REPORTING REQUIREMENTS FOR TOTAL PCBs (PCB CONGENERS BY EPA METHOD 1668C rev. 11/09/2021

MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER AND SCIENCE ADMINISTRATION

REPORTING REQUIREMENTS FOR TOTAL PCBs (PCB CONGENERS) BY EPA METHOD 1668 C rev 11/9/2021

OVERVIEW:

Polychlorinated biphenyls (PCBs) are a group of man-made chemicals that were once widely used in industry and electrical equipment. They are persistent organic pollutants (POPs), which means that they are resistant to breakdown in the environment and can accumulate in living organisms. PCBs were once widely used in industry and consumer products, but their production was banned in the United States by the Toxic Substances Control Act in 1976. They are still found everywhere around us and can be harmful to human health and the environment. PCBs can cause cancer in animals and evidence supports a cancer-causing effect in humans. They can also damage the immune system, reproductive system, and nervous system. PCBs are highly resistant to environmental degradation and can persist in the environment for long periods of time. They can accumulate in animals and humans and can be passed from one generation to the next. PCBs can contaminate fish and other aquatic life, and they can also accumulate in the soil and air. Humans can be exposed to PCBs through the consumption of contaminated fish, meat, and dairy products. PCBs can also be inhaled from the air or absorbed through the skin. Exposure to PCBs can cause a variety of health problems, including cancer, reproductive problems, and developmental disorders. PCBs are also known to damage the immune system and the nervous system.

Monitoring and sampling PCBs in wastewater effluent is important for several reasons:

- It can help to identify sources of PCBs in the environment.
- It can help to track the movement of PCBs through the environment.
- It can help to assess the effectiveness of PCB control measures.
- It can help to protect human health and the environment.
- It can help the Department better understand the levels of these pollutants in the environment, protect human health and the environment, and identify sources of PCB contamination.

PCB SAMPLING PROTOCOL

A. EQUIPMENT

1. Sampling Containers

Laboratory supplied 2 L PCB-free certified amber bottles shall be used.
If amber bottles are not available, all samples and blanks must be protected from the light. *Note 1: Some testing laboratories may only require 1 L sample containers. Permittees should follow the testing laboratory's direction on number of liters of sample required.*

Container caps must be threaded to fit sample bottles and container caps must be lined with fluoropolymer.

2. Compositing Equipment

Automatic sampler or manual set-up compositing system with glass containers cleaned by detergent water washed and then PCB free- solvent rinsed. Only glass or fluoropolymer tubing can be used for the intake tubing. If the sampler has a peristaltic pump, a minimum length of compressible silicone rubber tubing may be used in the pump assembly only. In addition, the pump tubing must be thoroughly rinsed with methanol, followed by repeated rinsing with reagent water to minimize sample contamination. Samples collected from continuous discharges should be taken as 24-hour flow-proportional composites samples at a frequency of not greater than one aliquot every hour for a nominal sample volume of 2 liters for both the sample and the field replicate. See Note 1 above.

B. SAMPLING REQUIREMENTS

1. Continuous Discharges

All samples must be collected as 24-hour flow proportional composite samples or as required by the permit with a nominal volume of 1.1 liters for both the sample and the field replicate. The field replicate must be collected at the same time as the sample. The sample and replicate cannot be split. Sample bottles: 1.1 liter minimum glass amber containers with screw cap that are certified PCB-free must be used to collect the samples then after collection of the sample sealed and stored at between 0-6 degrees C for shipment. These containers must be supplied by the testing laboratory.

2. Non-Continuous Discharges and Batch Discharges

Non-continuous effluent discharges and batch discharges which occur intermittently and are not caused by rainfall or precipitation and do not yield continuous long-term discharges should be sampled as follows:

A 1.1 liter minimum grab sample must be collected into a laboratory supplied PCB-free certified amber bottle, sealed and stored at between 0-6 degrees C for shipment. A replicate grab sample must be collected and treated in the same manner as the sample.

3. Sample Collection Technique for Stormwater or Stormwater Influenced Discharges

A 1.1 liter minimum grab sample must be collected into a laboratory supplied bottle within 30 minutes of the start of the discharge, sealed and stored at between 0-6 degrees C for

shipment. A field replicate sample must l be collected and treated in the same manner as the sample. Field replicate samples are independent samples that are collected concurrently with the primary samples at the same point in space and time. They are separate samples collected and stored in separate containers and are analyzed separately. These replicates are required as a backup for the analytical laboratory and will be analyzed in the event of an unforeseen problem or assist with the resolution of controversies.

If the required sampling is to be conducted during WET weather conditions the following conditions must have occurred:

- Rainfall event of 0.1 inches or greater
- No rainfall (defined as less than 0.1 inches) has occurred within the previous 72 hours

C. SAMPLES

1. Effluent or Target Sample

A 1.1 liter minimum sample that is collected into a laboratory supplied PCB-free certified amber bottle.

2. Field Replicates

Field replicate samples are independent samples that are collected concurrently with the primary samples at the same point in space and time. They are separate samples (1.1 liter minimum sample collected into a laboratory supplied PCB-free certified amber bottle) collected and stored in separate containers, and are analyzed separately. These are also 1.1 liter minimum samples collected into a laboratory supplied PCB-free certified amber bottle. These replicates are required as a backup for the analytical laboratory and will be analyzed in the event of an unforeseen problem or assist with the resolution of controversies.

3. Equipment Rinsate Blanks

Rinsate blanks are blanks that are utilized to assess analyte contamination of the sampling apparatus used for the collection of samples. These blanks consist of PCB free water that is used to rinse the sampling equipment and collected after the sampling equipment has been thoroughly cleaned or decontaminated (detergent water washed, then PCB-free solvent rinsed) prior to sampling. Rinsate blanks must be handled in the same manner as the samples. Laboratory water and sample bottles used in the collection of rinsate blanks must be supplied by the laboratory which will be performing the analysis. The laboratories must certify that the bottles and water are PCB free.

Rinsate Blanks must be collected and analyzed at the following frequency:

- A rinsate blank per sampling event and per each piece of sampling equipment must be collected and analyzed.
- Analyte concentrations from any resulting contamination of the rinsate blank will be compared to MDE's rinsate blank acceptability criteria. If rinsate blank concentration levels exceed the rinsate blank contamination criteria, the source of external contamination should be investigated and eliminated, if feasible. In addition, another sampling event may be required at the discretion of the MDE.

4. Sample Preservation

- If residual chlorine is present, add 80 mg sodium thiosulfate per liter of water.
- Maintain samples in the dark at <6 °C from the time of collection until receipt at the testing laboratory.
- Method 1668A specifies the adjustment of the sample to a pH of 2-3 S.U. with sulfuric acid. This is not necessary however, check with your testing lab for their requirements.

5. Trip Blanks

Trip blanks may be collected but are not required for Method 1668 analysis.

D. REPORTING REQUIREMENTS / LABORATORY DELIVERABLES[1]

1. The final report shall include a brief discussion of the sampling project objectives including facility name; complete sample identifications, which includes sample field location and corresponding laboratory assigned sample number or identifier. There must be detailed documentation of any quality control, sample, shipment and/ analytical problems encountered in the collection, processing and analyzing of the samples. In addition, a glossary of the laboratory's qualifier codes and terms used in the final report must be included. If positive results below the lowest calibration standard are found and reported, they must be flagged as estimated on the analysis report. If a compound was detected in a sample as well as in the method blank associated with the sample, the result must be flagged. If the sample must be diluted because a target compound is above the calibration range, then the positive result for the particular compound must be flagged. If the compound is still above the calibration rage after a dilution is performed on the sample, the positive result for the compound should be flagged.

[1]Some of Maryland Department of the Environment's required data package deliverables were based on the requirements specified in the US EPA Contract Laboratory Program Statement of Work for EPA Method 1668.

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2. Sample Data Package – The sample data should be arranged in sets consisting of the analytical results summaries followed by the raw data required by this document for the PCB sample analytical report. These sample data packages should be placed in alphanumeric order or based on the sample identification.

3. The Sample Data Report should include analytical data for primary or target samples. The analytical report shall consist of the quantitation analysis and include all information required to reproduce reported positive results and EDL results. The report shall include the data on all associated control samples such as rinsate blanks, field and trip blanks, if collected, second column analyses, any re-extractions or re-analyses, secondary dilutions, all blanks, ongoing precision and recovery (OPR) e. g. laboratory fortified blanks standards, matrix spikes, matrix spike duplicates, and/or laboratory duplicates. All Selected Ion Current Profile (SICP) Chromatograms shall be submitted (should be submitted as an electronic pdf files)

4. For each sample, the lab must include peak co-elution information, ion abundance ratios, estimated detection limits (EDLs), internal standard (both extraction and injection) recoveries and clean-up standard recoveries. Sample data shall be arranged in packets consisting of the analytical results followed by the raw data for PCB sample analysis. The laboratory must include all supporting documentation for the reported analytical results and the supporting data must be included in the data package in sequential order or in the order in which the results are presented in the data package. The data package must be complete at the time of submission and each page must be numbered in alphanumeric or numeric order.

5. All 209 congeners are to be monitored and congeners that are quantified above the EDL must be totaled and reported as total PCBs. Tabulated results which show the identification and quantitation of the extremely toxic 12 dioxin-like PCB congeners identified by the World Health Organization (WHO) shall be included in the final report. A list of these 12 congeners can be found in Appendix B. Any of the 12 dioxin-like toxic PCB identified by the WHO listed below that are quantified above the reporting limit shall be reported separately and identified**. All results must be reported to the estimated detection limit (EDL). See formula below:**

Estimated Detection Limit For analyte 'x', the EDL is calculated by the following formula:

$$EDLx = 2.5 \bullet \frac{Na \bullet Qis \bullet Rah}{Ais \bullet RFF \bullet wv}$$

Where: Na= Analyte peak to peak noise height.
Qis= Concentration of the internal standard
Rah= Area Height Ratio.

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Ais= Area of internal standard
RRF= initial calibration average relative response factor for the congener of interest.
wv= Sample weight/volume.
2.5= Minimum signal to noise ratio.

Noise calculations are to be taken from the discrete sections of the chromatogram rather than the entire chromatograph for a mass descriptor. No peak smoothing of the chromatograph is to be undertaken. Peak identification to be conducted on the raw chromatograph.

6. The analytical report must include the following information:

    - Sample volume in L or mL
    - Date received
    - Was sample Decanted?
    - Method or type of extraction used
    - Date of extraction
    - Extract volume uL
    - Injection Volume uL
    - Type of Clean-up utilized
    - Date analyzed

7. The report must include an explanation of all technical and administrative problems that might have occurred during the collection, shipment, processing and analysis of the samples including how problems were resolved or the corrective actions taken. All manual integrations shall be flagged on the laboratory report. The analytical report shall include all data or information required to reproduce reported positive results and EDL results such as sample dilution factors.

8. Copies of the field Chain-of-Custody Records for all samples must be included in the final report. Description of sample storage during holding and transport. A description of the condition and temperature of the samples upon receipt at the laboratory e.g. custody seal condition, container status must be provided for each Chain-of-Custody Record.

9. The **Quality Control (QC) Summary must include but not limited to the following data:**
    - A Duplicate Precision Summary shall be included in the report. All duplicate analysis must be reported. A relative percent difference summary for each laboratory duplicate analyzed must be reported. The duplicate summary form must identify the sample that was utilized for duplicate analysis. The identification of the original sample, the concentration of the compounds present in the original and duplicate sample. The summary should also include the laboratory's RPD

acceptance criteria. All compounds that do not meet the acceptance criteria should be flagged.

- An Ongoing Precision and Recovery (OPR) Summary which shows percent recovery for each OPR sample analyzed... The OPR summary report shall show the concentrations of the compounds present in the spiked sample. The summary form should also include the laboratory's OPR recovery acceptance criteria. The analytes that do not meet the specified criteria must be flagged.

- Method Blank Analysis Summary for each congener shall be reported. The summary must identify the samples associated with each method blank. The date of extraction, date of analysis, time of analysis of the method blank must be reported. MDE's acceptance criteria for the method blank can be found in the following Section F.

- Calibration Verification Data (Calibration Verification Summary Form, quantitation report, and SICP Chromatograms) for each calibration verification associated with each sample presented in chronological order, by GC column, by instrument.

- Mass spectrometer resolution data for the reference standard (PFK or other substance) analyzed to demonstrate mass resolution should be submitted with the report. Output for each descriptor should identify the lab file identification, date and time of analysis, instrument identification, and exact mass ions monitored. The laboratory must show verification of an initial calibration summary for each multi-point initial calibration performed, including a summary of the relative response factor, and the relative standard deviation among the relative response factors. A calibration verification summary for each calibration verification standard analyzed, summarizing the true and found concentrations, and the percent recoveries and the relative response factors of the calibration verification and the isotope ratios and retention times. The summary shall show a list of the compounds utilized to evaluate recovery performance and identify all compounds that did not meet the acceptance criteria. The summary should indicate the instrument identification, the date of the initial calibration, the date and time of analysis, column type, and diameter of the column. All raw data necessary to support calibration verification must also be submitted.

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E. BLANK ACCEPTANCE CRITERIA

Rinsate Blank

- An individual congener shall not exceed 40 pg/L
- If a congener exceeds 40 pg/L in the rinsate blank and the associated sample concentration exceeds 3× the amount in the blank, the sample is acceptable
- If a congener exceeds 40 pg/L and the congener is not quantified in the associated sample, the sample is acceptable.
- The total PCB concentration of the rinsate blank shall not exceed 600 pg/L
- If rinsate blank concentration levels are above the rinsate blank contamination criteria, the source of the contamination should be investigated and eliminated before further monitoring.

Method Blank Sample Acceptance Criteria (see Appendix D)

An individual congener quantified in the method bland should be < 20 pg/L

Sample associated with method blank is **Acceptable**:

- If an Individual Congener is < 20 pg/L
- If an individual congener exceeds 20 pg/L in the method blank and the associated sample exceeds 10X the amount in blank then the sample associated with the blank is acceptable.
- If an individual congener exceeds 20 pg/L in the method blank and congener is not found in associated sample, that sample is acceptable
- If total PCB concentrations are < 300 pg/L and one or more congeners are found to exceed 20 pg/L, the associated sample is acceptable.

Sample associated with method blank is **Not Acceptable:**

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- If an individual congener exceeds 20 pg/L in the method blank and the concentration in the associated sample does not exceed 10X the amount in blank then the sample results associated with the blank is not acceptable. The replicate must be analyzed.

- If an individual congener exceeds 20 pg/L and congener(s) are quantified in associated sample and the total PCB concentrations are >300 pg/L, the associated sample results are not acceptable and the replicate sample must be analyzed.

Appendix A

Table of PCB Species by Congener Number

IUPAC Name	Congener Number	CASRN	Descriptors
Biphenyl	0	92-52-4	
2-Chlorobiphenyl	1	2051-60-7	CP1
3-Chlorobiphenyl	2	2051-61-8	CP0
4-Chlorobiphenyl	3	2051-62-9	CP0
2,2'-Dichlorobiphenyl	4	13029-08-8	
2,3-Dichlorobiphenyl	5	16605-91-7	CP1
2,3'-Dichlorobiphenyl	6	25569-80-6	CP1
2,4-Dichlorobiphenyl	7	33284-50-3	CP1
2,4'-Dichlorobiphenyl	8	34883-43-7	CP1
2,5-Dichlorobiphenyl	9	34883-39-1	CP1
2,6-Dichlorobiphenyl	10	33146-45-1	
3,3'-Dichlorobiphenyl	11	2050-67-1	CP0, 2M
3,4-Dichlorobiphenyl	12	2974-92-7	CP0
3,4'-Dichlorobiphenyl	13	2974-90-5	CP0
3,5-Dichlorobiphenyl	14	34883-41-5	CP0, 2M
4,4'-Dichlorobiphenyl	15	2050-68-2	CP0, PP
2,2',3-Trichlorobiphenyl	16	38444-78-9	
2,2',4-Trichlorobiphenyl	17	37680-66-3	
2,2',5-Trichlorobiphenyl	18	37680-65-2	
2,2',6-Trichlorobiphenyl	19	38444-73-4	
2,3,3'-Trichlorobiphenyl	20	38444-84-7	CP1, 2M

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2,3,4-Trichlorobiphenyl	21	55702-46-0	CP1
2,3,4'-Trichlorobiphenyl	22	38444-85-8	CP1
2,3,5-Trichlorobiphenyl	23	55720-44-0	CP1, 2M
2,3,6-Trichlorobiphenyl	24	55702-45-9	
2,3',4-Trichlorobiphenyl	25	55712-37-3	CP1
2,3',5-Trichlorobiphenyl	26	38444-81-4	CP1, 2M
2,3',6-Trichlorobiphenyl	27	38444-76-7	
2,4,4'-Trichlorobiphenyl	28	7012-37-5	CP1, PP
2,4,5-Trichlorobiphenyl	29	15862-07-4	CP1
2,4,6-Trichlorobiphenyl	30	35693-92-6	
2,4',5-Trichlorobiphenyl	31	16606-02-3	CP1
2,4',6-Trichlorobiphenyl	32	38444-77-8	
2,3',4'-Trichlorobiphenyl	33	38444-86-9	CP1
2,3',5'-Trichlorobiphenyl	34	37680-68-5	CP1, 2M
3,3',4-Trichlorobiphenyl	35	37680-69-6	CP0, 2M
3,3',5-Trichlorobiphenyl	36	38444-87-0	CP0, 2M
3,4,4'-Trichlorobiphenyl	37	38444-90-5	CP0, PP
3,4,5-Trichlorobiphenyl	38	53555-66-1	CP0, 2M
3,4',5-Trichlorobiphenyl	39	38444-88-1	CP0, 2M
2,2',3,3'-Tetrachlorobiphenyl	40	38444-93-8	4CL, 2M
2,2',3,4-Tetrachlorobiphenyl	41	52663-59-9	4CL
2,2',3,4'-Tetrachlorobiphenyl	42	36559-22-5	4CL
2,2',3,5-Tetrachlorobiphenyl	43	70362-46-8	4CL, 2M
2,2',3,5'-Tetrachlorobiphenyl	44	41464-39-5	4CL, 2M
2,2',3,6-Tetrachlorobiphenyl	45	70362-45-7	4CL
2,2',3,6'-Tetrachlorobiphenyl	46	41464-47-5	4CL
2,2',4,4'-Tetrachlorobiphenyl	47	2437-79-8	4CL, PP
2,2',4,5-Tetrachlorobiphenyl	48	70362-47-9	4CL
2,2',4,5'-Tetrachlorobiphenyl	49	41464-40-8	4CL
2,2',4,6-Tetrachlorobiphenyl	50	62796-65-0	4CL
2,2',4,6'-Tetrachlorobiphenyl	51	68194-04-7	4CL

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2,2',5,5'-Tetrachlorobiphenyl	52	35693-99-3	4CL, 2M
2,2',5,6'-Tetrachlorobiphenyl	53	41464-41-9	4CL
2,2',6,6'-Tetrachlorobiphenyl	54	15968-05-5	4CL
2,3,3',4-Tetrachlorobiphenyl	55	74338-24-2	CP1, 4CL, 2M
2,3,3',4'-Tetrachlorobiphenyl	56	41464-43-1	CP1, 4CL, 2M
2,3,3',5-Tetrachlorobiphenyl	57	70424-67-8	CP1, 4CL, 2M
2,3,3',5'-Tetrachlorobiphenyl	58	41464-49-7	CP1, 4CL, 2M
2,3,3',6-Tetrachlorobiphenyl	59	74472-33-6	4CL, 2M
2,3,4,4'-Tetrachlorobiphenyl	60	33025-41-1	CP1, 4CL, PP
2,3,4,5-Tetrachlorobiphenyl	61	33284-53-6	CP1, 4CL, 2M
2,3,4,6-Tetrachlorobiphenyl	62	54230-22-7	4CL
2,3,4',5-Tetrachlorobiphenyl	63	74472-34-7	CP1, 4CL, 2M
2,3,4',6-Tetrachlorobiphenyl	64	52663-58-8	4CL
2,3,5,6-Tetrachlorobiphenyl	65	33284-54-7	4CL, 2M
2,3',4,4'-Tetrachlorobiphenyl	66	32598-10-0	CP1, 4CL, PP
2,3',4,5-Tetrachlorobiphenyl	67	73575-53-8	CP1, 4CL, 2M
2,3',4,5'-Tetrachlorobiphenyl	68	73575-52-7	CP1, 4CL, 2M
2,3',4,6-Tetrachlorobiphenyl	69	60233-24-1	4CL
2,3',4',5-Tetrachlorobiphenyl	70	32598-11-1	CP1, 4CL, 2M
2,3',4',6-Tetrachlorobiphenyl	71	41464-46-4	4CL
2,3',5,5'-Tetrachlorobiphenyl	72	41464-42-0	CP1, 4CL, 2M
2,3',5',6-Tetrachlorobiphenyl	73	74338-23-1	4CL, 2M
2,4,4',5-Tetrachlorobiphenyl	74	32690-93-0	CP1, 4CL, PP
2,4,4',6-Tetrachlorobiphenyl	75	32598-12-2	4CL, PP
2,3',4',5'-Tetrachlorobiphenyl	76	70362-48-0	CP1, 4CL, 2M
3,3',4,4'-Tetrachlorobiphenyl	77	32598-13-3	CP0, 4CL, PP, 2M
3,3',4,5-Tetrachlorobiphenyl	78	70362-49-1	CP0, 4CL, 2M
3,3',4,5'-Tetrachlorobiphenyl	79	41464-48-6	CP0, 4CL, 2M
3,3',5,5'-Tetrachlorobiphenyl	80	33284-52-5	CP0, 4CL, 2M
3,4,4',5-Tetrachlorobiphenyl	81	70362-50-4	CP0, 4CL, PP, 2M
2,2',3,3',4-Pentachlorobiphenyl	82	52663-62-4	4CL, 2M
2,2',3,3',5-Pentachlorobiphenyl	83	60145-20-2	4CL, 2M

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2,2',3,3',6-Pentachlorobiphenyl	84	52663-60-2	4CL, 2M
2,2',3,4,4'-Pentachlorobiphenyl	85	65510-45-4	4CL, PP
2,2',3,4,5-Pentachlorobiphenyl	86	55312-69-1	4CL, 2M
2,2',3,4,5'-Pentachlorobiphenyl	87	38380-02-8	4CL, 2M
2,2',3,4,6-Pentachlorobiphenyl	88	55215-17-3	4CL
2,2',3,4,6'-Pentachlorobiphenyl	89	73575-57-2	4CL
2,2',3,4',5-Pentachlorobiphenyl	90	68194-07-0	4CL, 2M
2,2',3,4',6-Pentachlorobiphenyl	91	68194-05-8	4CL
2,2',3,5,5'-Pentachlorobiphenyl	92	52663-61-3	4CL, 2M
2,2',3,5,6-Pentachlorobiphenyl	93	73575-56-1	4CL, 2M
2,2',3,5,6'-Pentachlorobiphenyl	94	73575-55-0	4CL, 2M
2,2',3,5',6-Pentachlorobiphenyl	95	38379-99-6	4CL, 2M
2,2',3,6,6'-Pentachlorobiphenyl	96	73575-54-9	4CL
2,2',3,4',5'-Pentachlorobiphenyl	97	41464-51-1	4CL, 2M
2,2',3,4',6'-Pentachlorobiphenyl	98	60233-25-2	4CL
2,2',4,4',5-Pentachlorobiphenyl	99	38380-01-7	4CL, PP
2,2',4,4',6-Pentachlorobiphenyl	100	39485-83-1	4CL, PP
2,2',4,5,5'-Pentachlorobiphenyl	101	37680-73-2	4CL, 2M
2,2',4,5,6'-Pentachlorobiphenyl	102	68194-06-9	4CL
2,2',4,5',6-Pentachlorobiphenyl	103	60145-21-3	4CL
2,2',4,6,6'-Pentachlorobiphenyl	104	56558-16-8	4CL
2,3,3',4,4'-Pentachlorobiphenyl	105	32598-14-4	CP1, 4CL, PP, 2M
2,3,3',4,5-Pentachlorobiphenyl	106	70424-69-0	CP1, 4CL, 2M
2,3,3',4',5-Pentachlorobiphenyl	107	70424-68-9	CP1, 4CL, 2M
2,3,3',4,5'-Pentachlorobiphenyl	108	70362-41-3	CP1, 4CL, 2M
2,3,3',4,6-Pentachlorobiphenyl	109	74472-35-8	4CL, 2M
2,3,3',4',6-Pentachlorobiphenyl	110	38380-03-9	4CL, 2M
2,3,3',5,5'-Pentachlorobiphenyl	111	39635-32-0	CP1, 4CL, 2M
2,3,3',5,6-Pentachlorobiphenyl	112	74472-36-9	4CL, 2M
2,3,3',5',6-Pentachlorobiphenyl	113	68194-10-5	4CL, 2M
2,3,4,4',5-Pentachlorobiphenyl	114	74472-37-0	CP1, 4CL, PP, 2M
2,3,4,4',6-Pentachlorobiphenyl	115	74472-38-1	4CL, PP

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2,3,4,5,6-Pentachlorobiphenyl	116	18259-05-7	4CL, 2M
2,3,4',5,6-Pentachlorobiphenyl	117	68194-11-6	4CL, 2M
2,3',4,4',5-Pentachlorobiphenyl	118	31508-00-6	CP1, 4CL, PP, 2M
2,3',4,4',6-Pentachlorobiphenyl	119	56558-17-9	4CL, PP
2,3',4,5,5'-Pentachlorobiphenyl	120	68194-12-7	CP1, 4CL, 2M
2,3',4,5',6-Pentachlorobiphenyl	121	56558-18-0	4CL, 2M
2,3,3',4',5'-Pentachlorobiphenyl	122	76842-07-4	CP1, 4CL, 2M
2,3',4,4',5'-Pentachlorobiphenyl	123	65510-44-3	CP1, 4CL, PP, 2M
2,3',4',5,5'-Pentachlorobiphenyl	124	70424-70-3	CP1, 4CL, 2M
2,3',4',5',6-Pentachlorobiphenyl	125	74472-39-2	4CL, 2M
3,3',4,4',5-Pentachlorobiphenyl	126	57465-28-8	CP0, 4CL, PP, 2M
3,3',4,5,5'-Pentachlorobiphenyl	127	39635-33-1	CP0, 4CL, 2M
2,2',3,3',4,4'-Hexachlorobiphenyl	128	38380-07-3	4CL, PP, 2M
2,2',3,3',4,5-Hexachlorobiphenyl	129	55215-18-4	4CL, 2M
2,2',3,3',4,5'-Hexachlorobiphenyl	130	52663-66-8	4CL, 2M
2,2',3,3',4,6-Hexachlorobiphenyl	131	61798-70-7	4CL, 2M
2,2',3,3',4,6'-Hexachlorobiphenyl	132	38380-05-1	4CL, 2M
2,2',3,3',5,5'-Hexachlorobiphenyl	133	35694-04-3	4CL, 2M
2,2',3,3',5,6-Hexachlorobiphenyl	134	52704-70-8	4CL, 2M
2,2',3,3',5,6'-Hexachlorobiphenyl	135	52744-13-5	4CL, 2M
2,2',3,3',6,6'-Hexachlorobiphenyl	136	38411-22-2	4CL, 2M
2,2',3,4,4',5-Hexachlorobiphenyl	137	35694-06-5	4CL, PP, 2M
2,2',3,4,4',5'-Hexachlorobiphenyl	138	35065-28-2	4CL, PP, 2M
2,2',3,4,4',6-Hexachlorobiphenyl	139	56030-56-9	4CL, PP
2,2',3,4,4',6'-Hexachlorobiphenyl	140	59291-64-4	4CL, PP
2,2',3,4,5,5'-Hexachlorobiphenyl	141	52712-04-6	4CL, 2M
2,2',3,4,5,6-Hexachlorobiphenyl	142	41411-61-4	4CL, 2M
2,2',3,4,5,6'-Hexachlorobiphenyl	143	68194-15-0	4CL, 2M
2,2',3,4,5',6-Hexachlorobiphenyl	144	68194-14-9	4CL, 2M
2,2',3,4,6,6'-Hexachlorobiphenyl	145	74472-40-5	4CL
2,2',3,4',5,5'-Hexachlorobiphenyl	146	51908-16-8	4CL, 2M
2,2',3,4',5,6-Hexachlorobiphenyl	147	68194-13-8	4CL, 2M

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2,2',3,4',5,6'-Hexachlorobiphenyl	148	74472-41-6	4CL, 2M
2,2',3,4',5',6-Hexachlorobiphenyl	149	38380-04-0	4CL, 2M
2,2',3,4',6,6'-Hexachlorobiphenyl	150	68194-08-1	4CL
2,2',3,5,5',6-Hexachlorobiphenyl	151	52663-63-5	4CL, 2M
2,2',3,5,6,6'-Hexachlorobiphenyl	152	68194-09-2	4CL, 2M
2,2',4,4',5,5'-Hexachlorobiphenyl	153	35065-27-1	4CL, PP, 2M
2,2',4,4',5,6'-Hexachlorobiphenyl	154	60145-22-4	4CL, PP
2,2',4,4',6,6'-Hexachlorobiphenyl	155	33979-03-2	4CL, PP
2,3,3',4,4',5-Hexachlorobiphenyl	156	38380-08-4	CP1, 4CL, PP, 2M
2,3,3',4,4',5'-Hexachlorobiphenyl	157	69782-90-7	CP1, 4CL, PP, 2M
2,3,3',4,4',6-Hexachlorobiphenyl	158	74472-42-7	4CL, PP, 2M
2,3,3',4,5,5'-Hexachlorobiphenyl	159	39635-35-3	CP1, 4CL, 2M
2,3,3',4,5,6-Hexachlorobiphenyl	160	41411-62-5	4CL, 2M
2,3,3',4,5',6-Hexachlorobiphenyl	161	74472-43-8	4CL, 2M
2,3,3',4',5,5'-Hexachlorobiphenyl	162	39635-34-2	CP1, 4CL, 2M
2,3,3',4',5,6-Hexachlorobiphenyl	163	74472-44-9	4CL, 2M
2,3,3',4',5',6-Hexachlorobiphenyl	164	74472-45-0	4CL, 2M
2,3,3',5,5',6-Hexachlorobiphenyl	165	74472-46-1	4CL, 2M
2,3,4,4',5,6-Hexachlorobiphenyl	166	41411-63-6	4CL, PP, 2M
2,3',4,4',5,5'-Hexachlorobiphenyl	167	52663-72-6	CP1, 4CL, PP, 2M
2,3',4,4',5',6-Hexachlorobiphenyl	168	59291-65-5	4CL, PP, 2M
3,3',4,4',5,5'-Hexachlorobiphenyl	169	32774-16-6	CP0, 4CL, PP, 2M
2,2',3,3',4,4',5-Heptachlorobiphenyl	170	35065-30-6	4CL, PP, 2M
2,2',3,3',4,4',6-Heptachlorobiphenyl	171	52663-71-5	4CL, PP, 2M
2,2',3,3',4,5,5'-Heptachlorobiphenyl	172	52663-74-8	4CL, 2M
2,2',3,3',4,5,6-Heptachlorobiphenyl	173	68194-16-1	4CL, 2M
2,2',3,3',4,5,6'-Heptachlorobiphenyl	174	38411-25-5	4CL, 2M
2,2',3,3',4,5',6-Heptachlorobiphenyl	175	40186-70-7	4CL, 2M
2,2',3,3',4,6,6'-Heptachlorobiphenyl	176	52663-65-7	4CL, 2M
2,2',3,3',4,5',6'-Heptachlorobiphenyl	177	52663-70-4	4CL, 2M
2,2',3,3',5,5',6-Heptachlorobiphenyl	178	52663-67-9	4CL, 2M
2,2',3,3',5,6,6'-Heptachlorobiphenyl	179	52663-64-6	4CL, 2M

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2,2',3,4,4',5,5'-Heptachlorobiphenyl	180	35065-29-3	4CL, PP, 2M
2,2',3,4,4',5,6-Heptachlorobiphenyl	181	74472-47-2	4CL, PP, 2M
2,2',3,4,4',5,6'-Heptachlorobiphenyl	182	60145-23-5	4CL, PP, 2M
2,2',3,4,4',5',6-Heptachlorobiphenyl	183	52663-69-1	4CL, PP, 2M
2,2',3,4,4',6,6'-Heptachlorobiphenyl	184	74472-48-3	4CL, PP
2,2',3,4,5,5',6-Heptachlorobiphenyl	185	52712-05-7	4CL, 2M
2,2',3,4,5,6,6'-Heptachlorobiphenyl	186	74472-49-4	4CL, 2M
2,2',3,4',5,5',6-Heptachlorobiphenyl	187	52663-68-0	4CL, 2M
2,2',3,4',5,6,6'-Heptachlorobiphenyl	188	74487-85-7	4CL, 2M
2,3,3',4,4',5,5'-Heptachlorobiphenyl	189	39635-31-9	CP1, 4CL, PP, 2M
2,3,3',4,4',5,6-Heptachlorobiphenyl	190	41411-64-7	4CL, PP, 2M
2,3,3',4,4',5',6-Heptachlorobiphenyl	191	74472-50-7	4CL, PP, 2M
2,3,3',4,5,5',6-Heptachlorobiphenyl	192	74472-51-8	4CL, 2M
2,3,3',4',5,5',6-Heptachlorobiphenyl	193	69782-91-8	4CL, 2M
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	194	35694-08-7	4CL, PP, 2M
2,2',3,3',4,4',5,6-Octachlorobiphenyl	195	52663-78-2	4CL, PP, 2M
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	196	42740-50-1	4CL, PP, 2M
2,2',3,3',4,4',6,6'-Octachlorobiphenyl	197	33091-17-7	4CL, PP, 2M
2,2',3,3',4,5,5',6-Octachlorobiphenyl	198	68194-17-2	4CL, 2M
2,2',3,3',4,5,5',6'-Octachlorobiphenyl	199	52663-75-9	4CL, 2M
2,2',3,3',4,5,6,6'-Octachlorobiphenyl	200	52663-73-7	4CL, 2M
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	201	40186-71-8	4CL, 2M
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	202	2136-99-4	4CL, 2M
2,2',3,4,4',5,5',6-Octachlorobiphenyl	203	52663-76-0	4CL, PP, 2M
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	204	74472-52-9	4CL, PP, 2M
2,3,3',4,4',5,5',6-Octachlorobiphenyl	205	74472-53-0	4CL, PP, 2M
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	206	40186-72-9	4CL, PP, 2M
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	207	52663-79-3	4CL, PP, 2M
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	208	52663-77-1	4CL, 2M
Decachlorobiphenyl	209	2051-24-3	4CL, PP, 2M

Appendix B

World Health Organization (WHO) List of 12 dioxin-like PCB congeners

IUPAC #	Homolog Group	Substitution Group	IUPAC Name
non-*ortho* substituted PCBs			
77	tetra-CB	non-ortho	3,3',4,4'-tetra-CB
81	tetra-CB	non-ortho	3,4,4',5-tetra-CB
126	penta-CB	non-ortho	3,3',4,4',5-penta-CB
169	hexa-CB	non-ortho	3,3',4,4',5,5'-hexa-CB
mono-*ortho* substituted PCBs			
105	penta-CB	mono-ortho	2,3,3',4,4'-penta-CB
114	penta-CB	mono-ortho	2,3,4,4',5-penta-CB
118	penta-CB	mono-ortho	2,3',4,4',5-penta-CB
123	penta-CB	mono-ortho	2,3',4,4',5-penta-CB
156	hexa-CB	mono-ortho	2,3,3',4,4',5-hexa-CB
157	hexa-CB	mono-ortho	2,3,3',4,4',5'-hexa-CB
167	hexa-CB	mono-ortho	2,3',4,4',5,5'-hexa-CB
189	hepta-CB	mono-ortho	2,3,3',4,4',5,5'-hepta-

Appendix C

The following labs are able to conduct the PCBs test in accordance with EPA method 1668A or C:

MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER AND SCIENCE ADMINISTRATION

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Axys Analytical Services Ltd. P.O. Box 2219 2045 Mills Road Sidney, British Columbia CANADA V8L 5X2 Contact: Georgina Brooks Phone - direct: (250) 655-5801 Phone - general: (250) 655-5800 Fax: (250) 655-5811 Email: gbrooks@axys.com

Battelle Laboratories 505 King Avenue Columbus, OH 43201 Contact: Mary E. Schrock Phone: (614) 424-4976 Fax: (614) 424-3638 Email: schrock@battelle.org

Battelle Ocean Sciences 397 Washington Street Duxbury, MA 02332 Contact: John Thorn Phone: (781) 952-5200 Fax: (781) 952-5221 Email: thornj@battelle.org

Cape Fear Analytical, LLC. 3306 Kitty Hawk Rd., Suite 120 Wilmington, NC 28405 Contact: Christopher Cornwell Phone: (910) 795-0421 Email: chris.cornwell@cfanalytical.com

Eurofins Lancaster Laboratories Environmental, LLC
2425 New Holland Pike
Lancaster, PA 17601
Contact: Jeremy Young
Phone: (717) 693-5814
Fax: (717) 656-2681
Email: JeremyYoung@EurofinsUS.com

Midwest Research Institute 425 Volker Boulevard Kansas City, MO 64110 Contact: Anne Reid Phone: (816) 753-7600 ext. 1134 Fax: (816) 753-8420

SGS North America, Inc. 5500 Business Drive Wilmington, NC 28405 Contact: Amy Boehm Phone: (910) 350-1903 Fax: (910) 350-1557 Email: amy.boehm@SGS.com

TDI-Brooks International, Inc. 1902 Pinon College Station, TX, 77845 Contact: James M. Brooks Phone: (979) 693-3446 Fax: (979) 693-6389 Email: Drjmbrooks@aol.com

TestAmerica - Knoxville 5815 Middlebrook Pike Knoxville, TN 37921 Contact: John Reynolds Phone: (865) 291-3000 Fax: (865) 584-4315 Email: info@testamericainc.com

TestAmerica - West Sacramento 880 Riverside Parkway West Sacramento, CA 95605 Contact: Nilo Ligi Phone: (916) 373-5600 Fax: (916) 372-1059 Email: nilo.ligi@testamericainc.com

Texas A&M Research Foundation Geochemical & Environmental Research Group 833 Graham Road College Station, TX 77845 Contact: Terry Wade Phone: (979) 862-2323 Fax: (979) 862-2361 Email: terry@gerg.tamu.edu

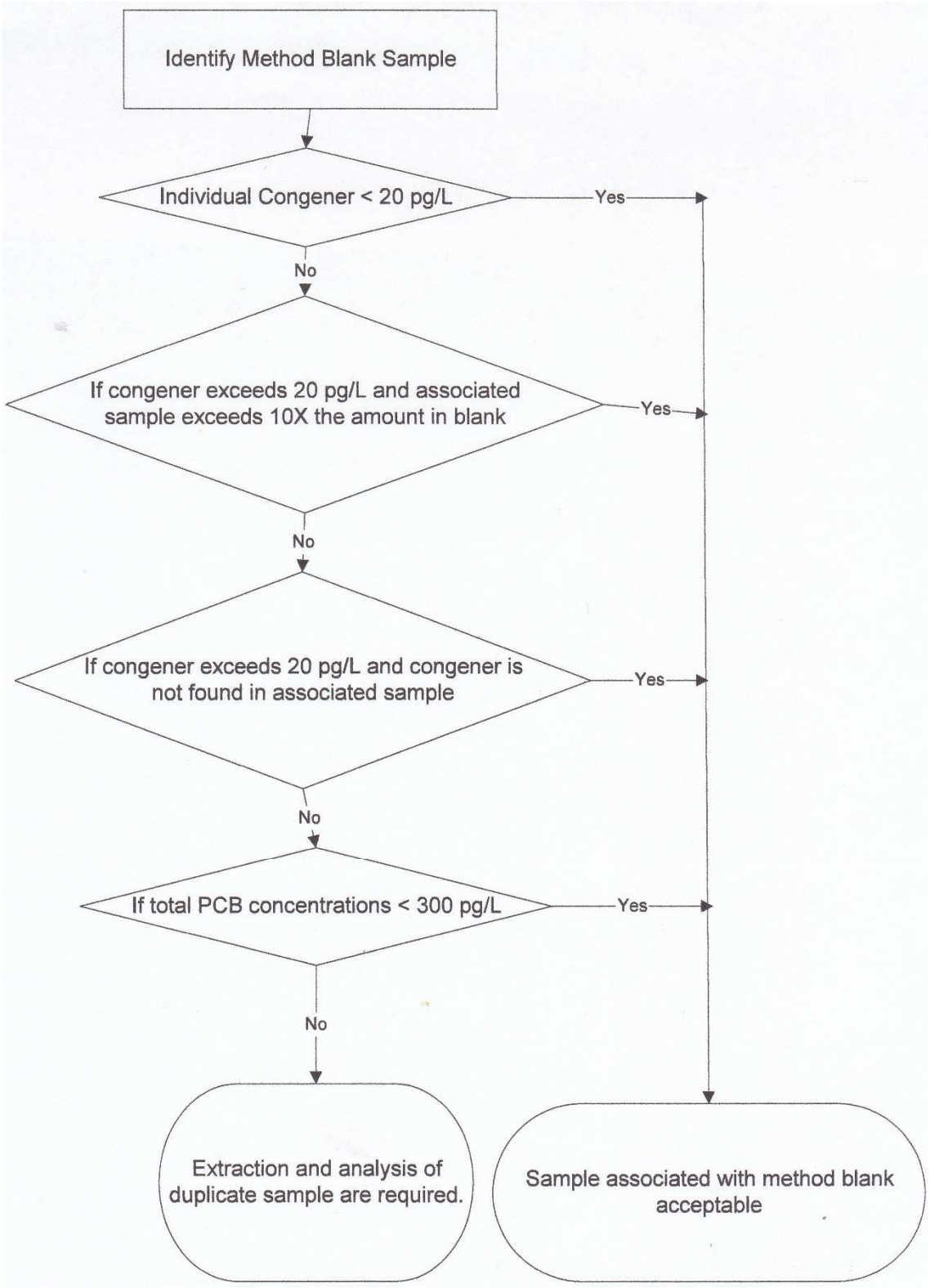
Vista Analytical Laboratory, Inc. 1104 Windfield Way El Dorado Hills, CA 95762 Contact: William Luksemburg Phone: (916) 673-1520 Fax: (916) 673-0106 Email: billux@altalab.com

Appendix D

Method Blank Decision Rule Flow Chart

MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER AND SCIENCE ADMINISTRATION

REPORTING REQUIREMENTS FOR TOTAL PCBs (PCB CONGENERS) BY EPA METHOD 1668 C rev 11/9/2021



MARYLAND DEPARTMENT OF THE ENVIRONMENT
WATER AND SCIENCE ADMINISTRATION

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