. Flag data. 2. Discuss results in report narrative.

Appendix IV: Table 2, Typical Instrument Operating Parameters

Flow Rate: 1.2 mL/min.
Sample Loop: (Autosampler) 50 ul
Eluent: 1.4mM sodium bicarbonate, 4.5mM sodium carbonate
Detector Output: Baseline conductivity should be 20 - 25 uS prior to sample analysis
Suppressor Current: 31 mA

Appendix V: Figure 1, Example chromatogram



Appendix VI: Correspondence from MICE concerning the CCV criteria

FW Method 9056 calib verif for SOP
From: EHSG MICE [mailto:mice@cpmx.saic.com]
Sent: Wednesday, December 11, 2002 11:25 AM
To: Harris, Scott
Subject: RE: Method 9056 calibration verification criteria

Dear Mr. Harris,

It would be incorrect to compare CCV responses to that of the ICV, since this would not an accurate assessment of the calibration stability. For example, say the ICV barely passed at 90%, and a subsequent CCV was 90% of the ICV response. Essentially the 90% CCV when evaluated against the ICV is 80% of the initial calibration which would not meet the method required criteria of +/- 10%.

It is recognized that the 5% criteria specified in Sec. 8.2 is unreasonable and is probably a typo that was corrected in Method 9056A. It would certainly be unrealistic for the CCV criteria to be more stringent that the ICV criteria. We recommend that you use 10% for the acceptance criteria in Sec. 8.2.

EUROFINS STANDARD OPERATING PROCEDURE

TOTAL ANION PREPARATION FOR ANALYSIS BASED ON METHOD 5050 AND ASTM E-4423

STANDARD OPERATING PROCEDURE
TITLE: Sample Preparation for Total Halogen Determination
(SUPERSEDES: KNOX-WC-0016, Rev. 10)

Approvals (Signature/Date):

Andrew West 6-21-23
Andrew West — Date
Prepared by:

Don Wasmund 6-28-23
Don Wasmund — Date
Technical Specialist

Lewis Osborne 6-29-23
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Kevin McGee 6/21/23
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Quality Assurance Manager

Kevin Woodcock 30-Jun-23
Kevin Woodcock — Date
Laboratory Director

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1. Scope and Application

1.1. The purpose of this procedure is to describe the preparation steps followed to determine total chlorine, fluorine, bromine and iodine in waste feeds and related materials.

1.2. This procedure is applicable to the analysis of a wide variety of waste feed materials for total bromine, chlorine, fluorine and iodine. The determination will include bromine, chlorine, fluorine and iodine from both inorganic and organic materials present in the sample. It is based on ASTM Method E442, *Standard Test Method for Chlorine, Bromine and Iodine in Organic Compounds by Oxygen Flask Combustion,* ASTM D 3761-96, *Standard Test Method for Total Fluorine in Coal by the Oxygen Bomb Combustion/Ion Selective Electrode Method* and SW-846 Method 5050, *Bomb Preparation Method for Solid Waste.*

1.2.1. For this procedure, the reporting limits are as follows:

- Total Bromine, 50 mg/kg.
- Total Chlorine, 100 mg/kg.
- Total Fluorine, 100 mg/kg
- Total Iodine, 100 mg/kg

1.3. Samples may be prepped for Total Sulfur using minor modification of this SOP. The specific modifications are given in Section 11.2.1. to 11.7.

2. Summary of Method

2.1. The sample is oxidized by combustion in an oxygen bomb containing oxygen at 30 atm or higher. The liberated halogen compounds are absorbed primarily as halides in a sodium carbonate/sodium bicarbonate buffer solution. The combustion products are collected by repeated rinsing of the combustion apparatus, and analyzed in accordance with SOP KNOX-WC-0005 "Anion Analysis by Ion Chromatography", current revision, based on SW-846 Method 9056.

3. Definitions

3.1. Total Bromine: The total bromine content of the sample, both from inorganic and organic sample constituents, expressed in terms of mg/kg.

3.2. Total Chlorine: The total chlorine content of the sample, both from inorganic and organic sample constituents, expressed in terms of mg/kg.

3.3. Total Fluorine: The total fluorine content of the sample, both from inorganic and organic sample constituents, expressed in terms of mg/kg.

3.4. Total Iodine: The total iodine content of the sample, both from inorganic and organic sample constituents, expressed in terms of mg/kg.

3.5. Total Halogens: For the purposes of this procedure, the total bromine, chlorine, fluorine and iodine content of the sample.

3.6. Additional definitions can be found in the Eurofins Knoxville Quality Assurance Manual (QAM), current revision.

4. Interferences

4.1. Samples with very high water content (> 25%) may not burn efficiently and require the addition of combustion aids to facilitate combustion.

5. Safety

5.1. Employees must abide by the policies and procedures in the Eurofins Environmental Health and Safety Manual, Radiation Safety Manual and this document.

5.2. Procedures shall be carried out in a manner that protects the health and safety of all associates. Exposure to chemicals and samples will be maintained as low as reasonably achievable; therefore, unless they are known to be non-hazardous, all samples must be opened, transferred and prepared in a fume hood, or under other means of mechanical ventilation. Solvent and waste containers will be kept closed unless transfers are being made. The preparation of all standards, reagents and glassware cleaning procedures that involve solvents will be conducted in a fume hood with the sash closed as far as the operations will permit.

5.3. All work must be stopped in the event of a known or potential compromise to the health and safety of any associate. The situation must be reported immediately to a laboratory supervisor.

5.4. Oxygen vigorously accelerates combustion. Keep all oil and greases away, do not use on regulators or gauges. Keep all combustibles away from oxygen and eliminate ignition sources. Use common safety practices for handling gas cylinders and ensure cylinder is secured at all times.

5.5. Bomb maintenance is required to maintain proper seals. The oxygen bombs used for heat of combustion analysis have a heavy sample load, **and the pressure release valve seal must be changed monthly**. Inspect rubber o-rings in the bomb head at that time. Change any that are no longer flexible. Also, if several

large batches are processed in a short time, such that a bomb has been fired approximately 80 to 100 times since the seals were last changed, re-initiate the seal maintenance procedure even if it has not been a month since the last occurrence.

5.6. Inspection of Oxygen Bombs—Oxygen bombs **MUST** be inspected for leaks prior to ignition. Totally immerse the pressurized bomb in deionized water. Observe and inspect for bubbles escaping from the bomb. **DO NOT** ignite the sample if bubbles are observed to escape in a continuous manner. If a continuous stream of bubbles is seen, remove the oxygen bomb from the water and reseal valves. If bubbles are leaking from an o-ring seal, depressurize the bomb and replace o-rings as necessary to prevent the leak. Once maintenance is completed, operations may resume at the appropriate point in the procedure. The bomb must be inspected as before prior to ignition.

5.7. Place a blast shield in front of the oxygen bomb and lower the hood sash as far a possible prior to ignition.

5.8. Primary materials used: The following is a list of the materials used in this method, which have a serious or significant hazard rating. NOTE: This list does not include all materials used in the method. The table contains a summary of the primary hazards listed in the SDS for each of the materials listed in the table. A complete list of materials used in the method can be found in the reagents and materials section. Employees must review the information in the SDS for each material before using it for the first time or when there are major changes to the SDS.

Material	**Hazards**	**Exposure Limit (1)**	**Signs and symptoms of exposure**
Oxygen, Compressed	Oxidizer	NA	Exposure to Oxygen will not result in exposure symptoms unless the individual is exposed to high levels for more than 17 hours. However, exposure of flammable or combustible materials to Oxygen can create an extremely dangerous situation and result in an explosion,
2,2,2-Trichloroethanol	Corrosive	Not available	Causes burns. Harmful by inhalation, in contact with skin and if swallowed.
Methanol	Flammable, Poison, Irritant	200 ppm-TWA	A slight irritant to the mucous membranes. Toxic effects exerted upon nervous system, particularly the optic nerve. Symptoms of overexposure may include headache, drowsiness and dizziness. Methyl alcohol is a defatting agent and may cause skin to become dry and cracked. Skin absorption can occur; symptoms may parallel inhalation exposure. Irritant to the eyes.

Hydrazine Sulfate	Toxic	Not available	May cause allergic skin reaction. Causes burns. Toxic if absorbed through the skin. Toxic if inhaled. Material is extremely destructive to the tissue of the mucous membranes, upper respiratory tract, eyes and skin. Inhalation may result in spasm, inflammation and edema of the larynx, bronchi, chemical pneumonitis and pulmonary edema.
Hydrogen Peroxide, 30%	Oxidizer Corrosive	1 ppm-TWA	Vapors are corrosive and irritating to the respiratory tract. Vapors are very corrosive and irritating to the eyes and skin.
Acetone	Flammable	1000 ppm-TWA	Inhalation of vapors irritates the respiratory tract. May cause coughing, dizziness, dullness, and headache.
1-octanol	Flammable	TWA Not established.	May be harmful if swallowed or inhaled. Causes irritation to skin, eyes and respiratory tract. Affects the central nervous system. Combustible liquid and vapor.
2,3-dibromopropanol	Toxic	TWA Not established.	Harmful if swallowed. Toxic by inhalation and in contact with skin. Limited evidence of a carcinogenic effect. Risk of serious damage to eyes.
2,2,2-trifluoroethanol	Flammable Toxic	TWA Not established.	Harmful by inhalation, in contact with skin and if swallowed. Irritating to respiratory system and skin. Risk of serious damage to eyes.
2-iodoethanol	Toxic Combustible	TWA Not established.	Toxic if swallowed.
1-Exposure limit refers to the OSHA regulatory exposure limit.			

6. Equipment and Supplies

6.1. Parr Instrument Company Oxygen Bomb, Model 1108CL or equivalent.

6.2. Fuse Wire, Nickel-Chromium Alloy, 34 ga, Parr Instrument Company Cat. No. 45C10 or equivalent.

6.3. Parr Instrument Company Igniter, Cat. No. 2901EB or equivalent.

6.4. High density polyethylene (HDPE) sample containers, 125-mL capacity.

6.5. Analytical balance capable of weighing to 0.0001 g.

6.6. 3M Transparent Tape, Parr Instrument Company Cat. No. 517A or equivalent.

6.7. Sample capsule—an open crucible of stainless steel.

6.8. Top loading balance, capable of weighing to 0.1 grams.

7. Reagents and Standards

7.1. Deionized water.

7.2. Oxygen, free of combustible material and halogen compounds, available at a pressure of 40 atm.

7.3. Buffer solution, 0.048M Na_2CO_3/ 0.038M $NaHCO_3$. Dissolve 4.03 g Na_2CO_3 and 4.03 g $NaHCO_3$ in reagent water and dilute to l L. Store in HDPE bottle.

7.4. 1-Octanol, 99% purity.

7.5. Hexadecane, 98% purity.

7.6. 2,2,2-Trifluoroethanol, 99% purity.

7.7. 2,2,2,-Trichloroethanol, 99% purity.

7.8. 2,3-Dibromopropanol, 98% purity.

7.9. 2-Iodoethanol, 99% purity.

7.10. Hydrazine sulfate, ACS Certified, 2% w/v.

7.10.1. Add 10 g hydrazine sulfate to 500 mL deionized water in a glass sample bottle. Shake to dissolve.

7.11. Sodium Hydroxide (NaOH) Standard Solution, 10N, Fisher SS255-1 or equivalent (HMIS H3/F0/R1)

7.12. Eluate stock solution: Dissolve 11.76 g $NaHCO_3$ and 47.70 g Na_2CO_3 in 1L deionized water. A portion of the eluate concentrate prepared for the ion chromatography (Method SW-9056) may be reserved for use during the sample preparation, but the container must be properly labeled and identified. Use a new container for each new aliquot to limit contamination.

7.13. Sodium hydroxide (NaOH), 2N—Prepare by diluting 20 mL 10N NaOH with deionized water to a final volume of 100 mL. Use a new container for each new batch to limit contamination. The container must be properly labeled and identified.

7.14. Methanol, 99% purity.

7.15. Acetone, Reagent grade.

7.16. LCS and MS/MSD Standard Solution: Prepare a solution of 2,3-dibromopropanol, 2-iodoethanol, 2,2,2-trichloroethanol and 2,2,2-trifluoroethanol to contain 20,000 mg/L chlorine and iodine and 7500 mg/L fluorine and bromine in methanol. Spiking solutions may be prepared that contain some or all of these components, as required. Stock solutions of each component should be prepared as a basis for the final spiking solution.

7.16.1. A solution containing chlorine and fluorine is sufficient for most testing. An additional solution containing all four halogens should be readily available at the concentrations listed. Please note that the concentrations given are for the elemental halogens, and the percentage of each halogen in the spiking compound must be taken into account.

8. Sample Collection, Preservation and Storage

8.1. Sampling is not performed for this method by Eurofins Knoxville. For information regarding sample shipping, refer to SOP KNOX-SC-0003 "Sample Receipt and Log In", current revision.

MATRIX	CONTAINER	PRESERVATION	HOLDING TIME
Aqueous Waste Feed Samples	Amber glass with Teflon™-lined closure (minimum: 1 x 250 mL)	None Required. Cool, 4°C if high volatile content is suspected.	28 days
Organic Waste Feed Samples	Amber glass with Teflon™-lined closure (minimum: 1 x 250 mL)	None Required. Cool, 4°C if high volatile content is suspected.	28 days
Soil, Sediment, Sludge or Other Solid Waste Feed Samples	Wide-mouth glass with Teflon™-lined closure (minimum 4 oz.)	None Required. Cool, 4°C if high volatile content is suspected.	28 days

9. Quality Control

9.1. Method Blanks: Add 1 mL of 1:1 methanol:1-octanol to a taped Parr sample capsule. Combust the sample in a Parr Bomb according to section 11.3. Analyze the collected combustate solution for chloride and fluoride. Calculate the concentration based on a 1.0-gram sample.

9.2. Laboratory Control Samples: Prepare a sample capsule by covering it with 3M tape, sealing the tape firmly around the edges. Cut away the excess tape with a sharp knife or razor blade. Using a syringe, add 1 mL of 1:1 methanol:1-octanol by puncturing the tape. Add 500 µL of LCS spiking solution, using a syringe to

measure, by injecting the liquid through the hole used to inject the 1-octanol. Immediately place the capsule in the capsule holder and assemble the oxygen bomb. Combust the contents of the sample capsule without delay according to sections 11.2.3 - 11.2.4. Collect the combustate solution (section 11.2.5 – 11.2.7), and analyze for bromide, chloride, fluoride and/or iodide, as required.

9.3 Matrix Spike/Matrix Spike Duplicate Samples: Add 500 µL of LCS/MS/MSD spiking solution to an aliquot of the sample equivalent to that analyzed for the unspiked sample. For samples diluted in methanol or acetone, add the same amount of diluted sample to a taped sample capsule as was used for the unspiked sample. Assemble the bomb and combust without delay according to section 11.2.4 - 11.2.5. Collect the combustate solution (11.2.5- 11.2.7), and analyze for bromide, chloride, fluoride and/or iodide.

9.3.1 For samples that are simultaneously prepared for total sulfur analysis, add 500 µL of the total sulfur spiking solution to the laboratory control samples and the matrix spike samples in addition to the usual halogen spike.

QC PARAMETER	FREQUENCY	ACCEPTANCE CRITERIA	CORRECTIVE ACTION
Method Blank	One per sample preparation batch of up to 20 samples.	The result should be less than or equal to the RL. Sample results greater than 20x the blank concentration or samples for which the contaminant is < RL do not require reprep.	Reprep and reanalyze samples.
Laboratory Control Sample (LCS)	One per sample preparation batch of up to 20 samples.	80-120% recovery for F, Cl; 70-130% recovery for Br, I.	Reprep and/or reanalyze all samples associated with the LCS.
Laboratory Duplicate	One per sample preparation batch of up to 10 samples. (Minimum one duplicate per trial burn)	RPD ≤ 10%	Flag the data if RPD > 10%. Note in the narrative.
Matrix Spike	One per sample preparation batch of up to 20 samples. For trial burn samples, one per trial burn.	80-120% recovery for F, Cl; 70-130% recovery for Br, I.	Flag the data if % recovery is outside QC acceptance limits. Note in the narrative.

Matrix Spike Duplicate	One per sample preparation batch of up to 20 samples. For trial burn samples, one per trial burn.	80-120% recovery for F, Cl; 70-130% recovery for Br, I. RPD ≤ 10%	Flag the data if RPD > 10%. Note in the narrative.

10. Calibration and Standardization

10.1. The analytical balance must have the calibration checked each day that analytical mass measurements are made. Calibrate the balance according to the manufacturer's instructions whenever the calibration check does not pass the daily criteria.

11. Procedure

11.1. All samples must be analyzed by combustion in an oxygen bomb. Higher concentration samples should not be combusted in an oxygen bomb unless the sample size is reduced to keep the amount of halide low organic. If a liquid sample is expected to contain > 5% halogen, dilute the sample in methanol or acetone prior to combustion.

11.2. Sample Preparation

11.2.1. Cleaning procedure for bomb and sample capsule: Remove any residual fuse wire from the terminals and the cup. Scrub the bomb with residue free soap solution (for example, Conrad 70, Decon Labs). Using hot water, thoroughly rinse the interior of the bomb, the sample capsule, the terminals, and the inner surface of the bomb cover. Copiously rinse the bomb and bomb head with deionized water. Fill the bomb completely with deionized water and place the bomb head in bomb. Add 5 mL concentrated nitric acid. Push into flask valve, and then leach for 15 minutes with deionized water. After the 15 minute waiting period, empty the bomb and then rinse the bomb and bomb head with deionized water. Again, fill the bomb completely with deionized water and place the bomb head in bomb completely. Do not add acid. Water should flush out of the top of the pressure release valve. Leach for 15 minutes with deionized water. After the 15 minute waiting period empty the bomb and proceed with sample preparation.

11.2.2. Preparation of bomb and sample: Weigh and record the sample aliquot weight in a tared sample capsule.

11.2.2.1. Cut a piece of firing wire approximately 100 mm in length and attach the free ends to the terminals. Arrange the wire so that it is touching the sample without touching the sample capsule or itself.

11.2.2.2. Pipette 10 mL of the NaHCO3/Na2CO3 buffer solution into the bomb, wetting the sides. Add 50 uL hydrogen peroxide, 30%. **Hydrogen peroxide is not necessary unless total bromine, total iodine or total sulfur is to be determined.**

11.2.2.3. Take an aliquot of the sample of 0.5-1.0 g or less, using an appropriate device (syringe, disposable pipette, spatula, etc.) and place in a tared sample capsule. If the sample contains volatile components, cover the capsule with 3M™ tape. Add 1 mL of 1:1 methanol:1-octanol. Obtain the exact weight of sample by first taring the capsule to zero, then adding the sample to the capsule and re-weighing.

11.2.2.3.1. Samples with high (5-25%) halogen content: Weigh 0.5-1.0 g sample into a clean 10, 25 or 50 mL volumetric flask. Samples should be diluted according to good judgment based on screening tests and historical data from repeat projects. Dilute to the mark with acetone or methanol. If the solutions are cloudy or otherwise heterogeneous, make a new solution a different solvent. Add 0.5 mL sample to a taped capsule. Assemble the bomb and combust without delay. For samples with very high halogen content (>25%), dilute 1 g sample to 50 mL.

11.2.2.3.2. Loose Solid Samples: Large particles may not burn completely and small particles are easily swept out of the capsule by turbulent gases during rapid combustion. Crush solid materials to obtain more surface area for combustion. If the material is very loose (e.g., fluffy organic crystals similar to benzoic acid, use the pellet press to make a pellet out of the loose solid material. Measure out approximately 1 gram of the sample and make a pellet out of it. Determine the weight of the pellet.

11.2.2.3.3. Combustion Aids: 1 mL of 1:1 Methanol:1-octanol shall be routinely added to each sample, including those samples that are diluted in methanol or acetone. If a non-aqueous sample is difficult to ignite under these conditions, 0.5 mL acetone or methanol can be mixed with the sample. Combustion aids add to the total energy released in

the bomb and the amount of sample may have to be reduced to compensate for the added charge.

11.2.2.3.4. Volatile Samples: Volatile samples can be handled in a standard sample capsule. These capsules can be sealed with a disc of plastic adhesive tape. Use the following procedure when filling and handling any of these tape-sealed sample capsules:

- Cover the sample capsule with tape and seal the tape on the edges. Trim the excess tape with a sharp knife or razor blade.
- Add the sample with a syringe.
- Set the cup in the electrode loop and arrange the wire fuse so that it touches the center of the tape disc.
- Fill the bomb with the usual oxygen charging pressure.

11.2.2.3.5. Aqueous Samples: Water inhibits combustion, and it is difficult to ignite samples that are composed of combustible materials dissolved in water. Use ashless (~0.3 to 0.5 g) filter paper to absorb the sample in the sample capsule. Add 1 mL of 1:1 methanol:1-octanol to obtain complete combustion of the sample.

11.2.3. Oxygen Bomb Assembly and the Addition of Oxygen: Place the sample capsule in position and arrange the fuse wire so that the end dips into the sample. Assemble the bomb and tighten the cover securely. Admit oxygen slowly (to avoid blowing the sample from the cup) until a pressure of 450 psi (~30 atm) is reached. Do not add oxygen or ignite the sample if the bomb has been jarred, dropped, or tilted.

11.2.4. Sample combustion: Completely immerse the bomb in a cool water bath. Connect the terminals to the open electrical circuit. Close the circuit to ignite the sample. Remove the bomb from the bath after immersion for at least 5 minutes.

11.2.4.1. Ice may be added to the water bath for highly reactive samples to prevent generated heat damaging bomb o-rings. Damaged o-rings contaminate the combustate via residue and seal

degradation. Replace any damaged o-rings, reduce sample aliquot or accelerant amount as applicable, then repeat sample combustion using ice bath.

11.2.5. At least 15 minutes after ignition, release the pressurized gas. Slowly release the pressurized contents of the bomb in a fume hood.

11.2.6. Open and inspect the bomb: After all of the pressurized gas has been released, open the bomb and examine the contents. If traces of unburned oils or sooty deposits are found, discard the sample, and thoroughly clean the bomb before using it again. Process a new sample, taking care that the sample capsule is positioned properly and the ignition wire is in contact with the sample. If combustion is incomplete, vary the sample conditions and repeat.

11.2.7. Collection of halide solution-- Tap the sample capsule from loop electrode into the buffer solution and swirl until reaction ceases prior to rinsing. Using deionized water, thoroughly rinse the interior of the bomb, the sample capsule, the terminals, and the inner surface of the bomb into the bomb casing. Decant the bomb contents into a 125 mL wide-mouth HDPE sample bottle. Rinse with deionized water three times (in total), decanting the rinses into the sample container each time. The collected rinsate should contain approximately 75 to 90 mL of fluid. After all pH adjustments are made, raise the final volume to 100 mL. **Do not add hydrazine sulfate if total sulfur is to be determined.**

11.2.7.1. Collection of halide and sulfur solutions – Split the collected rinsate (collection method described by 11.2.7) into two equal portions if bromine or iodine is to be determined. Shake vigorously prior to separating portions into appropriately labeled 125 mL wide-mouth HDPE sample bottles. Add 5 mL of hydrazine sulfate (2% solution) to halide portion then wait 30 minutes to 1 hour before making pH adjustments. Adjusting the pH is unnecessary for the sulfur portion. Raise both portions to a final volume of 50 mL for a combined final volume of 100 mL.

11.2.8. If bromine or iodine are to be determined, add 10 mL of hydrazine sulfate (2% solution).

11.2.9. pH adjustment

- Raise the pH to 4 to 7 with 2N NaOH only if total fluorine is to be determined.

- Add 4.0 mL eluate stock solution and mix well.

11.3. Sample Analysis: Analyze the combustate for the requested halides according to SOP KNOX-WC-0005 "Anion Analysis by Ion Chromatography", current revision. This preparation is applicable to analysis using the Dionex AS_14A column. It may be necessary to dilute the samples so that the concentration will fall within the range of standards.

Note: Care should be taken if a low-level sample is analyzed after a high level sample. If the preparation was performed in the oxygen bomb, repeat the low level sample preparation if carryover is suspected.

11.4. One time procedural variations are allowed only if deemed necessary in the professional judgment of supervision to accommodate variation in sample matrix, radioactivity, chemistry, sample size, or other parameters. Any variation in procedure, except those specified by project specific instructions, shall be completely documented and approved by a Technical Specialist, Project Manager and QA Manager. If contractually required, the client shall be notified.

11.5. Any unauthorized deviations from this procedure must also be documented as a nonconformance, with a cause and corrective action described.

12. Data Analysis and Calculations

12.1. Calculations. Calculate the concentrations of each element detected in the sample according to the following equation:

$$C = \frac{C_{com} \times V_{com}}{W} \times 1000$$

where:

C	=	concentration of analyte in the sample, mg/kg
C_{com}	=	concentration of analyte in the combustate, mg/L (corrected for bench dilutions
V_{com}	=	total volume of combustate, L
W	=	weight of sample combusted, g.

12.1.1. Calculate the sample weight in the final prep as follows:

$$W = \frac{SW\, x V_{com}}{DV}$$

where:

W	=	sample weight in final prep, g

SW	=	sample weight before dilution (if any), g
DV	=	total dilution volume, mL
V_{com}	=	volume of sample dilution combusted, mL

12.2. Report the concentration of each halide detected in the sample in milligrams per kilogram (mg/kg).

12.3. The Percent Recovery is calculated using the following equation:

$$Percent\,Recovery\,(\%) = \frac{(X - S)}{T} \times 100$$

where:

X	=	Experimentally determined concentration of the spiked sample
S	=	Sample concentration before spiking
T	=	True concentration of the spike

12.4. The Percent Difference is calculated using the following equation:

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

where: D_1 and D_2 = Results of duplicate measurements.

12.5. Refer to Appendix I for an example data review checklist used to perform and document the review of the data. Using the data review checklist, the analyst also creates a narrative which includes any qualifications of the sample data.

13. Method Performance

13.1. Method Detection Limit (MDL) - An MDL must be determined for each analyte in each routine matrix prior to the analysis of any samples. Method Detection limits are determined and verified as specified in the current revision of SOP NDSC-QA-SOP42091 based on 40 CFR Part 136 Appendix B. The result of the MDL determination must support the reporting limit. MDL summaries are stored on the local area network. Current method detection limits are available in the TestAmerica Laboratory Information Management System (TALS).

13.2. Initial Demonstration of Capability: Each analyst must perform an initial demonstration of capability (IDOC) for each target analyte prior to performing the analysis independently. The IDOC is determined by analyzing four replicate spikes (e.g., LCSs) as detailed in Eurofins Knoxville SOP KNOX-QA-0009.

13.3. Training Qualification: The group/team leader has the responsibility to ensure that this procedure is performed by an associate who has been properly trained in its use and has the required experience. Refer to SOP KNOX-QA-0009 current revision for further requirements for performing and documenting initial and on-going demonstrations of capability.

14. Pollution Prevention

14.1. All procedures shall be conducted in a manner to minimize, as far as practical, the use of solvents, reagents and other chemicals.

15. Waste Management

15.1. All waste will be disposed of in accordance with Federal, State and Local regulations. Where reasonably feasible, technological changes have been implemented to minimize the potential for pollution of the environment. Employees will abide by this method and the policies in section 13 of the Corporate Safety Manual for "Waste Management and Pollution Prevention."

15.2. Waste streams produced by the procedure: Excess sample waste will be collected and placed in containers specifically designated for this type of waste material.

16. References

16.1. Eurofins Knoxville Quality Assurance Manual (QAM), current revision.

16.2. Method 5050, Bomb Preparation Method for Solid Waste, USEPA SW-846, Test Methods for Evaluating Solid Waste, Third Edition.

16.3. Method 9056, Determination of Inorganic Anions by Ion Chromatography, USEPA SW-846 Test Methods for Evaluating Solid Waste, Third Edition.

16.4. ASTM Method E442-74 (1981). Standard Test Method for Chlorine, Bromine or Iodine in Organic Compounds by Oxygen Flask Combustion.

16.5. ASTM Method D 3761-96 (2002) Total Fluorine in Coal by the Oxygen Bomb Combustion/Ion Selective Electrode Method.

16.6. Eurofins SOP NDSC-QA-SOP42091, "Detection and Quantitation Limits", current revision

17. Miscellaneous

17.1. Modifications from the referenced method

17.1.1. ASTM Method E442

17.1.1.1. This method applies to total halogen determination in solid and liquid samples that are non-volatile at room temperature. All combustion is normally carried out in an oxygen flask at 1 atm. This SOP may also be used for volatile samples and reports results for total chloride and fluoride (not bromide and iodide). Also, all samples processed by this procedure will be combusted in an oxygen bomb at high pressure.

17.1.1.2. The analytical finish listed in the method is by titration, not ion chromatography as specified in this SOP.

17.1.1.3. The method uses KOH solution and H2O2. This SOP uses a bicarbonate buffer solution based on EPA Method 5050.

17.1.2. Method 5050

17.1.2.1. This method does not give any guidance for adding hydrogen peroxide to the buffer solution or using hydrazine sulfate to reduce more highly oxidized forms of bromine or iodine to bromide or iodide.

17.1.2.2. The buffer concentration has been increased from the promulgated method.

17.1.3. ASTM Method D 3761

17.1.3.1. Ion chromatography is used as the analytical finish to the procedure in order to minimize interference.

17.1.3.2. A sodium carbonate/sodium hydroxide buffer is introduced to the bomb to collect the haloacid by-products of combustion instead of a sodium hydroxide solution.

17.2. Appendix I: Example Data Review Checklist

Appendix I: Example Data Review Checklist

Eurofins Knoxville Total Halogens Data Review / Narrative Checklist
Methods: 5050/ASTM D3761 (KNOX-WC-0016, Rev.11) and Method: 9056 (KNOX-WC-0005, Rev. 18)

Batch Number		**Analytes:**	☐ Total Chlorine ☐ Total Fluorine ☐ Total Bromine ☐ Total Iodine
Lot Numbers:			
Analysis Date:	**File ID:**	**ICAL File ID:**	

Review Items	**NA**	**Y**	**N**	**If No, why is data reportable?**	**2nd √**
1. ICV within 90-110%R and ICB/CCB < 1/2 RL?					
2. CCVs/CCBs run after every 10 samples & end of run?					
3. Is %D ≤10% for each CCV?					
4. If CCV failed, was it rerun only once?					
5. LCS/LCSD analytes within 80-120%R? (70 -130% for Total Br, I) *If no, list LCS ID:*				☐ **[lcs3] LCS recovery >120% and sample results <RL.***	
6. Method blank < RL? *If no, list blank ID:*				☐ **[mb3] No analyte > RL in associated samples.*** ☐ [mb8] Sample results > 20x higher than blank.	
7. MS/MSD done per prep batch?					
8. MS/MSD within 80-120% recovery (70 -130% for Total Br, I) and ≤10 RPD? *If no, list ID:*				☐ [ms3] LCS acceptable indicating sample matrix effects. ☐ [ms4] Native analyte concentration >4x spike level.	
9. DUP done per 10 samples or per trial burn?					
10. DUP RPD ≤ 10%? *If no, list ID:*				☐ [rpd] OS and/or DUP < RL. ☐ [rpd2] LCS acceptable. Sample heterogeneity.	
11. Sample analyses done within holding time (HT)? *If no, list samples:*				☐ [ht1] HT expired upon receipt. ☐ *[ht2] Analysis requested after HT expired.**	
12. Were results processed using correct ICAL?					
13. Are positive results within the calibration range?					
14. Is integration acceptable for all samples, QC samples and standards?					
15. For manual integrated standards and QC samples, are before/after chromatograms provided with initials/date/reason?				Reasons: S=Split peak, U=Undetected peak, I=Incorrect peak integration, B=Baseline correction, W=Wrong peak chosen by data system.	
16. Calculations checked for error? (Document manual calculation checks.)					
17. Were spreadsheets checked for transcription errors?					
18. Are results below RL obtained from undiluted IC runs?				☐ [elev1] Elevated RLs due to matrix interferences.	
19. For results below RL, were samples prepared using at least 0.5 g sample weight in final prep?					
20. Sample results correct? (Verify results, RLs, units, qualifiers, DFs, dates, spikes.)					

Reviewed by:	**Date:**	**2nd Level Reviewed by:**	**Date:**
Comments:		**Comments:**	

Final Review by:	**Date:**	**NA**	**Y**	**N**	**If No, why is data reportable?**
1. Are all NCMs documented and discussed in narrative?					List NCM #:
2. Narrative correct? (Appropriate autotext included and all deviations noted.)					☐ [chlor] Total chlorine. ☐ [hal] Total chlorine, fluorine, bromine, iodine.
3. For trial burn samples, are sample results from the same waste feed consistent? (Spread of values < 20% of avg.)					☐ [tb1] Related PT data show similar variation. ☐ [tb2] Solid samples likely to be heterogeneous. ☐ [tb3] Reactive matrix. ☐ [tb4] Mutiphasic samples run as one analysis per client.

Comments:

* Such action must be taken in consultation with client. WC084R13.DOC, 06/20/23
Nonconformance memos are required for **bold** and *italicized* [autotext] statements: **Bold** = deficiency, *italicized* = anomaly.

ATTACHMENT F

A-LINE WIPE SAMPLE AND PCB ANALYSIS STANDARD OPERATING PROCEDURES

Subject:	Wipe Sampling		
Version:	1.0	**Issue Date:**	01/02/2018
Maintained By:	A-Line TDS, Inc. Management		

PPE Requirements

1. Safety glasses
2. Fresh pair of nitrile or latex gloves
3. Rubber boots
4. Face shield of splash potential is possible

Wipe Sampling Procedure for PCBs

5. Remove the absorbent pad from its wrapper. (2” x 2”, 4 ply square)
6. Wet both external surfaces of the pad with trimethylpentane. (Do not use solvent when the surface to be sampled is visibly wet, simply blot liquid within measurement.)
7. Place 100cm^2 template on surface to delineate area to be sampled.
8. Wipe 10 cm square area horizontally from left to right and then vertically from left to right.
9. Carefully roll the pad into vial and cap.
10. Seal, label, and prepare vial for transport to the laboratory.
11. Fill out chain of custody completely ensuring to include wipe area.
12. Place used template and gloves in plastic bag and dispose of as assumed PCB contaminated materials.

Standard Operating Procedure
SOP-ASTMD4059_WIPE

1. Scope and Application

1.1 This method is used to determine concentration of polychlorinated biphenyls (PCBs) in surface wipe(s).

2. Responsibility

2.1 This procedure is restricted to use by or under the supervision of A-Line Lab Personnel experienced in interpretation of gas chromatographs. Prior to sample analysis, each analyst must demonstrate the ability to generate acceptable results using this method.

3. Safety

3.1 Personnel expected to deal with sampling or testing of PCB contaminated equipment, transformers shall be familiar with the PCB Training Outline.

3.2 Unless otherwise noted, samples from all incoming transformers and other components should be assumed to be hazardous. Practice good personal hygiene, including proper use of PPE.

3.3 A reference file of material safety data sheets (MSDS) is available in hardcopy or electronically to all personnel involved in these analyses.

4. Equipment and Supplies

4.1 Shimadzu GC-2010 equipped with an autosampler, megabore capillary column, and ECD detector.
4.2 Adjustable micropipettor (calibrated annually) and universal disposable tips
4.3 Solvent dispenser (verified daily, using calibrated analytical balance)
4.4 Analytical balance with readability 0.001g (calibrated annually)
4.5 Acid-resistant dispenser
4.6 Vortexer
4.7 Sonicator
4.8 Disposable pipets for sample extract transfer
4.9 Clean forceps for removal of gauze pads
4.10 Clean glass bottles, 125 mL with plastic cap
4.11 Clean glass test tube or vial (15 mL or other appropriate volume)
4.12 Test tube rack if necessary
4.13 Clean amber GC autosampler vials with PTFE snap lids
4.14 Pesticide-grade or better iso-Octane (2,2,4-Trimethylpentane)
4.15 Sulfuric acid
4.16 Florisil (60-100 Mesh)

4.17 Certified Aroclor standards (1242, 1254, and 1260) at 50mg/kg and 500 mg/kg in mineral oil

4.18 Certified PCB-Free transformer oil

5. Procedure

5.1 Dilution of Unknown Wipe Samples

5.1.1 Sample preparation is done using 125 mL clean glass jars with a plastic lid. These can be pre-filled with 100 mL of Isooctane (2,2,4-Trimethylpentane), carefully measured with the solvent dispenser. Evaluate the volume indicated.

5.1.1.1 In order to maintain confidence in dispenser, a daily record, "Solvent Dispenser Log" is kept of passing value(s) of one aliquot of iso-Octane*, with adjustment as necessary.

*Isooctane (2,2,4-Trimethylpentane) specific gravity listed as 0.69g/cm3 per Fisher Scientific MSDS. Acceptable ranges within 10% weight per volume of liquid. [1.5mL] 0.93g to 1.14g [10mL] 6.21g to 7.59g

5.1.2 Using clean forceps, remove gauze from original Wipe Sample vial (see PLT-002 Collection of Wipe Samples). Open fresh pre-filled 125 mL bottle, labeled with corresponding sample ID. Place gauze in bottle, and cap tightly.

5.1.3 Place sample bottle (125 mL bottle with Wipe Sample gauze) in sonicator, and set timer for twenty minutes, or other appropriately determined time.

5.1.4 Wipe Sample extraction solvent can be removed from the 125 mL jar using a clean pipette, and added to a clean, labelled test tube (in test tube rack) or 15 mL jar. This test tube will be used for Mineral Oil Spike, and subsequent Cleanup.

5.2 Mineral oil Spike

5.2.1.1 Ensure the micropipettor is set to the desired aliquot amount (12uL or other determined volume). With gloved hands, open the certified PCB-Free transformer oil. Referring to SOP-ASTMD4059 for proper pipetting techniques, add determined amount of oil to the test tube (or vial) of Wipe Sample extract.

5.2.1.2 Vortex test tube / vial of the resultant Spiked Wipe Sample extract, and prepare for Cleanup.

*Refer to SOP-ASTMD4059, section 5 for instruction on preparing the sample for GC Injection (including Cleanup), and section 6 for Obtaining Data

6 Data Evaluation and Calculation

6.1 Before performing any analysis, the analyst must demonstrate the ability to generate acceptable accuracy and precision with this method.

6.2 Each unknown chromatogram is to be examined by the analyst using GC Solution software. Each PCB Aroclor can be located by comparing retention time windows and peak shape. Evaluation methods are set up for each calibration curve. These can be accessed in the *Post Run* feature of ***GC Solution***

6.2.1 If a ***GC Solution*** evaluation method identifies Aroclor peaks, record each value (in the case of Wipe samples, the reporting value is to be expressed in ug/100cm2, per 40 CFR 761.123) along with the corresponding Aroclor. Total PCB (ug/100cm2) can be determined by adding values together.

6.2.2 If ***GC Solution*** determines that there is no detection of PCB (ND), then this result may be used as the final reporting value.

7.2.2 Unknown Wipe Samples that lie outside calibration limits or the detection limit of the detector can be further diluted to be brought within limits. The *Dil. Factor* column in the batch table can be adjusted accordingly.

7.2.3 The reportable value for Wipe Samples and standards and corresponding Aroclors shall be recorded on the “Daily Testing Log”.

7 Worksheets

7.1 “Dilution Chart”
7.2 “PCB Testing Daily Log”
7.3 “Solvent Dispenser Log”
7.4 “Standard Prep Log”

8 References

8.1 ASTM D4059-00(2005); Standard Test Method for Analysis of Polychlorinated Biphenyls in Insulating Liquids by Gas Chromatography, Issued 2000, Reapproved 2005

8.2 A-Line EDS SOP-ASTMD4059*

8.3 A-Line EDS PLT-002 Collection of Wipe Samples

8.4 EPA Method 3620C Florisil Cleanup

8.5 EPA Method 3550C Ultrasonic Extraction

8.6 PCB Training Outline, A-Line E.D.S., Inc.

8.7 Shimadzu GC Solutions Operation Manual

8.8 40 CFR 761.123

Customer ***EXAMPLE REPORT***
Address

Contact
Phone

Polychlorinated Biphenyls
(PCB's) Summary
ASTM Method D-4059

A-LINE E.D.S.
ENVIRONMENTAL DECOMMISSION SERVICE
808 Dearborn Ave.
Waterloo, IA 50703
(319)232-3889

A-Line ID#	Serial Number	Cust ID #	Description of Material	KVA	Manufacturer	Notes	Date Taken	Date Received	Results (ppm)
303289	4144575	43	Transformer				10/20/2020	10/21/2020	6
303290	126409	44	Transformer				10/20/2020	10/21/2020	ND
303291	79A195018	45	Transformer				10/20/2020	10/21/2020	ND
303292	35572	46	Recloser				10/20/2020	10/21/2020	ND
303293	47	47	Tank			Wipe	10/20/2020	10/21/2020	1.5 ug/100cm2
303294	48	48	Tank			Wipe	10/20/2020	10/21/2020	3 ug/100cm2
303295	49	49	Tank			Wipe	10/20/2020	10/21/2020	1.4 ug/100cm2
303296	50	50	Tank			Wipe	10/20/2020	10/21/2020	4 ug/100cm2
303297	113722	51	Transformer			Wipe	10/20/2020	10/21/2020	4 ug/100cm2
303298	113724	52	Transformer			Wipe	10/20/2020	10/21/2020	6 ug/100cm2

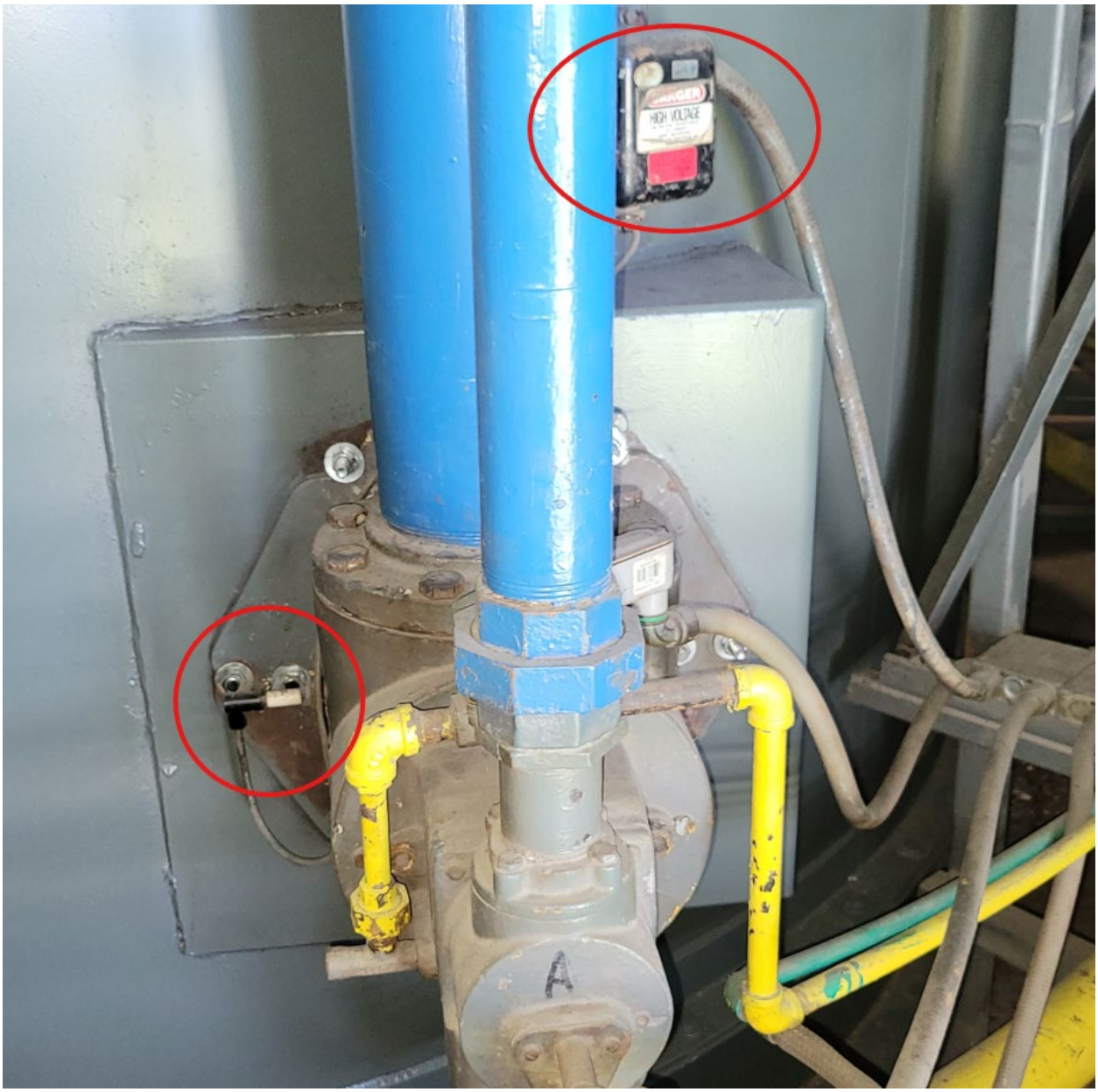
Submitted by: Nicole Littlefield

Nicole Littlefield, Laboratory Manager

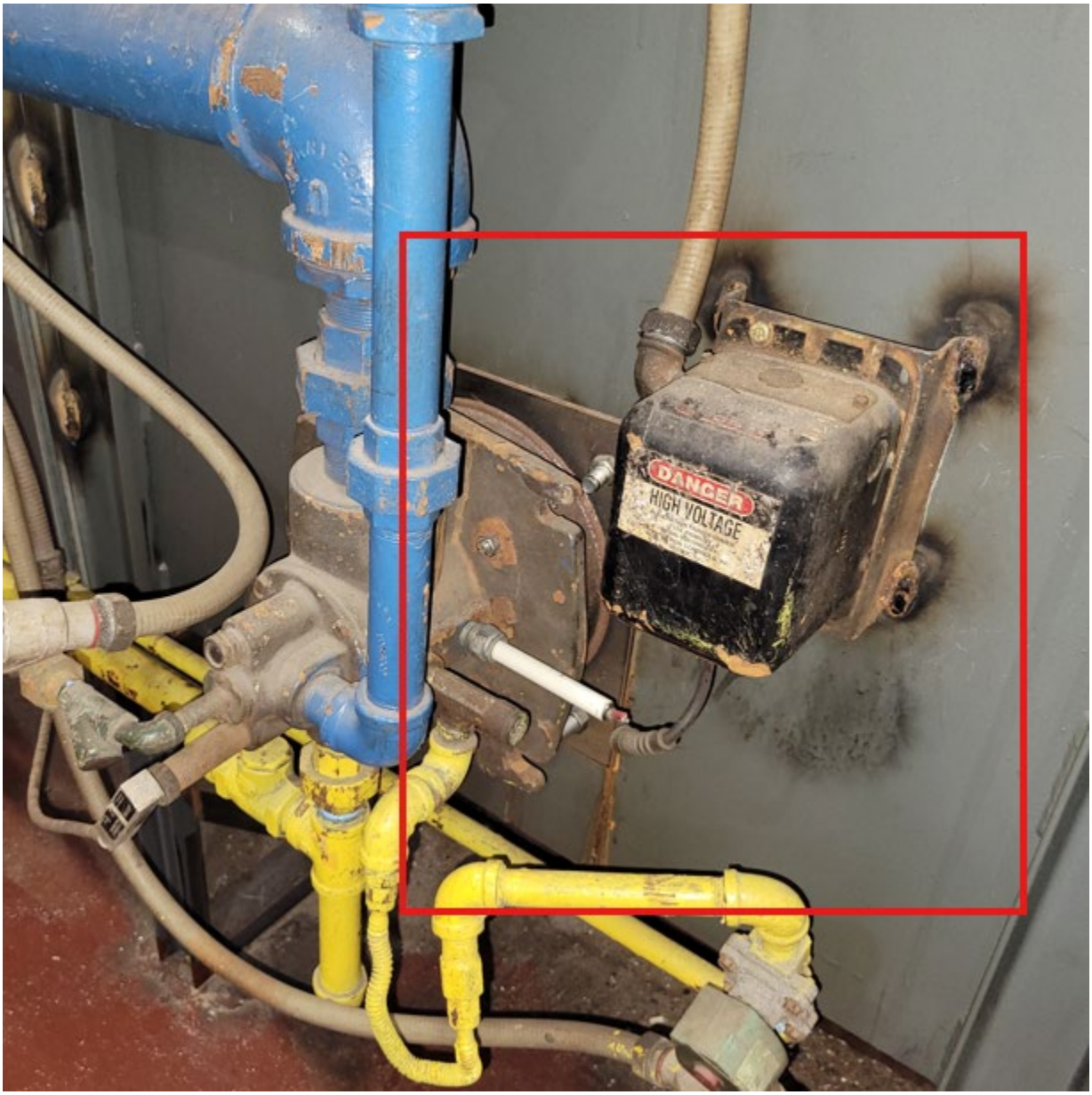
Furnace Transfer Car Being Removed from Furnace

Burn Tray Being Placed on Furnace Transfer Car

Furnace Transfer Car Being Pushed into the Furnace



Secondary Chamber Burner-Electrical Starter Circled



Primary Chamber Burner-Electrical Starter Highlighted