PORTLAND HARBOR RI/FS

ROUND 2 MULTIPLATE INVERTEBRATE TISSUE DATA REPORT

APPENDIX A
DATA QUALITY SUMMARY

DRAFT

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June 12, 2006

Prepared for

The Lower Willamette Group

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LIST OF ACRONYMS

Axys	Axys Analytical Services, Ltd.
CAS	Columbia Analytical Services
DQOs	data quality objectives
EPA	U.S. Environmental Protection Agency
FSR	field sampling report
ICP/AES	inductively coupled plasma/atomic emission spectrometry
ICP/MS	inductively coupled plasma/mass spectrometry
LCS/LCSD	laboratory control sample / laboratory control sample duplicate
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike / matrix spike duplicate
OPR	ongoing precision and recovery
PARCC	precision, accuracy, representativeness, completeness, comparability
PCB	polychlorinated biphenyl
PCDD/Fs	polychlorinated dibenzo-p-dioxins/furans
QC	quality control
QAPP	quality assurance project plan
RDL	reported detection limit
RI/FS	remedial investigation and feasibility study

1. INTRODUCTION

This report summarizes the data quality of analyses performed on invertebrate multiplate tissue samples collected during Round 2 of the Portland Harbor remedial investigation and feasibility study (RI/FS). Samples were collected September 6-15, 2005. A detailed description of the Round 2 groundwater and sediment sampling is included in the Round 2 Sampling of Invertebrates Using Multiplate Samplers Field Sampling Report (FSR; Windward 2005).

Round 2 invertebrate multiplate tissue samples were analyzed for total solids, polychlorinated dibenzo-p-dioxin/furans (PCDD/Fs), PCDD/F homologs, metals, organochlorine pesticides, polychlorinated biphenyl (PCB) Aroclors, PCB congeners, PCB homologs, lipid content, and percent moisture. The Round 2 invertebrate multiplate tissue samples were analyzed according to the sample preparation and analytical procedures in the Round 2 Quality Assurance Project Plan (QAPP; Integral and Windward 2004), the Round 2 QAPP Addendum 5: Invertebrate Tissue Collection Using Multiplate Samplers (Integral 2005a), and its supplement (Integral 2005b). Deviations from the QAPP are noted in Section 3.3.3 of the main body of this report.

Total solids and metals analyses were conducted by Columbia Analytical Services (CAS; Kelso, WA), and analyses for PCB Aroclors, PCB congeners, PCB homologs, PCDD/Fs, PCDD/F homologs, organochlorine pesticides, lipid content, and percent moisture were completed by Axys Analytical Services Ltd. (Axys; Sidney, B.C., Canada). Round 2 invertebrate multiplate tissue samples were prepared and analyzed by methods detailed in Table A-1.

2. DATA QUALITY AND USABILITY

Data generated in the field and at the laboratories were verified and validated according to the criteria and procedures described in the Round 2 QAPP (Integral and Windward 2004). Data quality and usability were evaluated based on the results of the data validation and the data quality objectives (DQOs) for the Round 2 data. The performance criteria in the QAPP included project analytical goals for precision, accuracy, representativeness, completeness, and comparability (PARCC) of the Round 2 data.

The precision, accuracy, representativeness, and comparability of the data were assessed during data validation, as described in the *Data Validation* section below and in the Round 2 QAPP. Completeness is calculated by comparing the total number of acceptable data (non-rejected data) to the total number of data points generated. Completeness for the Round 2 multiplate tissue data is summarized by parameter group in Table A-2. Completeness was 100% overall, which exceeds the QAPP completeness objective of 95%.

2.1. DATA VALIDATION

Data validation was conducted as required by the Round 2 QAPP (Integral and Windward 2004) and is summarized in Section 3.2 of the main body of this report. The data validation subcontractor for the Round 2 multiplate tissue data was EcoChem, Inc. located in Seattle, WA. Data verification and validation was conducted in accordance with *Guidance on Environmental Data Verification and Validation* (EPA 2002a). Data verification and validation for organic compounds and metals/inorganics was completed according to methods described in the U.S. Environmental Protection Agency's (EPA) guidance for data review (EPA 1996, 1999b, 2002b). As required by the Round 2 QAPP (Integral and Windward 2004), approximately 10 percent of the Round 2 multiplate tissue data were fully validated, and the remaining data were subjected to Level 3 data validation, which includes the evaluation and assessment of the sample results and applicable quality control results reported by the laboratories. The following deliverables were reviewed during Level 3 and full data validation:

- The case narrative discussing analytical problems (if any) and procedures
- Chain-of-custody documentation and laboratory sample receipt logs
- Instrument calibration results
- Method blank results
- Results for laboratory quality control samples required by the referenced method including laboratory control sample/laboratory control sample duplicate (LCS/LCSD) analyses, matrix spike/matrix spike duplicate (MS/MSD) analyses, and surrogate recoveries

- Analytical results for the Round 2 multiplate tissue samples.

In addition to review and assessment of the documentation identified above, full validation included verification of reported concentrations of the results for field samples and quality control (QC) samples, verification of intermediate transcriptions, and review of instrument data, such as mass spectra, to verify analyte identification procedures. The EcoChem data validation reports are provided in Appendix B.

Data qualifiers were assigned during data validation if applicable control limits were not met, in accordance with the EPA data validation guidelines (EPA 1996, 1999b, 2002b) and the quality control requirements included in the referenced methods (EPA 2006). The quality control limits for surrogate spikes, matrix spike/matrix spike, laboratory control samples, and ongoing precision and recovery (OPR) for the laboratories are summarized in Tables A-3 and A-4. The data validation qualifiers and definitions are summarized in Table A-5. Data quality reports and a tabular summary of qualified data generated by EcoChem are included respectively, in Appendix B and Table 4-1 of the main body of this report.

2.2. DATA QUALITY

The EcoChem data validation reports (Appendix B) provide detailed information on the data quality issues and data validation qualifiers for each parameter group for each laboratory data package. A summary of the qualified data by parameter group, with the reasons for qualification, is included in Table A-6.

The discussion below includes a comparison of the reported detection limits to the detection limits specified in the Round 2 QAPP Addendum 5 (Integral 2005a) and its supplement (Integral 2005b), followed by a summary of the qualified data for each parameter group and any limitations to the usability of the data.

2.2.1. Reported Detection Limits

Sample data for Round 2 of the Portland Harbor RI/FS were reported to the method detection limit (MDL) in most cases. Sample-specific detection limits were reported for PCDD/Fs and PCB congeners, as specified in the method protocols (EPA methods 1613B and 1668A; EPA 1994, 1999a). These detection limits are based on the signal-to-noise ratio of the analytical system for each analyte and sample. In several cases, the MDL and method reporting limit (MRL) were elevated at the laboratory or during data validation because matrix interference or the presence of another analyte interfered with the quantification of a given analyte. MDLs and MRLs were also elevated when results were restated as undetected during data validation because of possible sample contamination, as indicated by the presence of target analytes in an associated method blank or equipment blank.

The reported detection limit (RDL) is the collective term for the detection limit or reporting limit used to quantify non-detects, as applicable to each sample and analyte. Table A-7 provides the MDLs included in the Round 2 QAPP Addendum 5 (Integral 2005a) and the minimum and maximum RDL attained by the laboratories for each analyte and sample type.

MDLs and MRLs listed in the Round 2 QAPP Addendum 5 (Integral 2005a) and its supplement (Integral 2005b) were based on inductively coupled plasma/mass spectrometry (ICP/MS) methodology (EPA Method 6020; EPA 2006). Results for aluminum and chromium had higher MDLs and MRLs than stated in QAPP Addendum 5 and its supplement, because they were analyzed by inductively coupled plasma/atomic emission spectrometry (ICP/AES) methodology (EPA Method 6010B; EPA 2006).

2.2.2. Field Quality Control Samples

Quality control samples were prepared in the field and at the laboratories to monitor the bias and precision of the sample collection and analysis procedures. Field QC samples for this study were limited to the collection of one rinse blank for sample processing equipment. Field splits were not collected due to the nature of the multiplate sample devices and the limited mass of invertebrate tissue that was collected from each sampler.

2.2.2.1. Summary of Qualified Data

Selected data not meeting the data quality criteria were qualified as undetected or estimated during validation, in accordance with the QAPP. A summary of the qualified data by parameter group, including the reasons for qualification, is included in Table A-6. Data qualified as undetected are usable for all intended purposes. Data qualified as estimated are usable for all intended purposes, with the knowledge that these data may be less precise or less accurate than unqualified data.

The precision and accuracy of the Round 2 multiplate tissue data was acceptable. The completeness of the Round 2 multiplate tissue data was 100% (see Table A-2). Overall, the data quality was good and will meet program objectives and goals for the RI/FS.

3. REFERENCES

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Integral and Windward. 2004. Portland Harbor RI/FS Round 2 Quality Assurance Project Plan. Prepared for the Lower Willamette Group, Portland, OR. Integral Consulting Inc., Mercer Island, WA.

Windward. 2005. Portland Harbor RI/FS Round 2 Sampling of Invertebrates using Multiplate Samplers Field Sampling Report. Prepared for the Lower Willamette Group, Portland, OR. Windward Environmental LLC, Seattle, WA.

Table A-1. Laboratory Methods for the Round 2 Multiplate Tissue Samples

Analytes	Laboratory	Sample Preparation		Quantitative Analysis	
		Protocol	Procedure	Protocol	Procedure
Total Solids	CAS	CAS SOP	Freeze dry	CAS SOP	Gravimetric
Metals	CAS				
Aluminum, chromium		EPA 3050B	Acid digestion	EPA 6010B	ICP/AES
Aluminum, antimony, arsenic, cadmium, chromium, copper, lead, nickel, selenium, silver, zinc		EPA 3050B	Acid digestion	EPA 6020	ICP/MS
Selenium		EPA 3050B/7742	Acid digestion/hydride generation	EPA 7742	AAS
Lipids	Axys	Axys SOP MLA-013 [a]	Soxhlet extraction	Axys SOP	Gravimetric
Percent Moisture	Axys	--	--	Axys SOP	Oven/Gravimetric
Chlorinated PCDD/Fs [b]	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography Carbon celite Layered silver nitrate/acid/base silica 1% deactivated basic alumina	Axys Method MLA-017/EPA 1613B	HRGC/HRMS
PCB Congeners [c]	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography Acid/base silica column 1% deactivated basic alumina	Axys Method MLA-010/EPA 1668A	HRGC/HRMS
Organochlorine Pesticides	Axys	Axys Method MLA-013 Rev 05	Soxhlet extraction Gel permeation chromatography Florisil® chromatography	Axys Method MLA-028 Rev 01	HRGC/HRMS

Notes:

[a] PCDD/Fs, PCBs, pesticides, and lipids analyzed from the same extract.
[b] Includes analyses for PCDD/F homologs.
[c] Includes all 209 congeners. Includes analyses for PCB congener homologs and PCB Aroclors.

AAS - atomic absorption spectrometry
CAS - Columbia Analytical Services
EPA - U.S. Environmental Protection Agency
HRGC/HRMS - high resolution gas chromatography/high resolution mass spectrometry
ICP/AES - inductively coupled plasma/atomic emission spectrometry
ICP/MS - inductively coupled plasma/mass spectrometry
PCB - polychlorinated biphenyl
SOP - standard operating procedure

Table A-2. Percent Completeness by Parameter Group.

Analysis	Total # of Data Points [a]	Number of Data Points		Completeness (%)
		Accepted	Rejected	
Conventionals [b]	2	2	0	100
PCDD/F homologs	70	70	0	100
PCDD/Fs	112	112	0	100
Metals	22	22	0	100
Organochlorine Pesticides	196	196	0	100
PCB Aroclors	49	49	0	100
PCB congener homologs	63	63	0	100
PCB congeners	1120	1120	0	100
Multiplate Tissue Sampling Project Total	**1634**	**1634**	**0**	**100**

Notes:

[a] Totals include field replicates and split samples and exclude field blanks.

[b] Includes total solids.

Table A-3. Laboratory Control Limits for Surrogate Recoveries in Round 2 Multiplate Tissue Samples.

Analysis	Surrogate Percent Recovery
PCDD/Fs	
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzofuran	28 - 143
^{13}C-1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	23 - 140
^{13}C-1,2,3,4,7,8,9-Heptachlorodibenzofuran	26 - 138
^{13}C-1,2,3,4,7,8-Hexachlorodibenzofuran	26 - 152
^{13}C-1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	32 - 141
^{13}C-1,2,3,6,7,8-Hexachlorodibenzofuran	26 - 123
^{13}C-1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	28 - 130
^{13}C-1,2,3,7,8,9-Hexachlorodibenzofuran	29 - 147
^{13}C-1,2,3,7,8-Pentachlorodibenzofuran	24 - 185
^{13}C-1,2,3,7,8-Pentachlorodibenzo-p-dioxin	25 - 181
^{13}C-2,3,4,6,7,8-Hexachlorodibenzofuran	28 - 136
^{13}C-2,3,4,7,8-Pentachlorodibenzofuran	21 - 178
^{13}C-2,3,7,8-Tetrachlorodibenzofuran	24 - 169
^{13}C-2,3,7,8-Tetrachlorodibenzo-p-dioxin	25 - 164
^{13}C-Octachlorodibenzo-p-dioxin	17 - 157
^{37}Cl-2,3,7,8-Tetrachlorodibenzo-p-dioxin	35 - 197
PCB Congeners	
^{13}C-2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,4',5-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',5,5',6,6'-Octachlorobiphenyl	25 - 150
^{13}C-2,2',3,3',5,5',6-Heptachlorobiphenyl	30 - 135
^{13}C-2,2',3,4,4',5,5'-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',3,4',5,6,6'-Heptachlorobiphenyl	25 - 150
^{13}C-2,2',4,4',6,6'-Hexachlorobiphenyl	25 - 150
^{13}C-2,2',4,6,6'-Pentachlorobiphenyl	25 - 150
^{13}C-2,2',6,6'-Tetrachlorobiphenyl	25 - 150
^{13}C-2,2',6-Trichlorobiphenyl	25 - 150
^{13}C-2,2'-Dichlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4',5,5',6-Octachlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4',5,5'-Heptachlorobiphenyl	25 - 150
^{13}C-2,3,3',4,4'-Pentachlorobiphenyl	25 - 150
^{13}C-2,3,3',5,5'-Pentachlorobiphenyl	30 - 135
^{13}C-2,3',4,4',5,5'-Hexachlorobiphenyl	25 - 150
^{13}C-2,3',4,4',5'-Pentachlorobiphenyl	25 - 150
^{13}C-2,3',4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-2,3,4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-2,4,4'-Trichlorobiphenyl	30 - 135
^{13}C-2-Chlorobiphenyl	15 - 150
^{13}C-3,3',4,4',5,5'-Hexachlorobiphenyl	25 - 150
^{13}C-3,3',4,4',5-Pentachlorobiphenyl	25 - 150
^{13}C-3,3',4,4'-Tetrachlorobiphenyl	25 - 150
^{13}C-3,4,4',5-Tetrachlorobiphenyl	25 - 150
^{13}C-3,4,4'-Trichlorobiphenyl	25 - 150
^{13}C-4,4'-Dichlorobiphenyl	25 - 150
^{13}C-4-Chlorobiphenyl	15 - 150
PCB156L & 157L	25 - 150

Table A-3. Laboratory Control Limits for Surrogate Recoveries in Round 2 Multiplate Tissue Samples.

Analysis	Surrogate Percent Recovery
Organochlorine Pesticides	
^{13}C-2,4'-DDE	40 - 150
^{13}C-2,4'-DDT	40 - 150
^{13}C-4,4'-DDE	40 - 150
^{13}C-4,4'-DDT	40 - 150
^{13}C-Aldrin	30 - 200
^{13}C-alpha-Endosulfan	30 - 150
^{13}C-beta-Endosulfan	30 - 150
^{13}C-beta-Hexachlorocyclohexane	30 - 150
^{13}C-cis-Nonachlor	40 - 150
^{13}C-delta-Hexachlorocyclohexane	30 - 150
^{13}C-Dieldrin	30 - 150
^{13}C-Endrin	30 - 150
^{13}C-gamma-Hexachlorocyclohexane	30 - 150
^{13}C-Heptachlor	30 - 150
^{13}C-Heptachlor epoxide	30 - 150
^{13}C-Methoxychlor	30 - 150
^{13}C-Oxychlordane	30 - 200
^{13}C-trans-Chlordane	30 - 150
^{13}C-trans-Nonachlor	30 - 150
^{13}C-1,2,3-Trichlorobenzene	20 - 130
^{13}C-Hexachlorobenzene	20 - 150

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
Metals		
Aluminum	-- [a]	18.2 - 31.9
Antimony	-- [a]	--
Arsenic	-- [a]	7.76 - 22.9
Cadmium	-- [a]	15 - 24
Chromium	-- [a]	23.4 - 48.2
Copper	-- [a]	1.74 - 38.6
Lead	-- [a]	0.02 - 0.437
Nickel	-- [a]	1.9 - 27
Selenium	-- [a]	5.26 - 9.05
Silver	-- [a]	0.9 - 1.52
Zinc	-- [a]	20.3 - 107
Conventionals		
Total solids	--	--
Organochlorine Pesticides		
2,4'-DDD	-- [b]	70 - 130
2,4'-DDE	-- [b]	70 - 130
2,4'-DDT	-- [b]	70 - 130
4,4'-DDD	-- [b]	70 - 130
4,4'-DDE	-- [b]	70 - 130
4,4'-DDT	-- [b]	70 - 130
Aldrin	-- [b]	70 - 130
alpha-Endosulfan	-- [b]	70 - 130
alpha-Hexachlorocyclohexane	-- [b]	70 - 130
beta-Endosulfan	-- [b]	70 - 130
beta-Hexachlorocyclohexane	-- [b]	70 - 130
cis-Chlordane	-- [b]	70 - 130
cis-Nonachlor	-- [b]	70 - 130
delta-Hexachlorocyclohexane	-- [b]	60 - 130
Dieldrin	-- [b]	60 - 130
Endosulfan sulfate	-- [b]	70 - 130
Endrin	-- [b]	60 - 130
Endrin aldehyde	-- [b]	50 - 130
Endrin ketone	-- [b]	60 - 130
gamma-Hexachlorocyclohexane	-- [b]	70 - 130
Heptachlor	-- [b]	70 - 130
Heptachlor epoxide	-- [b]	60 - 130
Methoxychlor	-- [b]	60 - 130
Oxychlordane	-- [b]	70 - 130
trans-Chlordane	-- [b]	70 - 130
trans-Nonachlor	-- [b]	70 - 130
Hexachlorobenzene	-- [b]	70 - 130
Hexachlorobutadiene	-- [b]	--
PCDD/F homologs		
Heptachlorodibenzofuran homologs	-- [b]	--
Heptachlorodibenzo-p-dioxin homologs	-- [b]	--
Hexachlorodibenzofuran homologs	-- [b]	--
Hexachlorodibenzo-p-dioxin homologs	-- [b]	--
Octachlorodibenzofuran	-- [b]	63 - 170
Octachlorodibenzo-p-dioxin	-- [b]	78 - 144
Pentachlorodibenzofuran homologs	-- [b]	--

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
Pentachlorodibenzo-p-dioxin homologs	-- [b]	--
Tetrachlorodibenzofuran homologs	-- [b]	--
Tetrachlorodibenzo-p-dioxin homologs	-- [b]	--
PCDD/Fs		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	-- [b]	82 - 122
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	-- [b]	70 - 140
1,2,3,4,7,8,9-Heptachlorodibenzofuran	-- [b]	78 - 138
1,2,3,4,7,8-Hexachlorodibenzofuran	-- [b]	72 - 134
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	-- [b]	70 - 164
1,2,3,6,7,8-Hexachlorodibenzofuran	-- [b]	84 - 130
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	-- [b]	76 - 134
1,2,3,7,8,9-Hexachlorodibenzofuran	-- [b]	78 - 130
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	-- [b]	64 - 162
1,2,3,7,8-Pentachlorodibenzofuran	-- [b]	80 - 134
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	-- [b]	70 - 142
2,3,4,6,7,8-Hexachlorodibenzofuran	-- [b]	70 - 156
2,3,4,7,8-Pentachlorodibenzofuran	-- [b]	68 - 160
2,3,7,8-Tetrachlorodibenzofuran	-- [b]	75 - 158
2,3,7,8-Tetrachlorodibenzo-p-dioxin	-- [b]	67 - 158
PCB homologs		
Dichlorobiphenyl	-- [b]	--
Heptachlorobiphenyl	-- [b]	--
Hexachlorobiphenyl	-- [b]	--
Monochlorobiphenyl	-- [b]	--
Nonachlorobiphenyl	-- [b]	--
Octachlorobiphenyl	-- [b]	--
Pentachlorobiphenyl	-- [b]	--
Tetrachlorobiphenyl	-- [b]	--
Trichlorobiphenyl	-- [b]	--
PCB congeners		
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5,6-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,4',5-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',4,5,5'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	-- [b]	--
2,2',3,3',4,5',6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5',6-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,5'-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',4,6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',4,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',4,6-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',4-Pentachlorobiphenyl	-- [b]	--
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	-- [b]	50 - 150
2,2',3,3',5,5',6-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',5,5'-Hexachlorobiphenyl	-- [b]	--

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
2,2',3,3',5,6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,3',6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,3',6-Pentachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,5',6-Octachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,4,4',5,6-Heptachlorobiphenyl	-- [b]	--
2,2',3,4,4',5-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,4',6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,4',5,5',6-Heptachlorobiphenyl	-- [b]	--
2,2',3,4',5,5'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,5,5'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4',5,6,6'-Heptachlorobiphenyl	-- [b]	50 - 150
2,2',3,4,5,6,6'-Heptachlorobiphenyl	-- [b]	--
2,2',3,4',5,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,5',6-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,5,6-Hexachlorobiphenyl	-- [b]	--
2,2',3,4',6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,4,6'-Pentachlorobiphenyl	-- [b]	--
2,2',3,4'-Tetrachlorobiphenyl	-- [b]	--
2,2',3,5,5'-Pentachlorobiphenyl	-- [b]	--
2,2',3,5,6,6'-Hexachlorobiphenyl	-- [b]	--
2,2',3,5,6'-Pentachlorobiphenyl	-- [b]	--
2,2',3,5-Tetrachlorobiphenyl	-- [b]	--
2,2',3,6,6'-Pentachlorobiphenyl	-- [b]	--
2,2',3,6'-Tetrachlorobiphenyl	-- [b]	--
2,2',3-Trichlorobiphenyl	-- [b]	--
2,2',4,4',6,6'-Hexachlorobiphenyl	-- [b]	50 - 150
2,2',4,5',6-Pentachlorobiphenyl	-- [b]	--
2,2',4,5-Tetrachlorobiphenyl	-- [b]	--
2,2',4,6,6'-Pentachlorobiphenyl	-- [b]	50 - 150
2,2',4-Trichlorobiphenyl	-- [b]	--
2,2',5,5'-Tetrachlorobiphenyl	-- [b]	--
2,2',6,6'-Tetrachlorobiphenyl	-- [b]	50 - 150
2,2',6-Trichlorobiphenyl	-- [b]	50 - 150
2,2'-Dichlorobiphenyl	-- [b]	50 - 150
2,3,3',4,4',5,5',6-Octachlorobiphenyl	-- [b]	50 - 150
2,3,3',4,4',5,5'-Heptachlorobiphenyl	-- [b]	50 - 150
2,3,3',4,4',5',6-Heptachlorobiphenyl	-- [b]	--
2,3,3',4,4',5,6-Heptachlorobiphenyl	-- [b]	--
2,3,3',4,4',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',4,4'-Pentachlorobiphenyl	-- [b]	50 - 150
2,3,3',4,5,5',6-Heptachlorobiphenyl	-- [b]	--
2,3,3',4',5,5'-Hexachlorobiphenyl	-- [b]	--
2,3,3',4,5,5'-Hexachlorobiphenyl	-- [b]	--
2,3,3',4',5',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',4,5',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',4',5'-Pentachlorobiphenyl	-- [b]	--
2,3,3',4,5-Pentachlorobiphenyl	-- [b]	--
2,3,3',4,6-Pentachlorobiphenyl	-- [b]	--
2,3,3',4'-Tetrachlorobiphenyl	-- [b]	--
2,3,3',4-Tetrachlorobiphenyl	-- [b]	--

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
2,3,3',5,5',6-Hexachlorobiphenyl	-- [b]	--
2,3,3',5,5'-Pentachlorobiphenyl	-- [b]	--
2,3,3',5,6-Pentachlorobiphenyl	-- [b]	--
2,3,3',5'-Tetrachlorobiphenyl	-- [b]	--
2,3,3',5-Tetrachlorobiphenyl	-- [b]	--
2,3',4,4',5,5'-Hexachlorobiphenyl	-- [b]	50 - 150
2,3',4,4',5'-Pentachlorobiphenyl	-- [b]	50 - 150
2,3',4,4',5-Pentachlorobiphenyl	-- [b]	50 - 150
2,3,4,4',5-Pentachlorobiphenyl	-- [b]	50 - 150
2,3',4,4'-Tetrachlorobiphenyl	-- [b]	--
2,3,4,4'-Tetrachlorobiphenyl	-- [b]	--
2,3',4,5,5'-Pentachlorobiphenyl	-- [b]	--
2,3',4,5',6-Pentachlorobiphenyl	-- [b]	--
2,3',4,5'-Tetrachlorobiphenyl	-- [b]	--
2,3',4,5-Tetrachlorobiphenyl	-- [b]	--
2,3,4',5-Tetrachlorobiphenyl	-- [b]	--
2,3,4',6-Tetrachlorobiphenyl	-- [b]	--
2,3',4-Trichlorobiphenyl	-- [b]	--
2,3,4'-Trichlorobiphenyl	-- [b]	--
2,3',5,5'-Tetrachlorobiphenyl	-- [b]	--
2,3',5',6-Tetrachlorobiphenyl	-- [b]	--
2,3',5'-Trichlorobiphenyl	-- [b]	--
2,3,5-Trichlorobiphenyl	-- [b]	--
2,3',6-Trichlorobiphenyl	-- [b]	--
2,3,6-Trichlorobiphenyl	-- [b]	--
2,3'-Dichlorobiphenyl	-- [b]	--
2,3-Dichlorobiphenyl	-- [b]	--
2,4',5-Trichlorobiphenyl	-- [b]	--
2,4',6-Trichlorobiphenyl	-- [b]	--
2,4'-Dichlorobiphenyl	-- [b]	--
2,4-Dichlorobiphenyl	-- [b]	--
2,5-Dichlorobiphenyl	-- [b]	--
2,6-Dichlorobiphenyl	-- [b]	--
2-Chlorobiphenyl	-- [b]	50 - 150
3,3',4,4',5,5'-Hexachlorobiphenyl	-- [b]	50 - 150
3,3',4,4',5-Pentachlorobiphenyl	-- [b]	50 - 150
3,3',4,4'-Tetrachlorobiphenyl	-- [b]	50 - 150
3,3',4,5,5'-Pentachlorobiphenyl	-- [b]	--
3,3',4,5'-Tetrachlorobiphenyl	-- [b]	--
3,3',4,5-Tetrachlorobiphenyl	-- [b]	--
3,3',4-Trichlorobiphenyl	-- [b]	--
3,3',5,5'-Tetrachlorobiphenyl	-- [b]	--
3,3',5-Trichlorobiphenyl	-- [b]	--
3,3'-Dichlorobiphenyl	-- [b]	--
3,4,4',5-Tetrachlorobiphenyl	-- [b]	50 - 150
3,4,4'-Trichlorobiphenyl	-- [b]	50 - 150
3,4',5-Trichlorobiphenyl	-- [b]	--
3,4,5-Trichlorobiphenyl	-- [b]	--
3,5-Dichlorobiphenyl	-- [b]	--
3-Chlorobiphenyl	-- [b]	--
4,4'-Dichlorobiphenyl	-- [b]	50 - 150
4-Chlorobiphenyl	-- [b]	50 - 150

Table A-4. Laboratory Control Limits for Multiplate Tissue Matrix Spike and Laboratory Control Samples.

Analysis	Matrix Spike Recovery (percent)	Laboratory Control Sample Recovery (percent)
PCB012 & 013	-- [b]	--
PCB018 & 030	-- [b]	--
PCB020 & 028	-- [b]	--
PCB021 & 033	-- [b]	--
PCB026 & 029	-- [b]	--
PCB040 & 041 & 071	-- [b]	--
PCB044 & 047 & 065	-- [b]	--
PCB045 & 051	-- [b]	--
PCB049 & 069	-- [b]	--
PCB050 & 053	-- [b]	--
PCB059 & 062 & 075	-- [b]	--
PCB061 & 070 & 074 & 076	-- [b]	--
PCB083 & 099	-- [b]	--
PCB085 & 116 & 117	-- [b]	--
PCB086 & 087 & 097 & 108 & 119 & 125	-- [b]	--
PCB088 & 091	-- [b]	--
PCB090 & 101 & 113	-- [b]	--
PCB093 & 095 & 098 & 100 & 102	-- [b]	--
PCB107 & 124	-- [b]	--
PCB110 & 115	-- [b]	--
PCB128 & 166	-- [b]	--
PCB129 & 138 & 160 & 163	-- [b]	--
PCB134 & 143	-- [b]	--
PCB135 & 151 & 154	-- [b]	--
PCB139 & 140	-- [b]	--
PCB147 & 149	-- [b]	--
PCB153 & 168	-- [b]	--
PCB156 & 157	-- [b]	50 - 150
PCB171 & 173	-- [b]	--
PCB180 & 193	-- [b]	--
PCB183 & 185	-- [b]	--
PCB197 & 200	-- [b]	--
PCB198 & 199	-- [b]	--
Polychlorinated biphenyls	-- [b]	--
PCB Aroclors		
Aroclor 1016	-- [b]	--
Aroclor 1221	-- [b]	--
Aroclor 1232	-- [b]	--
Aroclor 1242	-- [b]	--
Aroclor 1248	-- [b]	--
Aroclor 1254	-- [b]	--
Aroclor 1260	-- [b]	--

Notes:

[a] Insufficient sample to perform a MS/MSD analysis; CAS analyzed an SRM in duplicate for metals.

[b] MS/MSD samples were not analyzed for organics due to insufficient sample size; laboratory control samples and blank spike samples were analyzed.

Table A-5. Data Validation Qualifiers and Definitions.

Data Qualifier	Definition
U	The material was analyzed for, but was not detected. The associated numerical value is the sample quantitation limit.
J	The associated numerical value is an estimated quantity.
NJ	Presumptive evidence of the presence of the material at an estimated quantity.
UJ	The material was analyzed for, but was not detected. The sample quantitation limit is an estimated quantity.
T	The associated numerical value was mathematically derived (e.g., from summing multiple analyte results such as Aroclors, or calculating the average of multiple results for a single analyte). Also indicates all results that are selected for reporting in preference to other available results (e.g., for parameters reported by multiple methods) for the Round 2 data.

Table A-6. Summary of Qualified Data by Parameter Group for Round 2 Multiplate Tissue Samples.

Analyte Group	Number of Samples [a]	Number of Data Points		Total # of Data Points	Detection and Qualification Frequencies (percent)		Reason for Qualification
		Detected	Undetected				
Conventionals	2	2	0	2	100	detected	
					0	undetected	
Metals	2	21	1	22	95	detected	
					5	undetected	
					41	J	Other, ICP %D
PCB Aroclors	7	17	32	49	35	detected	
					65	undetected	
					35	NJ	Other
Organochlorine Pesticides	7	148	48	196	76	detected	
					24	undetected	
					2	J	HT/SP
					4	UJ	Cal-I, Cal-C
					17	U	IAR
PCB Homologs	7	63	0	63	100	detected	
					0	undetected	
PCB congeners	7	974	146	1120	87	detected	
					13	undetected	
					4	U	IAR
PCDD/F Homologs	7	68	2	70	97	detected	
					3	undetected	
PCDD/Fs	7	71	41	112	63	detected	
					37	undetected	
					24	U	LB, IAR

Notes:

[a] Includes replicates and splits, excludes field blanks.

Cal-C - calibration (continuing)
Cal-I - calibration (initial)
HT/SP - holding time/sample preservation
IAR - ion abundance ratio criteria not met
ICP %D - ICP serial dilution % difference
LB - lab blank contamination (e.g., method blank, instrument, etc.)
Other - defined in validation reports

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
Metals							
Aluminum	7429-90-5	mg/kg	0.06	0.5	0.5	2	--
Antimony	7440-36-0	mg/kg	0.0016	0.001	0.0011	2	1
Arsenic	7440-38-2	mg/kg	0.006	0.006	0.007	2	--
Cadmium	7440-43-9	mg/kg	0.0012	0.0005	0.0005	2	--
Chromium	7440-47-3	mg/kg	0.1	0.04	0.04	2	--
Copper	7440-50-8	mg/kg	0.018	0.003	0.003	2	--
Lead	7439-92-1	mg/kg	0.0014	0.003	0.003	2	--
Nickel	7440-02-0	mg/kg	0.006	0.013	0.013	2	--
Selenium	7782-49-2	mg/kg	0.2	0.01	0.01	2	--
Silver	7440-22-4	mg/kg	0.0008	0.0003	0.0003	2	--
Zinc	7440-66-6	mg/kg	0.012	0.009	0.009	2	--
Conventionals							
Total solids	TSO	percent	--	--	--	2	--
Organochlorine Pesticides							
2,4'-DDD	53-19-0	µg/kg	--	0.00268	0.0725	7	--
2,4'-DDE	3424-82-6	µg/kg	--	0.0012	0.0126	7	--
2,4'-DDT	789-02-6	µg/kg	--	0.00373	0.0374	7	2
4,4'-DDD	72-54-8	µg/kg	--	0.00306	0.0968	7	--
4,4'-DDE	72-55-9	µg/kg	--	0.00168	0.0157	7	--
4,4'-DDT	50-29-3	µg/kg	--	0.00427	0.043	7	--
Aldrin	309-00-2	µg/kg	--	0.000364	0.0128	7	1
alpha-Endosulfan	959-98-8	µg/kg	--	0.00558	0.137	7	1
alpha-Hexachlorocyclohexane	319-84-6	µg/kg	--	0.00112	0.0178	7	3
beta-Endosulfan	33213-65-9	µg/kg	--	0.00739	0.156	7	4
beta-Hexachlorocyclohexane	319-85-7	µg/kg	--	0.002	0.0268	7	4
cis-Chlordane	5103-71-9	µg/kg	--	0.00185	0.0117	7	--
cis-Nonachlor	5103-73-1	µg/kg	--	0.00198	0.0112	7	--
delta-Hexachlorocyclohexane	319-86-8	µg/kg	--	0.00185	0.0174	7	4
Dieldrin	60-57-1	µg/kg	--	0.00162	0.0132	7	--
Endosulfan sulfate	1031-07-8	µg/kg	--	0.00617	0.067	7	2
Endrin	72-20-8	µg/kg	--	0.00263	0.146	7	2
Endrin aldehyde	7421-93-4	µg/kg	--	0.00551	0.109	7	2
Endrin ketone	53494-70-5	µg/kg	--	0.00324	0.228	7	2
gamma-Hexachlorocyclohexane	58-89-9	µg/kg	--	0.00184	0.0192	7	3
Heptachlor	76-44-8	µg/kg	--	0.000624	0.00606	7	4

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
Heptachlor epoxide	1024-57-3	µg/kg	--	0.000623	0.015	7	1
Methoxychlor	72-43-5	µg/kg	--	0.00635	0.109	7	3
Oxychlordane	27304-13-8	µg/kg	--	0.00278	0.0682	7	3
trans-Chlordane	5103-74-2	µg/kg	--	0.00162	0.0103	7	--
trans-Nonachlor	39765-80-5	µg/kg	--	0.00201	0.012	7	--
Hexachlorobenzene	118-74-1	µg/kg	--	0.000136	0.00129	7	--
Hexachlorobutadiene	87-68-3	µg/kg	--	0.006	0.063	7	7
PCB Homologs							
Dichlorobiphenyl	25512-42-9	pg/g	0.24 - 6.68	0.382	3.4	7	--
Heptachlorobiphenyl	28655-71-2	pg/g	0.24 - 6.68	0.763	6.79	7	--
Hexachlorobiphenyl	26601-64-9	pg/g	0.24 - 6.68	0.739	15.9	7	--
Monochlorobiphenyl	27323-18-8	pg/g	0.24 - 6.68	0.0628	0.552	7	--
Nonachlorobiphenyl	53742-07-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
Octachlorobiphenyl	55722-26-4	pg/g	0.24 - 6.68	0.109	8.22	7	--
Pentachlorobiphenyl	25429-29-2	pg/g	0.24 - 6.68	0.52	4.12	7	--
Tetrachlorobiphenyl	26914-33-0	pg/g	0.24 - 6.68	1.08	9.59	7	--
Trichlorobiphenyl	25323-68-6	pg/g	0.24 - 6.68	0.292	3.57	7	--
PCB congeners							
2,2',3,3',4,4',5,5',6,6'-Decachlorobiphenyl	2051-24-3	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,5',6-Nonachlorobiphenyl	40186-72-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,5'-Octachlorobiphenyl	35694-08-7	pg/g	0.24 - 6.68	0.0969	1.51	7	--
2,2',3,3',4,4',5,6,6'-Nonachlorobiphenyl	52663-79-3	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,6'-Octachlorobiphenyl	42740-50-1	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,4',5,6-Octachlorobiphenyl	52663-78-2	pg/g	0.24 - 6.68	0.109	1.61	7	--
2,2',3,3',4,4',5-Heptachlorobiphenyl	35065-30-6	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5,5',6,6'-Nonachlorobiphenyl	52663-77-1	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5,5'-Heptachlorobiphenyl	52663-74-8	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5',6,6'-Octachlorobiphenyl	40186-71-8	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5',6'-Heptachlorobiphenyl	52663-70-4	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5',6-Heptachlorobiphenyl	40186-70-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5,6'-Heptachlorobiphenyl	38411-25-5	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,5'-Hexachlorobiphenyl	52663-66-8	pg/g	0.24 - 6.68	0.339	3.44	7	--
2,2',3,3',4,6,6'-Heptachlorobiphenyl	52663-65-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',4,6'-Hexachlorobiphenyl	38380-05-1	pg/g	0.24 - 6.68	0.348	3.2	7	--
2,2',3,3',4,6-Hexachlorobiphenyl	61798-70-7	pg/g	0.24 - 6.68	0.334	3.17	7	--
2,2',3,3',4-Pentachlorobiphenyl	52663-62-4	pg/g	0.24 - 6.68	0.356	79.3	7	1
2,2',3,3',5,5',6,6'-Octachlorobiphenyl	2136-99-4	pg/g	0.24 - 6.68	0.0369	0.329	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
2,2',3,3',5,5',6-Heptachlorobiphenyl	52663-67-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',5,5'-Hexachlorobiphenyl	35694-04-3	pg/g	0.24 - 6.68	0.318	3.07	7	--
2,2',3,3',5,6,6'-Heptachlorobiphenyl	52663-64-6	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',6,6'-Hexachlorobiphenyl	38411-22-2	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,3',6-Pentachlorobiphenyl	52663-60-2	pg/g	0.24 - 6.68	0.339	1	7	--
2,2',3,4,4',5,5',6-Octachlorobiphenyl	52663-76-0	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,4',5,6,6'-Octachlorobiphenyl	74472-52-9	pg/g	0.24 - 6.68	0.108	8.22	7	7
2,2',3,4,4',5,6'-Heptachlorobiphenyl	60145-23-5	pg/g	0.24 - 6.68	0.0369	4.02	7	1
2,2',3,4,4',5,6-Heptachlorobiphenyl	74472-47-2	pg/g	0.24 - 6.68	0.0369	4.25	7	1
2,2',3,4,4',5-Hexachlorobiphenyl	35694-06-5	pg/g	0.24 - 6.68	0.307	3.06	7	--
2,2',3,4,4',6,6'-Heptachlorobiphenyl	74472-48-3	pg/g	0.24 - 6.68	0.0369	1.11	7	2
2,2',3,4',5,5',6-Heptachlorobiphenyl	52663-68-0	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4',5,5'-Hexachlorobiphenyl	51908-16-8	pg/g	0.24 - 6.68	0.275	2.64	7	--
2,2',3,4,5,5'-Hexachlorobiphenyl	52712-04-6	pg/g	0.24 - 6.68	0.301	3.01	7	--
2,2',3,4',5,6,6'-Heptachlorobiphenyl	74487-85-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,5,6,6'-Heptachlorobiphenyl	74472-49-4	pg/g	0.24 - 6.68	0.0468	2.92	7	6
2,2',3,4',5,6'-Hexachlorobiphenyl	74472-41-6	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,5',6-Hexachlorobiphenyl	68194-14-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,5,6-Hexachlorobiphenyl	41411-61-4	pg/g	0.24 - 6.68	0.403	3.02	7	7
2,2',3,4',6,6'-Hexachlorobiphenyl	68194-08-1	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,4,6,6'-Hexachlorobiphenyl	74472-40-5	pg/g	0.24 - 6.68	0.0384	1.28	7	5
2,2',3,4,6'-Pentachlorobiphenyl	73575-57-2	pg/g	0.24 - 6.68	0.324	1.91	7	1
2,2',3,4'-Tetrachlorobiphenyl	36559-22-5	pg/g	0.24 - 6.68	0.0432	0.67	7	--
2,2',3,5,5'-Pentachlorobiphenyl	52663-61-3	pg/g	0.24 - 6.68	0.31	0.901	7	--
2,2',3,5,6,6'-Hexachlorobiphenyl	68194-09-2	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,5,6'-Pentachlorobiphenyl	73575-55-0	pg/g	0.24 - 6.68	0.326	0.969	7	--
2,2',3,5-Tetrachlorobiphenyl	70362-46-8	pg/g	0.24 - 6.68	0.0473	7.74	7	1
2,2',3,6,6'-Pentachlorobiphenyl	73575-54-9	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',3,6'-Tetrachlorobiphenyl	41464-47-5	pg/g	0.24 - 6.68	0.0476	0.721	7	--
2,2',3-Trichlorobiphenyl	38444-78-9	pg/g	0.24 - 6.68	0.0426	0.329	7	--
2,2',4,4',6,6'-Hexachlorobiphenyl	33979-03-2	pg/g	0.24 - 6.68	0.0369	1.99	7	2
2,2',4,5',6-Pentachlorobiphenyl	60145-21-3	pg/g	0.24 - 6.68	0.268	0.793	7	--
2,2',4,5-Tetrachlorobiphenyl	70362-47-9	pg/g	0.24 - 6.68	0.0417	0.647	7	--
2,2',4,6,6'-Pentachlorobiphenyl	56558-16-8	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,2',4-Trichlorobiphenyl	37680-66-3	pg/g	0.24 - 6.68	0.0373	0.329	7	--
2,2',5,5'-Tetrachlorobiphenyl	35693-99-3	pg/g	0.24 - 6.68	0.0382	0.595	7	--
2,2',6,6'-Tetrachlorobiphenyl	15968-05-5	pg/g	0.24 - 6.68	0.038	0.621	7	--
2,2',6-Trichlorobiphenyl	38444-73-4	pg/g	0.24 - 6.68	0.0518	0.446	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
2,2'-Dichlorobiphenyl	13029-08-8	pg/g	0.24 - 6.68	0.225	1.74	7	--
2,3,3',4,4',5,5',6-Octachlorobiphenyl	74472-53-0	pg/g	0.24 - 6.68	0.089	1.33	7	--
2,3,3',4,4',5,5'-Heptachlorobiphenyl	39635-31-9	pg/g	0.33	0.122	18.7	7	1
2,3,3',4,4',5',6-Heptachlorobiphenyl	74472-50-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,3,3',4,4',5,6-Heptachlorobiphenyl	41411-64-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,3,3',4,4',6-Hexachlorobiphenyl	74472-42-7	pg/g	0.24 - 6.68	0.217	2.11	7	--
2,3,3',4,4'-Pentachlorobiphenyl	32598-14-4	pg/g	0.36	0.262	1.59	7	--
2,3,3',4,5,5',6-Heptachlorobiphenyl	74472-51-8	pg/g	0.24 - 6.68	0.763	6.79	7	7
2,3,3',4',5,5'-Hexachlorobiphenyl	39635-34-2	pg/g	0.24 - 6.68	0.304	8.47	7	3
2,3,3',4,5,5'-Hexachlorobiphenyl	39635-35-3	pg/g	0.24 - 6.68	0.231	2.4	7	--
2,3,3',4',5',6-Hexachlorobiphenyl	74472-45-0	pg/g	0.24 - 6.68	0.237	2.3	7	--
2,3,3',4,5',6-Hexachlorobiphenyl	74472-43-8	pg/g	0.24 - 6.68	0.404	3.06	7	7
2,3,3',4',5'-Pentachlorobiphenyl	76842-07-4	pg/g	0.24 - 6.68	0.336	10.4	7	2
2,3,3',4,5-Pentachlorobiphenyl	70424-69-0	pg/g	0.24 - 6.68	0.382	3.3	7	6
2,3,3',4,6-Pentachlorobiphenyl	74472-35-8	pg/g	0.24 - 6.68	0.278	1.56	7	--
2,3,3',4'-Tetrachlorobiphenyl	41464-43-1	pg/g	0.24 - 6.68	0.653	1.66	7	--
2,3,3',4-Tetrachlorobiphenyl	74338-24-2	pg/g	0.24 - 6.68	0.985	8.78	7	7
2,3,3',5,5',6-Hexachlorobiphenyl	74472-46-1	pg/g	0.24 - 6.68	0.256	2.52	7	--
2,3,3',5,5'-Pentachlorobiphenyl	39635-32-0	pg/g	0.24 - 6.68	0.237	5.48	7	3
2,3,3',5,6-Pentachlorobiphenyl	74472-36-9	pg/g	0.24 - 6.68	0.339	2.89	7	6
2,3,3',5'-Tetrachlorobiphenyl	41464-49-7	pg/g	0.24 - 6.68	0.617	3.01	7	2
2,3,3',5-Tetrachlorobiphenyl	70424-67-8	pg/g	0.24 - 6.68	0.603	4.21	7	2
2,3',4,4',5,5'-Hexachlorobiphenyl	52663-72-6	pg/g	0.29	0.231	2.27	7	--
2,3',4,4',5'-Pentachlorobiphenyl	65510-44-3	pg/g	0.68	0.267	11.7	7	1
2,3',4,4',5-Pentachlorobiphenyl	31508-00-6	pg/g	0.40	0.264	1.47	7	--
2,3,4,4',5-Pentachlorobiphenyl	74472-37-0	pg/g	0.33	0.256	1.42	7	--
2,3',4,4'-Tetrachlorobiphenyl	32598-10-0	pg/g	0.24 - 6.68	0.597	1.51	7	--
2,3,4,4'-Tetrachlorobiphenyl	33025-41-1	pg/g	0.24 - 6.68	0.652	1.7	7	--
2,3',4,5,5'-Pentachlorobiphenyl	68194-12-7	pg/g	0.24 - 6.68	0.227	0.661	7	--
2,3',4,5',6-Pentachlorobiphenyl	56558-18-0	pg/g	0.24 - 6.68	0.232	1.46	7	1
2,3',4,5'-Tetrachlorobiphenyl	73575-52-7	pg/g	0.24 - 6.68	0.582	1.47	7	--
2,3',4,5-Tetrachlorobiphenyl	73575-53-8	pg/g	0.24 - 6.68	0.534	1.36	7	--
2,3,4',5-Tetrachlorobiphenyl	74472-34-7	pg/g	0.24 - 6.68	0.579	1.49	7	--
2,3,4',6-Tetrachlorobiphenyl	52663-58-8	pg/g	0.24 - 6.68	0.0369	0.472	7	--
2,3',4-Trichlorobiphenyl	55712-37-3	pg/g	0.24 - 6.68	0.157	0.496	7	--
2,3,4'-Trichlorobiphenyl	38444-85-8	pg/g	0.24 - 6.68	0.195	0.61	7	--
2,3',5,5'-Tetrachlorobiphenyl	41464-42-0	pg/g	0.24 - 6.68	0.578	1.55	7	--
2,3',5',6-Tetrachlorobiphenyl	74338-23-1	pg/g	0.24 - 6.68	0.0369	0.869	7	1

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
2,3',5'-Trichlorobiphenyl	37680-68-5	pg/g	0.24 - 6.68	0.18	0.545	7	--
2,3,5-Trichlorobiphenyl	55720-44-0	pg/g	0.24 - 6.68	0.182	3.57	7	3
2,3',6-Trichlorobiphenyl	38444-76-7	pg/g	0.24 - 6.68	0.0369	0.329	7	--
2,3,6-Trichlorobiphenyl	55702-45-9	pg/g	0.24 - 6.68	0.0369	0.847	7	1
2,3'-Dichlorobiphenyl	25569-80-6	pg/g	0.24 - 6.68	0.128	0.974	7	--
2,3-Dichlorobiphenyl	16605-91-7	pg/g	0.24 - 6.68	0.149	1.13	7	--
2,4',5-Trichlorobiphenyl	16606-02-3	pg/g	0.24 - 6.68	0.166	0.508	7	--
2,4',6-Trichlorobiphenyl	38444-77-8	pg/g	0.24 - 6.68	0.17	0.524	7	--
2,4'-Dichlorobiphenyl	34883-43-7	pg/g	0.24 - 6.68	0.12	0.914	7	--
2,4-Dichlorobiphenyl	33284-50-3	pg/g	0.24 - 6.68	0.136	1.04	7	--
2,5-Dichlorobiphenyl	34883-39-1	pg/g	0.24 - 6.68	0.129	0.979	7	--
2,6-Dichlorobiphenyl	33146-45-1	pg/g	0.24 - 6.68	0.13	0.986	7	--
2-Chlorobiphenyl	2051-60-7	pg/g	0.24 - 6.68	0.058	0.528	7	--
3,3',4,4',5,5'-Hexachlorobiphenyl	32774-16-6	pg/g	0.37	0.678	15.9	7	7
3,3',4,4',5-Pentachlorobiphenyl	57465-28-8	pg/g	0.45	0.293	6.55	7	2
3,3',4,4'-Tetrachlorobiphenyl	32598-13-3	pg/g	0.38	0.622	1.59	7	--
3,3',4,5,5'-Pentachlorobiphenyl	39635-33-1	pg/g	0.24 - 6.68	0.463	4.12	7	6
3,3',4,5'-Tetrachlorobiphenyl	41464-48-6	pg/g	0.24 - 6.68	0.541	1.47	7	--
3,3',4,5-Tetrachlorobiphenyl	70362-49-1	pg/g	0.24 - 6.68	0.786	5.53	7	7
3,3',4-Trichlorobiphenyl	37680-69-6	pg/g	0.24 - 6.68	0.201	4	7	1
3,3',5,5'-Tetrachlorobiphenyl	33284-52-5	pg/g	0.24 - 6.68	1.08	9.59	7	7
3,3',5-Trichlorobiphenyl	38444-87-0	pg/g	0.24 - 6.68	0.263	1.12	7	4
3,3'-Dichlorobiphenyl	2050-67-1	pg/g	0.24 - 6.68	0.139	1.06	7	--
3,4,4',5-Tetrachlorobiphenyl	70362-50-4	pg/g	0.34	1.66	5.14	7	7
3,4,4'-Trichlorobiphenyl	38444-90-5	pg/g	0.24 - 6.68	0.163	0.538	7	--
3,4',5-Trichlorobiphenyl	38444-88-1	pg/g	0.24 - 6.68	0.257	1.59	7	3
3,4,5-Trichlorobiphenyl	53555-66-1	pg/g	0.24 - 6.68	0.306	2.65	7	7
3,5-Dichlorobiphenyl	34883-41-5	pg/g	0.24 - 6.68	0.382	3.4	7	7
3-Chlorobiphenyl	2051-61-8	pg/g	0.24 - 6.68	0.0622	0.502	7	--
4,4'-Dichlorobiphenyl	2050-68-2	pg/g	0.24 - 6.68	0.139	1.05	7	--
4-Chlorobiphenyl	2051-62-9	pg/g	0.24 - 6.68	0.0628	0.552	7	--
PCB012 & 013	PCB012_013	pg/g	0.24 - 6.68	0.141	1.07	7	--
PCB018 & 030	PCB018_030	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB020 & 028	PCB020_028	pg/g	0.24 - 6.68	0.175	0.54	7	--
PCB021 & 033	PCB021_033	pg/g	0.24 - 6.68	0.172	0.542	7	--
PCB026 & 029	PCB026_029	pg/g	0.24 - 6.68	0.175	0.543	7	--
PCB040 & 041 & 071	PCB040_041_071	pg/g	0.24 - 6.68	0.0419	0.647	7	--
PCB044 & 047 & 065	PCB044_047_065	pg/g	0.24 - 6.68	0.0372	0.574	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
PCB045 & 051	PCB045_051	pg/g	0.24 - 6.68	0.0416	0.638	7	--
PCB049 & 069	PCB049_069	pg/g	0.24 - 6.68	0.0369	0.549	7	--
PCB050 & 053	PCB050_053	pg/g	0.24 - 6.68	0.04	0.605	7	--
PCB059 & 062 & 075	PCB059_062_075	pg/g	0.24 - 6.68	0.0369	0.476	7	--
PCB061 & 070 & 074 & 076	PCB061_070_074_	pg/g	0.24 - 6.68	0.594	1.51	7	--
PCB083 & 099	PCB083_099	pg/g	0.24 - 6.68	0.313	0.912	7	--
PCB085 & 116 & 117	PCB085_116_117	pg/g	0.24 - 6.68	0.26	0.757	7	--
PCB086 & 087 & 097 & 108 & 119 & 125	PCB086_087_097_	pg/g	0.24 - 6.68	0.265	0.773	7	--
PCB088 & 091	PCB088_091	pg/g	0.24 - 6.68	0.3	0.886	7	--
PCB090 & 101 & 113	PCB090_101_113	pg/g	0.24 - 6.68	0.268	0.779	7	--
PCB093 & 095 & 098 & 100 & 102	PCB093_095_098_	pg/g	0.24 - 6.68	0.29	0.86	7	--
PCB107 & 124	PCB107_124	pg/g	0.24 - 6.68	0.323	1.7	7	--
PCB110 & 115	PCB110_115	pg/g	0.24 - 6.68	0.233	0.678	7	--
PCB128 & 166	PCB128_166	pg/g	0.24 - 6.68	0.276	2.78	7	--
PCB129 & 138 & 160 & 163	PCB129_138_160_	pg/g	0.24 - 6.68	0.275	2.75	7	--
PCB134 & 143	PCB134_143	pg/g	0.24 - 6.68	0.322	3.07	7	--
PCB135 & 151 & 154	PCB135_151_154	pg/g	0.24 - 6.68	0.0369	3.23	7	1
PCB139 & 140	PCB139_140	pg/g	0.24 - 6.68	0.291	2.72	7	--
PCB147 & 149	PCB147_149	pg/g	0.24 - 6.68	0.0562	2.65	7	--
PCB153 & 168	PCB153_168	pg/g	0.24 - 6.68	0.241	2.37	7	--
PCB156 & 157	PCB156_157	pg/g	0.42	0.285	2.98	7	--
PCB171 & 173	PCB171_173	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB180 & 193	PCB180_193	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB183 & 185	PCB183_185	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB197 & 200	PCB197_200	pg/g	0.24 - 6.68	0.0369	0.329	7	--
PCB198 & 199	PCB198_199	pg/g	0.24 - 6.68	0.0369	0.329	7	--
Polychlorinated biphenyls	1336-36-3	pg/g	0.24 - 6.68	--	--	7	--
PCDD/Fs							
Heptachlorodibenzofuran homologs	38998-75-3	pg/g	--	0.0369	0.329	7	--
Heptachlorodibenzo-p-dioxin homologs	37871-00-4	pg/g	--	0.0369	0.329	7	--
Hexachlorodibenzofuran homologs	55684-94-1	pg/g	--	0.0369	0.329	7	--
Hexachlorodibenzo-p-dioxin homologs	34465-46-8	pg/g	--	0.0369	0.329	7	--
Octachlorodibenzofuran	39001-02-0	pg/g	0.41	0.0369	0.329	7	--
Octachlorodibenzo-p-dioxin	3268-87-9	pg/g	0.73	0.0369	0.329	7	--
Pentachlorodibenzofuran homologs	30402-15-4	pg/g	--	0.0369	0.329	7	--
Pentachlorodibenzo-p-dioxin homologs	36088-22-9	pg/g	--	0.0369	0.672	7	2
Tetrachlorodibenzofuran homologs	30402-14-3	pg/g	--	0.0369	0.329	7	--
Tetrachlorodibenzo-p-dioxin homologs	41903-57-5	pg/g	--	0.0369	0.329	7	--

Table A-7. Reported Detection Limits for Round 2 Multiplate Tissue Samples.

Analyte	CAS Number	Units	Round 2 QAPP MDL	Reported Detection Limits		Total # Data Points	# Undetected Results
				Minimum	Maximum		
1,2,3,4,6,7,8-Heptachlorodibenzofuran	67562-39-4	pg/g	0.1	0.0369	0.329	7	--
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	35822-46-9	pg/g	0.16	0.0369	0.329	7	--
1,2,3,4,7,8,9-Heptachlorodibenzofuran	55673-89-7	pg/g	0.12	0.038	0.757	7	3
1,2,3,4,7,8-Hexachlorodibenzofuran	70648-26-9	pg/g	0.09	0.038	0.625	7	2
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	39227-28-6	pg/g	0.14	0.0369	0.95	7	2
1,2,3,6,7,8-Hexachlorodibenzofuran	57117-44-9	pg/g	0.08	0.0369	0.537	7	2
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	57653-85-7	pg/g	0.09	0.0369	0.329	7	--
1,2,3,7,8,9-Hexachlorodibenzofuran	72918-21-9	pg/g	0.12	0.0489	0.761	7	7
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	19408-74-3	pg/g	0.08	0.0369	0.555	7	3
1,2,3,7,8-Pentachlorodibenzofuran	57117-41-6	pg/g	0.12	0.0369	0.779	7	2
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	40321-76-4	pg/g	0.1	0.0369	0.672	7	3
2,3,4,6,7,8-Hexachlorodibenzofuran	60851-34-5	pg/g	0.1	0.063	0.331	7	7
2,3,4,7,8-Pentachlorodibenzofuran	57117-31-4	pg/g	0.09	0.0468	0.329	7	3
2,3,7,8-Tetrachlorodibenzofuran	51207-31-9	pg/g	0.03	0.0369	0.341	14	3
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1746-01-6	pg/g	0.03	0.0369	0.329	7	4
PCB Aroclors							
Aroclor 1016	12674-11-2	pg/g	0.24 - 6.68	0.532	2.47	7	7
Aroclor 1221	11104-28-2	pg/g	0.24 - 6.68	0.168	1.28	7	7
Aroclor 1232	11141-16-5	pg/g	0.24 - 6.68	0.214	1.88	7	7
Aroclor 1242	53469-21-9	pg/g	0.24 - 6.68	0.591	2.74	7	4
Aroclor 1248	12672-29-6	pg/g	0.24 - 6.68	3.64	9.2	7	3
Aroclor 1254	11097-69-1	pg/g	0.24 - 6.68	2.51	7.3	7	4
Aroclor 1260	11096-82-5	pg/g	0.24 - 6.68	0.185	1.64	7	--