REPORT

PCB Database Pilot Project

Spokane River Regional Toxics Task Force

February 2019

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Section 1
Project Background

The Spokane River Regional Toxics Task Force (SRRTTF) is currently leading efforts to find and reduce PCBs in the Spokane River. The first stage of such an endeavor is the collection of high-quality analytical data on the 209 congeners that constitute PCBs. The SRRTTF did not have a comprehensive database application to load, compile, evaluate, and summarize the large quantities of data generated to date (and those that will continue to be collected). Data is received from multiple labs using different methodologies and submitted in different formats. Data on air, water, wastewater, sediments, and fish tissues needs to be managed. Maintaining a robust quality assurance and control (QA/QC) strategy for the data is also important. The overall goal of the proposed project is to develop a comprehensive data management plan and application for managing PCB data, including options for public access to the data.

Based on initial evaluations, it was determined that the best approach for handling the Spokane River PCB data is to develop a modified version of the DRBC PCB database application for the SRRTTF's use. After this determination, CDM Smith developed a draft database application that was reviewed with SRRTTF Task Force. The draft application was then finalized to incorporate comments from SRRTTF members. Prior to the development of the draft database, CDM Smith prepared a technical memorandum titled "PCB Data Compatibility/Database Functionality Review – Findings and Recommendations" which summarized our review of existing data and needs for the database functionality.

Section 2

Existing Data and Functionality Review

A review of representative datasets provided by SRRTTF shows that the data is in 5 different formats. Fortunately, 3 of those data sets are from Axys laboratory, who have the capability to submit the EDDs in the preferred format. Pacific Rim and EIM EDDs will need a fair amount of work to convert them into database-friendly formats. After review of the formats, CDM Smith highly recommended conference calls and discussions with each laboratory to establish EDD protocol for future data and to investigate EDD resubmissions of existing data. SRRTTF was able to negotiate with Axys and obtain task force data in the required format and load them into the PCB Database application that was developed.

The SRRTTF sample data indicate much lower levels of total PCBs than in DRBC data. As a result, the quality of method blank and rinsate blank data becomes crucial for proper data evaluation. CDM Smith recommended that SRRTTF develop robust acceptability criteria for blanks. This will also help develop a better blank correction tool.

Evaluation and compilation of PCB data to support implementation of the SRRTTF Comprehensive Plan will benefit from tabular and graphical data summaries. Capabilities to export the appropriate data to GIS programs and tabular summaries for data analysis are critical components of the PCB database application. Reports should include summaries by homolog and total PCBs. In addition, both spatial and temporal data summaries are required to thoroughly evaluate the data.

Modifications to the existing DRBC PCB database primarily include the addition of tables to store non-chemical fish tissue data; addition of other chemical data such as TDS, TSS, TOC, DOC etc.; addition of criteria selection forms; and automation of tabular summary reports and simplification of data export features.

DRBC staff using the current PCB database were proficient in the use of Microsoft Access. As a result, most of the reporting was done via custom-built queries and data exports. To make the PCB database more user-friendly and meet the needs of SRRTTF members, the following modifications were recommended:

- Add a fish tissue table to store taxonomy and other non-chemical related fish data
- Add a form for automated blank correction reporting method
- Add report summarizing method blank/rinsate blank (MB/RB) acceptability
- Add criteria selection forms and summary table reports for PCB data
- Add ability to export homolog and fish tissue data for generating spatial GIS reports
- Add ability to generate PCB data summaries by river zones

- Add other non-PCB parameters such as dissolved organic carbon (DOC), total organic carbon (TOC), total suspended solids (TSS), and total dissolved solids (TDS) to the master parameter table so that related data can be imported and reported

The existing data review and database functionality discussion was summarized in the May 2017 Technical memorandum titled "PCB Data Compatibility/Database Functionality Review – Findings and Recommendations". This memorandum is included in Appendix A. These recommendations were used to develop the current Microsoft Access database application.

Section 3
Reporting Tools

Based on review of the existing data and functionality required, several tabular and graphical reports were developed for the PCB database application. Figure 3-1 displays the reporting options that were developed. To simplify the report generation process, a user-friendly report criteria selection form was utilized. Figure 3-2 shows the selection form for the reports. The criteria that needs to be specified for each report is different based on the type of report and are built into the form. This section provides a brief description of each report.

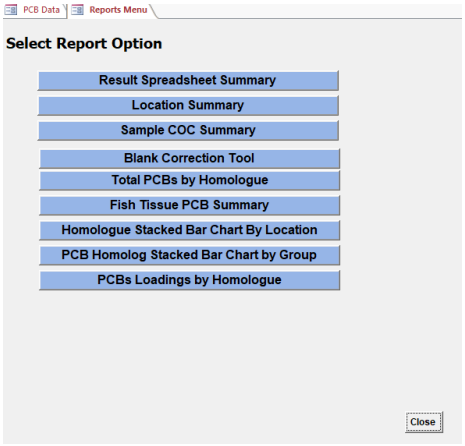


Figure 3-1
Report Options

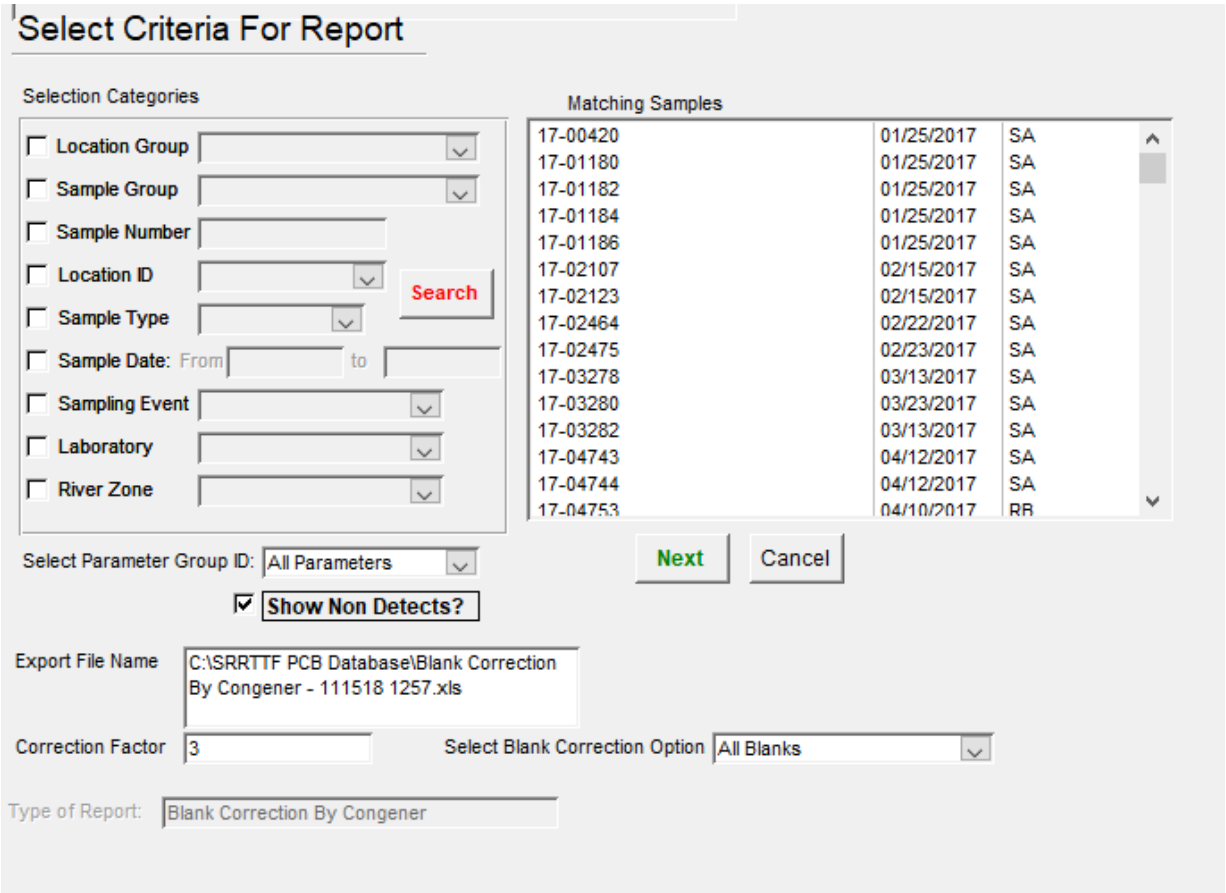


Figure 3-2
Report Criteria Selection Screen

3.1 Result Spreadsheet Summary

The result spreadsheet summary option generates an Excel spreadsheet that includes the sample location, sample date and lab sample number along with the raw data that was received from the laboratory. This report provides a detailed view into the PCB data and can be used to verify the accuracy of other data summary reports. Since this is a display of raw data, no blank correction options are available for this report. The sections below highlight the blank correction options that are available for the other reports in the database application. Figure 3-3 shows a sample output of the report.

Uncorrected Analytical Data								
Location								
Sample Date			WA0002447-016		WA0002447-016		WA0002447-021	
Sample Number			1/25/2017		2/22/2017		2/15/2017	
Parameter Name (Units)			17-01184		17-02464		17-02123	
2-Chlorobiphenyl (ng/l)	mono	1	0.0	NJ	0.0276		0.0224	
3-Chlorobiphenyl (ng/l)	mono	2	0.0482		0.0	UJ	0.0	UJ
4-Chlorobiphenyl (ng/l)	mono	3	0.0768		0.0281		0.0	UJ
2,2'-Dichlorobiphenyl (ng/l)	di	4	0.123		0.0	UJ	0.0	UJ
2,3-Dichlorobiphenyl (ng/l)	di	5	0.413		0.139		0.129	
2,3'-Dichlorobiphenyl (ng/l)	di	6	0.114		0.0	UJ	0.0	UJ
2,4-Dichlorobiphenyl (ng/l)	di	7	0.0	UJ	0.0	UJ	0.0	UJ
2,5-Dichlorobiphenyl (ng/l)	di	9	0.0	UJ	0.0	UJ	0.0	UJ
2,6-Dichlorobiphenyl (ng/l)	di	10	0.0	UJ	0.0	UJ	0.0	UJ
3,3'-Dichlorobiphenyl (ng/l)	di	11	2.4		0.967		0.448	
3,4-Dichlorobiphenyl (ng/l)	di	12	0.0	UJ	0.0	UJ	0.0	UJ
3,5-Dichlorobiphenyl (ng/l)	di	14	0.0	UJ	0.0	UJ	0.0	UJ
4,4'-Dichlorobiphenyl (ng/l)	di	15	0.172		0.0531		0.0338	
2,2',3-Trichlorobiphenyl (ng/l)	tri	16	0.156		0.207		0.0	U
2,2',4-Trichlorobiphenyl (ng/l)	tri	17	0.0432		0.134		0.0	U
2,2',5-Trichlorobiphenyl (ng/l)	tri	18	0.191		0.284		0.0	U
2,2',6-Trichlorobiphenyl (ng/l)	tri	19	0.0	U	0.0	UJ	0.0	U
2,3,3'-Trichlorobiphenyl (ng/l)	tri	20	0.464		0.109		0.0	UJ
2,3,4-Trichlorobiphenyl (ng/l)	tri	21	0.0	UJ	0.0	UJ	0.0	UJ
2,3,4'-Trichlorobiphenyl (ng/l)	tri	22	0.292		0.0	UJ	0.0	UJ
2,3,5-Trichlorobiphenyl (ng/l)	tri	23	0.0	UJ	0.0	UJ	0.0	UJ
2,3,6-Trichlorobiphenyl (ng/l)	tri	24	0.0	U	0.0	UJ	0.0	U
2,3',4-Trichlorobiphenyl (ng/l)	tri	25	0.0	NJ	0.0	UJ	0.0	UJ
2,3',5-Trichlorobiphenyl (ng/l)	tri	26	0.0907		0.0	UJ	0.0	UJ
2,3',6-Trichlorobiphenyl (ng/l)	tri	27	0.0	UJ	0.0	UJ	0.0	U
2,4,4'-Trichlorobiphenyl (ng/l)	tri	28	0.587		0.35		0.0	NJ
2,4,5-Trichlorobiphenyl (ng/l)	tri	29	0.0	UJ	0.0	UJ	0.0	UJ
2,4,6-Trichlorobiphenyl (ng/l)	tri	30	0.0	UJ	0.0	UJ	0.0	U
2,4',5-Trichlorobiphenyl (ng/l)	tri	31	0.641		0.332		0.0	NJ
2,4',6-Trichlorobiphenyl (ng/l)	tri	32	0.321		0.0	UJ	0.0	U
2,3',5'-Trichlorobiphenyl (ng/l)	tri	34	0.0	UJ	0.0	UJ	0.0	UJ
3,3',4-Trichlorobiphenyl (ng/l)	tri	35	0.0	NJ	0.0	UJ	0.0	UJ

Figure 3-3
Result Spreadsheet Summary

3.2 Location Summary

The Location summary generates a table that lists monitoring locations that have been added to the PCB database as shown in Figure 3-4 (provided at the end of this section).

3.3 Sample COC Summary

The Sample COC summary generates a table that lists details of samples that have been collected and added to the PCB database as shown in Figure 3-5 (provided at the end of this section).

3.4 Blank Correction Tool

When the blank correction tool option is selected in the reporting menu, the selection form allows users to select the type of blank (method, rinsate, field or trip) or all blanks and the correction factor to use (e.g. 3 s or 5 x) . A sample of the report is shown in Figure 3-6 (provided at the end of this section). Based on these criteria, the report displays corrected concentrations. If a specific blank type is selected, concentrations for that blank are used. If all blanks option is selected, then the maximum concentration from among the blanks is used for comparison. The selected concentration times the correction factor is calculated and provides the total to compare value. If a sample concentration is greater than the total to compare, then the concentration is used for analysis. Otherwise, a concentration value of 0 is used.

3.5 Total PCBs by Homologue

This report summarizes total PCB concentrations (Corrected or uncorrected, based on blank selection). Figure 3-7 (provided at the end of this section) shows a sample report.

3.6 Fish Tissue PCB Summary

This report will summarize PCB concentrations as well as other related data for fish tissue samples collected at various sample locations. This report will be finalized during the next phase of the project.

3.7 Homologue Stacked Bar Chart by Location

This report generates a stacked bar chart for a selected location that displays total PCBs by homologue. Figure 3-8 shows an example of this report.

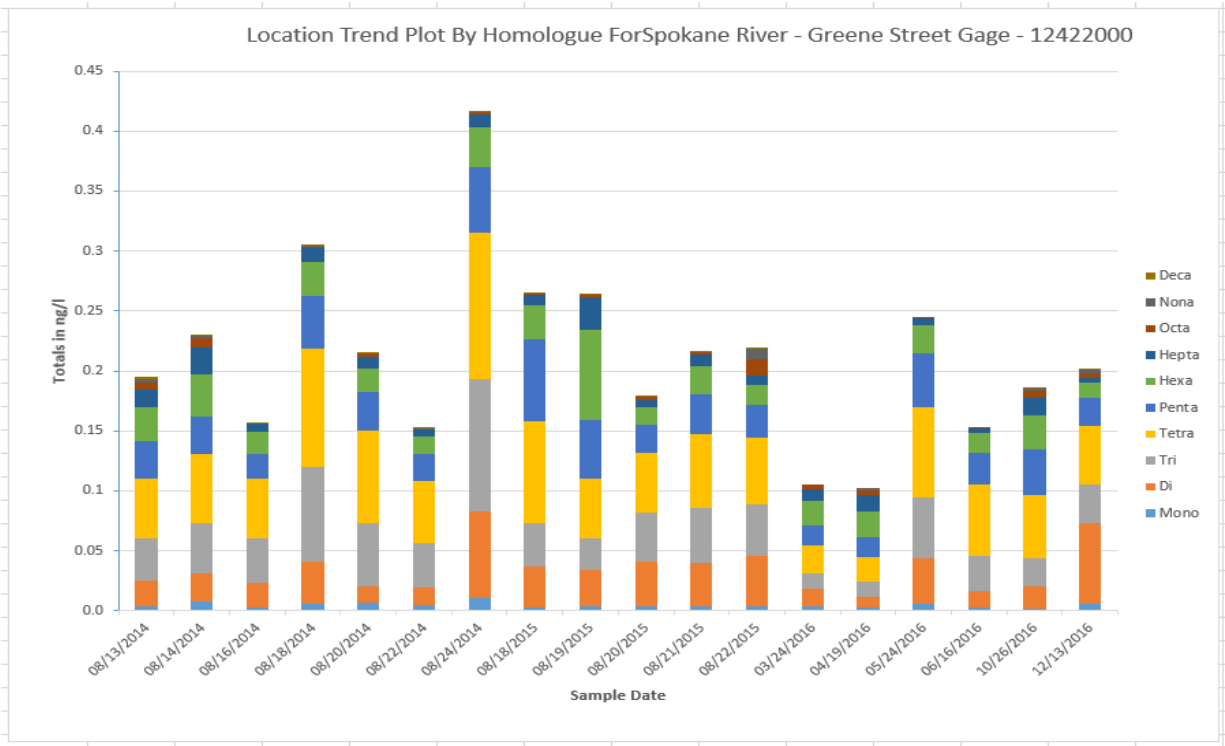


Figure 3-8
Homologue Stacked Bar Chart by Location

3.8 PCB Homologue Stacked Bar Chart by Location Group

This report generates a stacked bar chart for a selected group of locations that displays total PCBs by homologue. Figure 3-9 shows an example of this report.

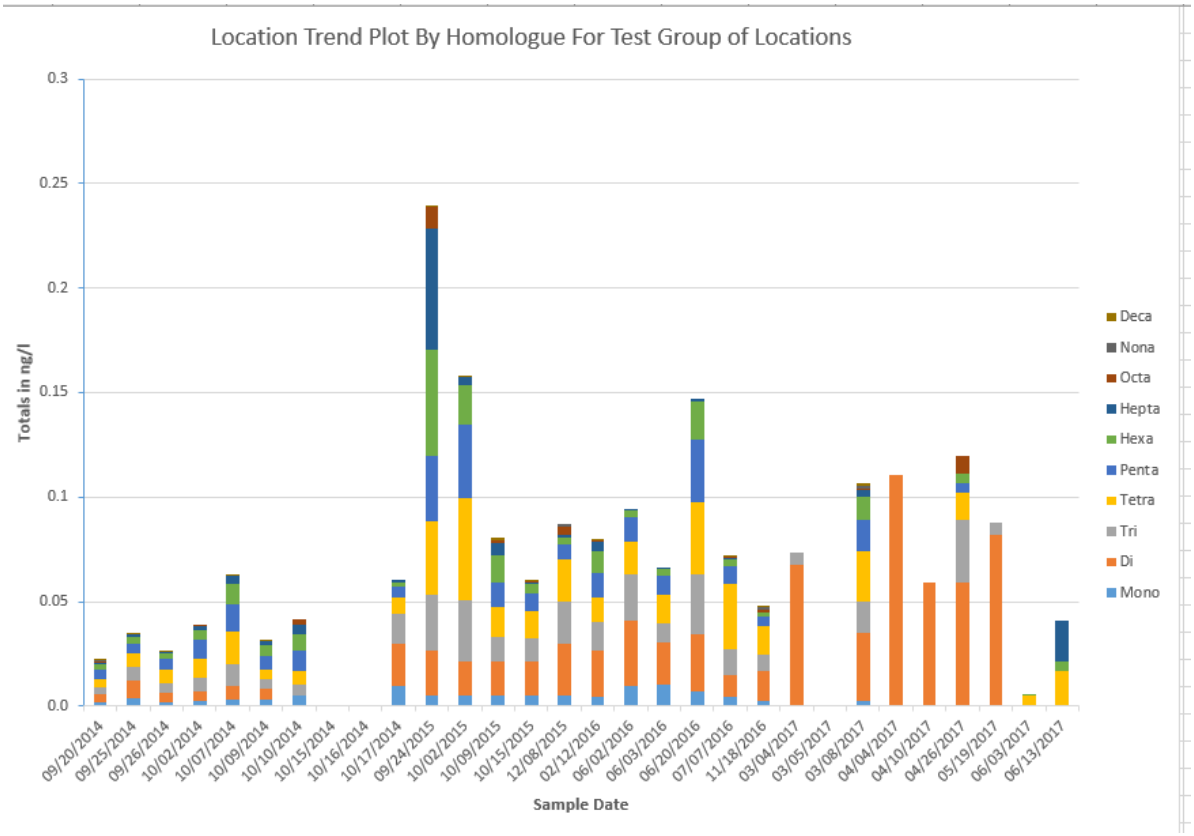
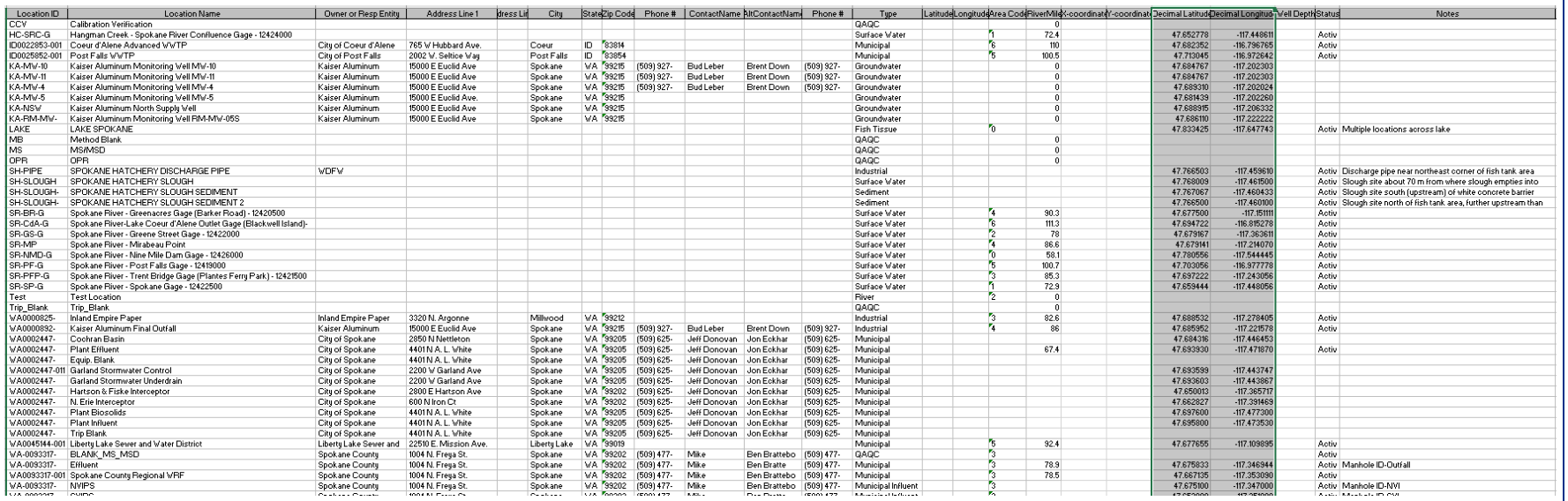


Figure 3-9
Homologue Stacked Bar Chart by Location Group

3.9 PCB Loadings by Homologue

When flow data is entered for a sample, this report calculates loadings in lbs/day and summarizes them for selected samples. Figure 3-10 (provided at the end of this section) shows an example of this report.



Location ID	Location Name	Owner or Resp Entity	Address Line 1	dress Lir	City	State	Zip Code	Phone #	ContactName	AltContactNam	Phone #	Type	Latitude	Longitude	Area Code	FiverMile	X-coordinate	Y-coordinate	Decimal Latitude	Decimal Longitu	Well Depth	Status	Notes
CCV	Calibration Verification											QAQC				0							
HC-SRC-G	Hangman Creek - Spokane River Confluence Gage - 12424000											Surface Water			1	72.4			47.652778	-117.448611		Activ	
ID0022853-001	Coeur d'Alene Advanced WWTP	City of Coeur d'Alene	765 W Hubbard Ave.		Coeur	ID	83814					Municipal			6	110			47.682352	-116.796765		Activ	
ID0025852-001	Post Falls WWTP	City of Post Falls	2002 W. Seltice Way		Post Falls	ID	83854					Municipal			5	100.5			47.713045	-116.972642		Activ	
KA-MW-10	Kaiser Aluminum Monitoring Well MW-10	Kaiser Aluminum	15000 E Euclid Ave		Spokane	WA	99215	(509) 927-	Bud Leber	Brent Down	(509) 927-	Groundwater				0			47.684767	-117.202303			
KA-MW-11	Kaiser Aluminum Monitoring Well MW-11	Kaiser Aluminum	15000 E Euclid Ave		Spokane	WA	99215	(509) 927-	Bud Leber	Brent Down	(509) 927-	Groundwater				0			47.684767	-117.202303			
KA-MW-4	Kaiser Aluminum Monitoring Well MW-4	Kaiser Aluminum	15000 E Euclid Ave		Spokane	WA	99215	(509) 927-	Bud Leber	Brent Down	(509) 927-	Groundwater				0			47.689310	-117.202024			
KA-MW-5	Kaiser Aluminum Monitoring Well MW-5	Kaiser Aluminum	15000 E Euclid Ave.		Spokane	WA	99215					Groundwater				0			47.681439	-117.202260			
KA-NSW	Kaiser Aluminum North Supply Well	Kaiser Aluminum	15000 E Euclid Ave		Spokane	WA	99215					Groundwater				0			47.688915	-117.206332			
KA-RIM-MW-	Kaiser Aluminum Monitoring Well RIM-MW-05S	Kaiser Aluminum	15000 E Euclid Ave		Spokane	WA	99215					Groundwater				0			47.686110	-117.222222			
LAKE	LAKE SPOKANE											Fish Tissue			0				47.833425	-117.647743		Activ	Multiple locations across lake
MB	Method Blank											QAQC				0							
MS	MS/MSD											QAQC				0							
OPR	OPR											QAQC				0							
SH-PIPE	SPOKANE HATCHERY DISCHARGE PIPE	WDFW										Industrial							47.766503	-117.459610		Activ	Discharge pipe near northeast corner of fish tank area
SH-SLOUGH	SPOKANE HATCHERY SLOUGH											Surface Water							47.768009	-117.461500		Activ	Slough site about 70 m from where slough empties into
SH-SLOUGH-	SPOKANE HATCHERY SLOUGH SEDIMENT											Sediment							47.767067	-117.460433		Activ	Slough site south (upstream) of white concrete barrier
SH-SLOUGH-	SPOKANE HATCHERY SLOUGH SEDIMENT 2											Sediment							47.766500	-117.460100		Activ	Slough site north of fish tank area, further upstream than
SR-BR-G	Spokane River - Greenacres Gage (Barker Road) - 12420500											Surface Water			4	90.3			47.677500	-117.151111		Activ	
SR-CdA-G	Spokane River-Lake Coeur d'Alene Outlet Gage (Blackwell Island)-											Surface Water			6	111.3			47.694722	-116.815278		Activ	
SR-GS-G	Spokane River - Greene Street Gage - 12422000											Surface Water			2	79			47.67967	-117.363611		Activ	
SR-MP	Spokane River - Mirabeau Point											Surface Water			4	86.6			47.67941	-117.234070		Activ	
SR-NMD-G	Spokane River - Nine Mile Dam Gage - 12426000											Surface Water			0	58.1			47.780556	-117.544445		Activ	
SR-PF-G	Spokane River - Post Falls Gage - 12419000											Surface Water			5	100.7			47.703056	-116.977778		Activ	
SR-PFP-G	Spokane River - Trent Bridge Gage (Plantes Ferry Park) - 12421500											Surface Water			3	85.3			47.697222	-117.243056		Activ	
SR-SP-G	Spokane River - Spokane Gage - 12422500											Surface Water			1	72.9			47.659444	-117.448056		Activ	
Test	Test Location											River			2	0							
Trip_Blank	Trip_Blank											QAQC				0							
WA0000825-	Inland Empire Paper	Inland Empire Paper	3320 N. Argonne		Millwood	WA	99212					Industrial			3	82.6			47.688532	-117.278405		Activ	
WA0000892-	Kaiser Aluminum Final Outfall	Kaiser Aluminum	15000 E Euclid Ave		Spokane	WA	99215	(509) 927-	Bud Leber	Brent Down	(509) 927-	Industrial			4	86			47.685952	-117.221578		Activ	
WA0002447-	Cochran Basin	City of Spokane	2850 N Nettleton		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.684316	-117.446453			
WA0002447-	Plant Effluent	City of Spokane	4401 N A. L. White		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal				67.4			47.693930	-117.471870		Activ	
WA0002447-	Equip. Blank	City of Spokane	4401 N A. L. White		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal											
WA0002447-011	Garland Stormwater Control	City of Spokane	2200 W Garland Ave		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.693599	-117.443747			
WA0002447-	Garland Stormwater Underdrain	City of Spokane	2200 W Garland Ave		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.693603	-117.443967			
WA0002447-	Hartson & Fiske Interceptor	City of Spokane	2800 E Hartson Ave		Spokane	WA	99202	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.650013	-117.365717			
WA0002447-	N. Erie Interceptor	City of Spokane	600 N Iron Ct		Spokane	WA	99202	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.662827	-117.391469			
WA0002447-	Plant Biosolids	City of Spokane	4401 N A. L. White		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.697600	-117.477300			
WA0002447-	Plant Influent	City of Spokane	4401 N A. L. White		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal							47.695800	-117.473530			
WA0002447-	Trip Blank	City of Spokane	4401 N A. L. White		Spokane	WA	99205	(509) 625-	Jeff Donovan	Jon Eckhar	(509) 625-	Municipal											
WA0045144-001	Liberty Lake Sewer and Water District	Liberty Lake Sewer and	22510 E. Mission Ave.		Liberty Lake	WA	99019					Municipal			5	92.4			47.677655	-117.109895		Activ	
WA-0093317-	BLANK_MS_MSD	Spokane County	1004 N. Freya St.		Spokane	WA	99202	(509) 477-	Mike	Ben Brattebo	(509) 477-	QAQC			3								
WA-0093317-	Effluent	Spokane County	1004 N. Freya St.		Spokane	WA	99202	(509) 477-	Mike	Ben Bratte	(509) 477-	Municipal			3	78.9			47.675833	-117.346944		Activ	Manhole ID-Outfall
WA0093317-001	Spokane County Regional WRF	Spokane County	1004 N. Freya St.		Spokane	WA	99202	(509) 477-	Mike	Ben Brattebo	(509) 477-	Municipal			3	78.5			47.667135	-117.353090		Activ	
WA-0093317-	NVIPS	Spokane County	1004 N. Freya St.		Spokane	WA	99202	(509) 477-	Mike	Ben Brattebo	(509) 477-	Municipal Influent			3				47.675100	-117.347000		Activ	Manhole ID-NVI

Figure 3-4
Location Summary

Location ID	Location Name	ClientSampleNumber	Database Sample #	ample Da	Sample Time	Collect	ample Typ	VeatherCategor	SampleMatrix	ampleSpeciesTaxo	xonCommonNa	Sampler	ler's Affil	mpling Eve	lysisreques	teSentToLa
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-081314-1805	SR4-081314-1805	08/13/2	6:05:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/14/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-081414-1645	SR4-081414-1645	08/14/2	4:45:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/18/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-081614-1230	SR4-081614-1230	08/16/2	12:30:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/18/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-081814-1240	SR4-081814-1240	08/18/2	12:40:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/18/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-082014-1220	SR4-082014-1220	08/20/2	12:20:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/20/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-082214-1345	SR4-082214-1345	08/22/2	1:45:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/25/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-082414-1305	SR4-082414-1305	08/24/2	1:05:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/25/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-Composite	SR4-Composite	08/24/2	12:00:00 PM	Grab	SA	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	8/25/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-081815-1826	SR4-081815-1826	08/18/2	6:26:00 PM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	8/24/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-081915-0928	SR4-081915-0928	08/19/2	9:28:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	8/24/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-082015-1410	SR4-082015-1410	08/20/2	2:10:00 PM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	8/24/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-082115-0949	SR4-082115-0949	08/21/2	9:49:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	8/24/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-082215-1127	SR4-082215-1127	08/22/2	11:27:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	8/24/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-032416-1145	SR4-032416-1145	03/24/2	11:45:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	3/28/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-041916-1030	SR4-041916-1030	04/19/2	10:30:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	4/19/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-052416-1030	SR4-052416-1030	05/24/2	10:30:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	4/19/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-061616-0945	SR4-061616-0945	06/16/2	9:45:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	6/16/201
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-102616-1120	SR4-102616-1120	10/26/2	11:20:00 AM	G	SA	WW	Water (Whole)			Jeff Schut	Gravity		1668C	10/27/20
SR-GS-G	Spokane River - Greene Street Gage - 12422000	SR4-121316-1125	SR4-121316-1125	12/13/2	11:25:00 AM	G	SA	DW	Water (Whole)			Jeff Schut	Gravity		1668C	12/13/20
SR-GS-G	Spokane River - Greene Street Gage - 12422000	Replicate 5	Replicate 5	08/18/2	12:40:00 PM	G	DUP	DW	Water (Whole)			Chris Behnke	LimnoTe		1668C	
SR-GS-G	Spokane River - Greene Street Gage - 12422000	Dup1-052416-1040	Dup1-052416-1040	05/24/2	10:40:00 AM	G	DUP	DW	Water (Whole)			Jeff Schut	Gravity		1668C	4/19/201

Figure 3-5
Sample COC Summary

	A	B	C	D	E	F	G	H	I	J	K
1	LocID	SampleNo	SampleDate	PName	homologue	No (IUPAC-BZ)	Sample Total PCBs	Blank Total PCBs	Total To Compare	Corrected Totals	FactorUsed
2	SR-PF-G	SR12-081214-1545	8/12/2014	2-Chlorobiphenyl (ng/l)	mono	1	0.00112	0.00183	0.00549	0	3
3	SR-PF-G	SR12-081214-1545	8/12/2014	3-Chlorobiphenyl (ng/l)	mono	2	0.00055	0.00178	0.00534	0	3
4	SR-PF-G	SR12-081214-1545	8/12/2014	4-Chlorobiphenyl (ng/l)	mono	3	0.00157	0.00187	0.00561	0	3
5	SR-PF-G	SR12-081214-1545	8/12/2014	2,2'-Dichlorobiphenyl (ng/l)	di	4	0.000916	0	0	0.000916	3
6	SR-PF-G	SR12-081214-1545	8/12/2014	2,3-Dichlorobiphenyl (ng/l)	di	5	0	0	0	0	3
7	SR-PF-G	SR12-081214-1545	8/12/2014	2,3'-Dichlorobiphenyl (ng/l)	di	6	0	0	0	0	3
8	SR-PF-G	SR12-081214-1545	8/12/2014	2,4-Dichlorobiphenyl (ng/l)	di	7	0.000615	0.000618	0.001854	0	3
9	SR-PF-G	SR12-081214-1545	8/12/2014	2,4'-Dichlorobiphenyl (ng/l)	di	8	0.00122	0.00202	0.00606	0	3
10	SR-PF-G	SR12-081214-1545	8/12/2014	2,5-Dichlorobiphenyl (ng/l)	di	9	0	0	0	0	3
11	SR-PF-G	SR12-081214-1545	8/12/2014	2,6-Dichlorobiphenyl (ng/l)	di	10	0	0	0	0	3
12	SR-PF-G	SR12-081214-1545	8/12/2014	3,3'-Dichlorobiphenyl (ng/l)	di	11	0.00574	0.00315	0.00945	0	3
13	SR-PF-G	SR12-081214-1545	8/12/2014	3,4-Dichlorobiphenyl (ng/l)	di	12	0	0	0	0	3
14	SR-PF-G	SR12-081214-1545	8/12/2014	3,4'-Dichlorobiphenyl (ng/l)	di	13	0	0	0	0	3
15	SR-PF-G	SR12-081214-1545	8/12/2014	3,5-Dichlorobiphenyl (ng/l)	di	14	0	0	0	0	3
16	SR-PF-G	SR12-081214-1545	8/12/2014	4,4'-Dichlorobiphenyl (ng/l)	di	15	0.00157	0.00216	0.00648	0	3
17	SR-PF-G	SR12-081214-1545	8/12/2014	2,2',3-Trichlorobiphenyl (ng/l)	tri	16	0.000343	0.00149	0.00447	0	3
18	SR-PF-G	SR12-081214-1545	8/12/2014	2,2',4-Trichlorobiphenyl (ng/l)	tri	17	0.000288	0.000905	0.002715	0	3
19	SR-PF-G	SR12-081214-1545	8/12/2014	2,2',5-Trichlorobiphenyl (ng/l)	tri	18	0.00137	0.00241	0.00723	0	3
20	SR-PF-G	SR12-081214-1545	8/12/2014	2,2',6-Trichlorobiphenyl (ng/l)	tri	19	0.000942	0.000373	0.001119	0	3
21	SR-PF-G	SR12-081214-1545	8/12/2014	2,3,3'-Trichlorobiphenyl (ng/l)	tri	20	0.00226	0.00688	0.020639999	0	3
22	SR-PF-G	SR12-081214-1545	8/12/2014	2,3,4-Trichlorobiphenyl (ng/l)	tri	21	0.000448	0.00487	0.014609999	0	3
23	SR-PF-G	SR12-081214-1545	8/12/2014	2,3,4'-Trichlorobiphenyl (ng/l)	tri	22	0.000445	0.00314	0.00942	0	3
24	SR-PF-G	SR12-081214-1545	8/12/2014	2,3,5-Trichlorobiphenyl (ng/l)	tri	23	0.000794	0.00027	0.00081	0	3
25	SR-PF-G	SR12-081214-1545	8/12/2014	2,3,6-Trichlorobiphenyl (ng/l)	tri	24	0	0	0	0	3
26	SR-PF-G	SR12-081214-1545	8/12/2014	2,3',4-Trichlorobiphenyl (ng/l)	tri	25	0	0	0	0	3
27	SR-PF-G	SR12-081214-1545	8/12/2014	2,3',5-Trichlorobiphenyl (ng/l)	tri	26	0	0.00103	0.00309	0	3
28	SR-PF-G	SR12-081214-1545	8/12/2014	2,3',6-Trichlorobiphenyl (ng/l)	tri	27	0	0	0	0	3
29	SR-PF-G	SR12-081214-1545	8/12/2014	2,4,4'-Trichlorobiphenyl (ng/l)	tri	28	0	0	0	0	3
30	SR-PF-G	SR12-081214-1545	8/12/2014	2,4,5-Trichlorobiphenyl (ng/l)	tri	29	0	0	0	0	3
31	SR-PF-G	SR12-081214-1545	8/12/2014	2,4,6-Trichlorobiphenyl (ng/l)	tri	30	0	0	0	0	3
32	SR-PF-G	SR12-081214-1545	8/12/2014	2,4',5-Trichlorobiphenyl (ng/l)	tri	31	0.00167	0.000503	0.001509	0.00167	3
33	SR-PF-G	SR12-081214-1545	8/12/2014	2,4',6-Trichlorobiphenyl (ng/l)	tri	32	0.000226	0.000963	0.002889	0	3
34	SR-PF-G	SR12-081214-1545	8/12/2014	2,3',4'-Trichlorobiphenyl (ng/l)	tri	33	0	0	0	0	3
35	SR-PF-G	SR12-081214-1545	8/12/2014	2,3',5'-Trichlorobiphenyl (ng/l)	tri	34	0.000798	0.000251	0.000753	0.000798	3
36	SR-PF-G	SR12-081214-1545	8/12/2014	3,3',4-Trichlorobiphenyl (ng/l)	tri	35	0.000197	0.00162	0.00486	0	3
37	SR-PF-G	SR12-081214-1545	8/12/2014	3,3',5-Trichlorobiphenyl (ng/l)	tri	36	0	0	0	0	3
38	SR-PF-G	SR12-081214-1545	8/12/2014	3,4,4'-Trichlorobiphenyl (ng/l)	tri	37	0.0013	0.000437	0.001311	0	3
39	SR-PF-G	SR12-081214-1545	8/12/2014	3,4,5-Trichlorobiphenyl (ng/l)	tri	38	0	0	0	0	3
40	SR-PF-G	SR12-081214-1545	8/12/2014	3,4',5-Trichlorobiphenyl (ng/l)	tri	39	0	0	0	0	3

Figure 3-6
Blank Correction Tool Sample

	A	B	C	D	E	F	G
1	homolog	WA0002447-021 | 01/25/2017 | 17-01180	WA0002447-021 | 01/25/2017 | 17-01182	WA0002447-021 | 02/15/2017 | 17-02123	WA0002447-021 | 03/13/2017 | 17-03278	WA0002447-021 | 04/12/2017 | 17-04743	WA0002447-021 | 05/24/2017 | 17-07082
2	deca	0.0136	0.0061	0.0003	0.0352	0	0
3	di	0.3984	0.067	0.043	0.0203	0.0724	0.079899999
4	hepta	0.0652	0.048	0.0504	0.1181	0.124850001	0.3456
5	hexa	0.1381	0.1395	0.07463	0.286999999	0.1542	0.4557
6	mono	0.0489	0	0.0134	0.0149	0.0264	0
7	nona	0.2354	0.0966	0.0304	0.2631	0.01279	0.2607
8	octa	0.0197	0.0135	0.0074	0.0827	0.06852	0.124400001
9	penta	1.545	0.6202	0.4993	0.227100001	0.14539	1.5098
10	tetra	0.6225	0.243	0.1175	0.0946	0.178720001	0.502699999
11	tri	0.269	0.133300001	0.5551	0.0659	0.05939	0.1827

Figure 3-7
Total PCBs by Homologue

A	B	C	D	E
homologue	SR-GS-G | 03/24/2016 | SR4-032416-1145	SR-GS-G | 04/19/2016 | SR4-041916-1030	SR-GS-G | 05/24/2016 | Dup1-052416-1040	SR-GS-G | 05/24/2016 | SR4-052416-1030
deca	0	0	0	0
di	0.01482	0.009066	0.013774999	0.02428
hepta	0.009999	0.013377	0.003	0.00255
hexa	0.020036	0.021471	0.011269	0.01262
mono	0.00348	0.00231	0.002643	0.003101
nona	0	0.00132	0	0
octa	0.003672	0.00418	0	0.00121
penta	0.017046	0.01652	0.021134	0.023796
tetra	0.022876	0.02054	0.03134	0.043212001
tri	0.013181	0.01325	0.020537	0.030450001

Figure 3-10
PCB Loadings by Homologue

Section 4
Public Access Options

An important aspect of the PCB study is the availability of the data to the stake holders and other interested public groups. CDM Smith evaluated options that are available for sharing the data and advantages and disadvantages of each of the options. Related impacts on schedule and costs were also evaluated. Table 4-1 summarizes our evaluation. A brief discussion of each option is presented below.

4.1 Compiled Reports on Web Site

Under this option, designated SRRTTF or other Task Force members would prepare standard graphical and tabular summaries of the data and post the compiled reports on the Task Force website. Since existing database reporting tools are used, no additional database development is required. As a result, no additional set-up time is needed. Periodic effort to prepare and post the data summaries would be the extent of ongoing tasks. While this option provides the most cost-effective and fastest option to share data with the public, that data is not live and no data querying capabilities would be available. The currency of the data would depend on the frequency of the report uploads. No geographic information system(GIS)-type visual reporting capabilities would be available.

4.2 Downloadable Microsoft Access Databases

Under this option, the Microsoft Access-based databases that have been developed would be posted on the Task Force website and could be downloaded and used by the public. As with the previous option, no additional database development and associated set-up time would be required. No staff effort for compiling and posting preset reports would be required either. This option would however require the users to have familiarity with using point-and-click database applications and necessitate some ongoing support from SRRTTF to periodically post the databases with updated analytical data and assist end users. No geographic information system (GIS)-type visual reporting capabilities would be available.

4.3 SQL Server-based Web Application

Under this option, the existing PCB Data would be migrated from Microsoft Access backend files to a SQL Server database hosted on the web. The data would be accessed via a custom web application in which the existing Microsoft Access database functionality would be duplicated. The biggest advantage of this option is the availability of live data and capability to query it on demand. However, this option would also require 4 to 6 months of set-up time. Initial costs are estimated to be around $96,000 and approximately $3,000/year is anticipated for hosting and support of the web application. Similar to options 4.1 and 4.2, GIS-type reporting options would not be available if only current functionality is duplicated. Web-based GIS reports could be built into the application but would require additional cost and time.

4.4 Google Earth-based Point and Click Interface

Under this option, preprocessed data summaries from the Microsoft Access database are uploaded via KML files and accessed via a Google Maps or Google Earth interface. This option is basically an addon that provides GIS-type visual reports to complement the tabular and graphical reports from the existing PCB database. Initial costs to set up the interface from Microsoft Access are estimated to be $16,000 and no annual costs are anticipated. This addon option could be developed in 2 to 3 months.

4.5 ArcMap-based Preprocessed Map Interface

Similar to option 4.1, under this option, preprocessed data summaries are uploaded via dbf format files and accessed via an ArcMap-based web interface. While this option doesn't have the complete GIS capabilities, it still provides excellent spatial visualization of the data. The main disadvantage of this option is that the data is not live. Periodic effort by SRRTTF staff would be required to upload the dbf files. Initial costs for setting up this option are estimated to be $27,000 and annual costs are estimated to be $1,000/year.

4.6 Full-Scale ArcGIS interface

Under this option, all PCB data will be uploaded into a SQL Server database and accessed via a custom Arc-GIS interface. This option provides tabular and visual representation of live PCB data. This option also provides a complete map-based interface to query data. Primary disadvantages include need for considerable server space and significant effort to set-up the custom GIS application. The set-up effort is anticipated to require 6 to 9 months and estimated initial costs are $125,000. Annual hosting and support costs are estimated to be $5,000 per year.

Table 4-1 Public Access Option Matrix

Option	Brief Description	Advantages	Disadvantages	Estimated Duration to Set-up	Estimated Set-up Cost
Compiled Reports on Web Site	Using the PCB database application, preset tabular and graphical reports are compiled and posted on SRRTTF web site	No additional database development needed	No on-demand access to live data that can be queried	No time required to set-up; ongoing effort to compile reports	$0
Downloadable Microsoft Access Databases	Final SRRTTF PCB Microsoft-Access databases are posted on SRRTTF web site for stakeholders to download and use.	No additional database development needed. Data can be kept current with periodic database uploads.	Will require some amount of user training and support. Familiarity with database applications is needed.	No time required to set-up; ongoing effort to post updated databases	$0
SQL Server-based Web Application	PCB Data will be stored in a SQL Server database hosted on the web and data is accessed via a web application. Existing Microsoft Access database functionality will be duplicated.	Live data will be available as needed to authorized users. Minimal effort to prepare compiled reports or upload databases.	Will require time and expense for development of a web application. Web and database servers will be required.	4 to 6 months	Initial Cost $96,000 Annual Cost $3,000/Year
Google Earth-based Point and Click Interface	Preprocessed data summaries are uploaded via KML files and accessed via Google Maps or Google Earth	Provides visual representation of PCB data summaries.	Not a true database application and no access to live data that can be queried. On-going creation of KML files will be required.	2 to 3 months	Initial Cost $16,000 Annual Cost $0/Year
ArcMap-based Preprocessed Map Interface	Preprocessed data summaries are uploaded via dbf files and accessed via ArcMap-based web interface	Provides tabular and visual representation of PCB data.	Not a true database application and no access to live data that can be queried. On-going creation of dbf files will be required.	4 to 6 months	Initial Cost $27,000 Annual Cost $1,000/Year
Full-Scale ArcGIS interface	All PCB data will be uploaded into a SQL Server database and accessed via a custom Arc-GIS interface	Provides tabular and visual representation of PCB data. Provides a complete map-based interface to query data.	Will require considerable server space, software and effort to set up GIS application and maintain it.	6 to 9 months	Initial Cost $125,000 Annual Cost $5,000/Year

Section 5
Recommendations for Future Tasks

Based on CDM Smith's review of the existing data and the development of the current database application, we recommend the following for continued success of the PCB tracking program:

- Continue discussion with Axys and the other labs to reproduce the previous data and generate new data in acceptable EDD formats. This will significantly reduce time and effort associated with analytical data entry and ensure good quality of the data.
- Dedicate resources to receive, compile and load into the database application. Using dedicated resources will minimize data tracking errors and maintain data consistency. This approach will also result in efficient data management.
- Considering the time and costs involved, we recommend that Option 4.2, posting up to date Microsoft Access backend and front-end databases to the Task Force website be considered. In addition, we recommend that Option 4.4, the Google Earth-based data visualization capabilities be added to the existing databases. This combination will provide efficient and cost-effective data reporting and visualization.
- Our experience with database applications indicates that the constant upkeep of the database is critical for deriving maximum value from the application. Maintaining currency and quality of the data will ensure trust in the reports and conclusions drawn from it.
- Due to the relatively low concentrations of PCBs in the SRRTTF data, maintaining adequate QA/QC with respect to blank sample collection and analysis is important.

Appendix A

PCB Data Compatibility/Database Functionality Review – Findings and Recommendations

CDM Smith

Memorandum

To: *Spokane River Regional Toxics Taskforce*

From: *Rao Sankarmanchi*

Date: *May 26, 2017*

Subject: *PCB Data Compatibility/Database Functionality Review – Findings and Recommendations*

This memorandum summarizes CDM Smith's review of the representative Spokane River watershed datasets provided by Spokane River Regional Toxics Task Force (SRRTTF) and its compatibility with the Delaware River Basin Commission (DRBC) polychlorinated biphenyls (PCB) database. The purpose of this evaluation was to:

- Determine the presence (or absence) of critical components across each PCB dataset format
- Evaluate the current capacity of the DRBC database to perform desired data processing functionalities
- Make recommendations for modifications to dataset formats and DRBC database programming to optimize compatibility and integrity of data reporting

This memorandum is divided into six parts:

- Project Background
- Dataset Formatting Review
- Required Database Functionality
- DRBC PCB Database Modifications Required
- Next Steps
- Conclusions and Recommendations

Project Background

The SRRTTF is currently leading efforts to find and reduce PCBs in the Spokane River. The first stage of such an endeavor is the collection of high-quality analytical data on the 209 congeners that constitute PCBs. At this stage, the SRRTTF does not have a comprehensive database application to load, compile, evaluate, and summarize the large quantities of data generated to date (and those that will continue to be collected). Data is received from multiple labs using different methodologies and submitted in different formats. Data on air, water, wastewater, sediments, and fish tissues needs to be managed. Maintaining a robust quality assurance and control (QA/QC) strategy for the data is also important. The overall goal of the proposed project is to develop a comprehensive data management plan and application for managing PCB data, including options for public access to the data.

Based on initial evaluations, the best approach for handling the Spokane River PCB data is to develop a modified version of the DRBC PCB database application for the SRRTTF's use.

Dataset Formatting Review

The majority of sampling data in the Spokane River watershed datasets is provided by Axys Analytical Services. However, there are other data providers, notably Pacific Rim Laboratories. Within their datasets, Axys' electronic data deliverables (EDDs) have three different formats (referred to here as AXYS 1, AXYS 2, AXYS 3) which are not consistent with each other. Likewise, Pacific Rim's fish tissue EDDs are differently formatted than their standard water sample EDDs. We will characterize the fish tissue EDD format as the Department of Ecology Environmental Information Management (EIM) format because there will be submitted data with this same structure analyzed by different labs. **Table 1** lists the 15 different sets of sampling data and **Table 2** indicates the format of each dataset.

Table 1: Representative SRRTTF Datasets

Datasets:
CDARoutine (Coeur d'Alene WWTP)
City of Spokane PCB Data
Dept. Ecology 2012 Fish Tissue Sampling
Dept. Ecology GW Sampling Data
HARSBRoutine (Hayden Area Regional Sewer Board WWTP)
IEPRoutine (Inland Empire Paper)
KaiserRoutine (Kaiser Aluminum)
LibertyLakeRoutine (Liberty Lake Sewer & Water WWTP)
Little Spokane PCB Verification Study
PostFallsRoutine (Post Falls WWTP)

Spokane County Water Reclamation PCB Data
SRRTTF 2014 Confidence Level Sampling
SRRTTF 2014 Synoptic Sampling Data
SRRTTF 2015 Synoptic Sampling Data
SRRTTF 2016 Monthly Sampling

Table 2: Dataset Formats

AXYS 1	AXYS 2	AXYS 3	Pacific Rim	EIM
SRRTTF 2014 Synoptic Sampling Data	PostFallsRoutine	Spokane County Water Reclamation PCB Data	LibertyLakeRoutine	Little Spokane PCB Verification Study
SRRTTF 2015 Synoptic Sampling Data	KaiserRoutine		City of Spokane PCB Data	Dept Ecology 2012 Fish Tissue Sampling
SRRTTF 2016 Monthly Sampling	IEPRoutine			
SRRTTF 2014 Confidence Level Sampling	HARSBRoutine			
Dept Ecology GW Sampling Data	CDARoutine			

The current EDD template for uploading analytical data to the DRBC database (Analytical_Results_EDD.xls) has 46 data fields. Using the DRBC's definition of each of these inputs, **Table 3** summarizes a comparison of the five formats to the preferred EDD template. Appendix A contains DRBC's definitions of data fields.

Table 3 also indicates the criticality of each result EDD data field. Fields in yellow are critical. Fields in blue are critical, but only for certain sampling types. Specifically, the first two of these fields (fish % moisture, % lipid) are only required for fish tissue sampling, while the rest (italicized) are only required for sediment sampling. Fields in green would be necessary in the event of a lab audit, and so their inclusion is highly recommended. Fields in grey are critical, but can be derived from other information included in the EDD. Providing them would only serve to make the formatting more consistent and uploading process more efficient. Fields not highlighted may be provided but are not required.

Table 3: SRRTTF Data Format Comparisons to DRBC Results EDD Format

Analytical_Results_EDD Inputs:	AXYS 1	AXYS 2	AXYS 3	Pacific Rim	EIM
Lab_Sample_ID	X	X	X	X	X
Sample_Date	X	X	X	X	X

IUPAC_PCB_#	X	X	X	X	X
Conc_Found	X	X	X	X	X
UNITS	X	X	X	X	X
Data_Qualifier	X	X	X	X	X
EDL	X	X	X	X	X
Lab_Name	X	X	X		X
Analysis_Date	X		X	X	X
CAS_#	X		X	X	X
Batch_ID	X	X	X		
Analysis_Performed	X		X		X
Sample_Size		X	X		
Size_Units		X	X		
Sample_Time			X		X
Sample_Matrix			X		X
Dilution Factor				X	
Sample_ID					
GC_Column_ID					
Test_type					
Minimum_Level					
Fish_Percent_Moisture					
Percent_Lipid					
Bulk_Density					
Density_Units					
Sed_Percent_Moisture					
Grain_Size					
Grain_Size_Units					
Percent_TOC					
Extraction_Date			X		
Ion_Abundance_Ratio			X		
RRT			X		
Initial_Cal_Date					
Instrument_ID					
Ion_Abundance_Ratio Lower Limit					
Ion_Abundance_Ratio Upper Limit					
RRT_Upper_Limit					
RRT_Lower_Limit					
QC_Code	X	X	X		X
Compound	X		X	X	
Cal_Ver_Lab_Sample_ID					
Method_Blank_Lab_Sample _ID					

Analysis_Time			X		X
Test_batch_type					
Conc_Lower_Limit					
Conc_Upper_Limit					

We recommend the use of a separate EDD or file for submitting fish tissue sampling details such as taxonomy, sample collection methods, etc., with a common Sample_ID field to link the results data with the non-chemical fish tissue data.

The PCB database also requires the uploading of sampling location and chain of custody information to generate reports and evaluate the data. As with the results EDD, the DRBC currently has templates for these EDDs (Location_Table_EDD.xls, Chain_Custody_EDD.xls). **Table 4** lists the data fields and follows the same convention as **Table 3** for indicating the criticality of data. Appendix A contains the data field definitions. The location and chain of custody data needs to be entered before analytical data EDDs can be loaded.

Table 4: Location and CoC EDD Requirements

Location_Table_EDD Inputs:	Chain_Custody_EDD Inputs:
Location ID	Location ID
Sampling Location Name	Sample ID
Point of Contact	Sample Date
Contact Phone Number	Sample Time
Alternate Point of Contact	Sample Collection Type
Alternate Contact Phone Number	Weather category
Type of sampling location	Sample Type
Latitude	Sample Matrix
Longitude	Sample Size
Sample Depth	Sample Units
Status	Sample Depth (ft)
Owner	Flow
Street Address	Analysis Requested
City	Laboratory Undertaking Analysis
State	Laboratory Contact
Zip Code	Laboratory Contact Phone Number
Municipality	Date sent to lab
Zone	Sampler
River Mile	Sampler affiliation
Drainage Area	Location ID (second outfall)

Permit Number	Sample ID (second Outfall)
Discharge ID	Source Category
	Precipitation (total amount on sampling date)
	Precipitation station
	Notes
	Laboratory Address

In general, the basic information required is present in all the datasets. However, the following is a list of issues to be addressed:

- The Chemical Abstract Service (CAS) number is the best identifier for each congener but is absent from most of the routine sampling datasets (AXYS 2).
- Except for KaiserRoutine data, AXYS 2 formats have missing sample dates (KaiserRoutine is missing EDL). The information needed for the Qc_Code input is present in most datasets, but is not usually provided in the required format.
- Multiple data fields are present in the same datum, such as "ANALYSIS_DATE" under AXYS 3 including both the analysis date and time. Coelution is also an issue that needs to be addressed via a consistent approach. Coelution compounds were not split out and not all congeners were reported on a 1-for-1 basis in the EDDs. Method blanks and rinstate blanks associated with each sample or batch of samples were not clearly identified. This is necessary to implement an acceptable blank correction approach.
- It was difficult to determine the sample matrix of each dataset (water data, sediment data, air data, etc.) as this information was absent from most formats. It will be imperative to include this information with existing data resubmissions, as well as submissions of future data.

Required Database Functionality

Based on our understanding of the needs, the following is the functionality required for the SRRTTF PCB database application:

1. User-friendly menu-driven point and click forms for adding and editing location, sample, result, fish, and lookup table information; point and click forms for uploading the location, sample, and result EDDs. Examples of such forms are shown below. The first form (**Figure 1**) is the location explorer where the user can see the samples collected from that location by clicking on that location and the analytical data for the sample by clicking on the sample. The second form (**Figure 2**) is a criteria selection

form for specifying which data is to be analyzed/exported. Similarly, data entry is also streamlined with such data input screens/forms.

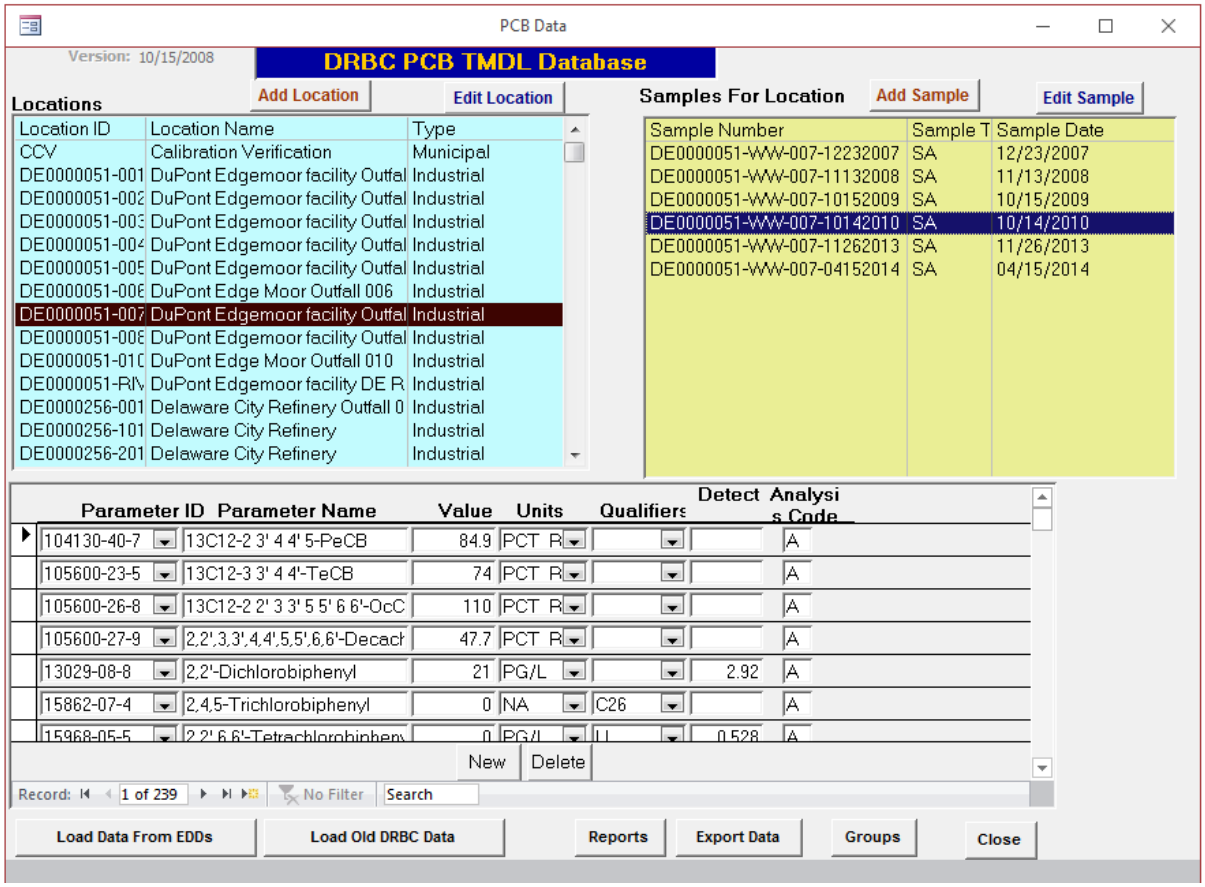


Figure 1: Location Explorer

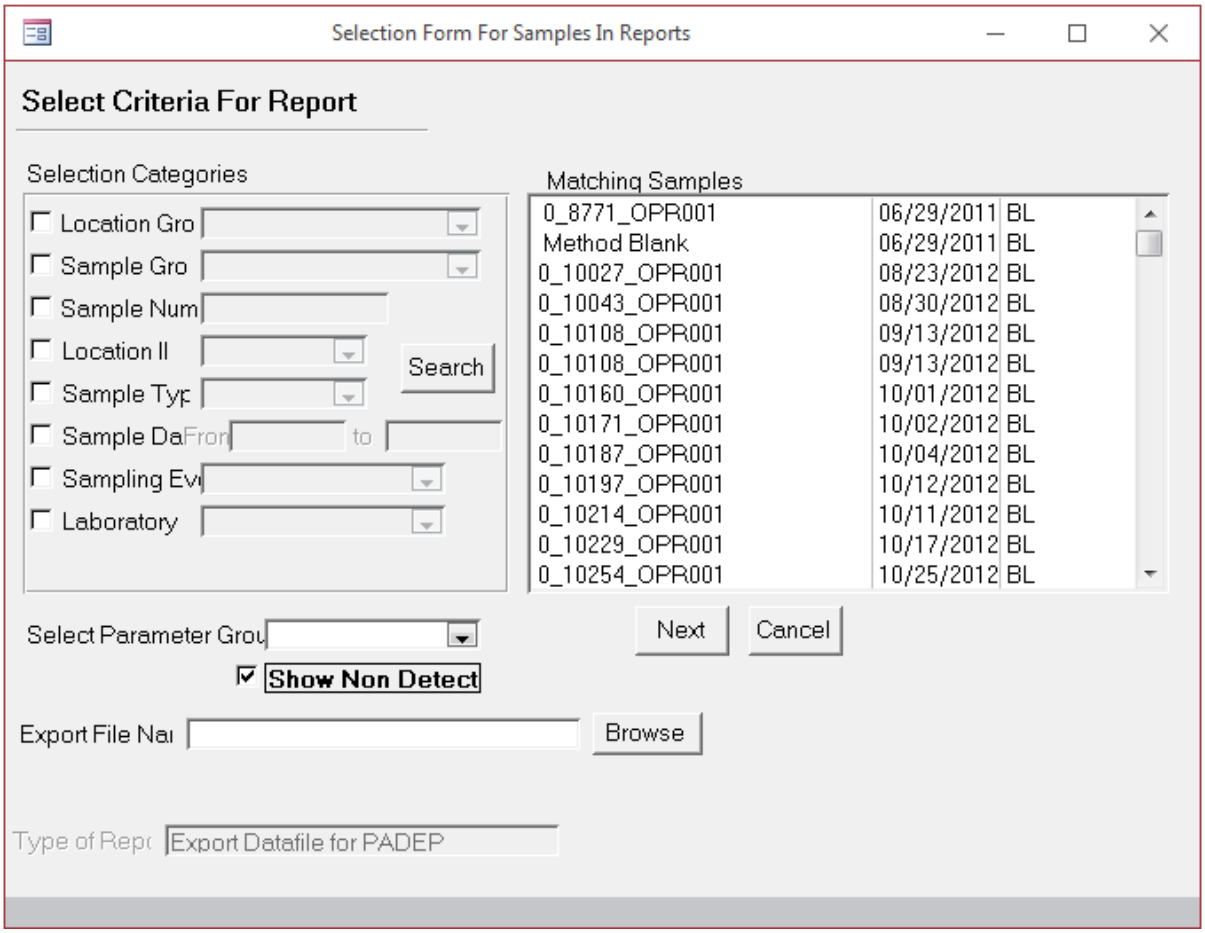


Figure 2: Criteria Selection Form

2. Tabular Summary Reports for PCB Data (including Excel export options)
    a. Summary tables showing samples down and parameters across
    b. Summary table of location data for sampling locations
    c. Summary table of Chain of Custody and other sample collection data by collection period and sample categories
    d. Summary table showing PCB totals by homolog and grand totals
    e. Whole water sample comparison tool
3. Tabular Summary Reports for Fish Tissue Data (including Excel export options)
    a. Summary table by homolog and total PCBs
    b. Summary table by fish species (multiple selection, include lipid and moisture data)

4. Figures showing Geographic Information System (GIS) layers and contaminant mapping (spatial and temporal, by homolog or total PCBs) (see **Figure 3** for a spatial graphical display example)

5. Figure showing PCB homolog fingerprint summary by zone

6. Trend plot tool to show temporal variations in PCB concentrations

7. Method blank/rinsate blank comparison and correction tool with options to select the blank correction methodologies such as a user defined multiplier, subtraction etc. (by homolog)

8. Export options to deliver data to Dr. Lisa Rodenburg for positive matrix factorization (PMF) analysis

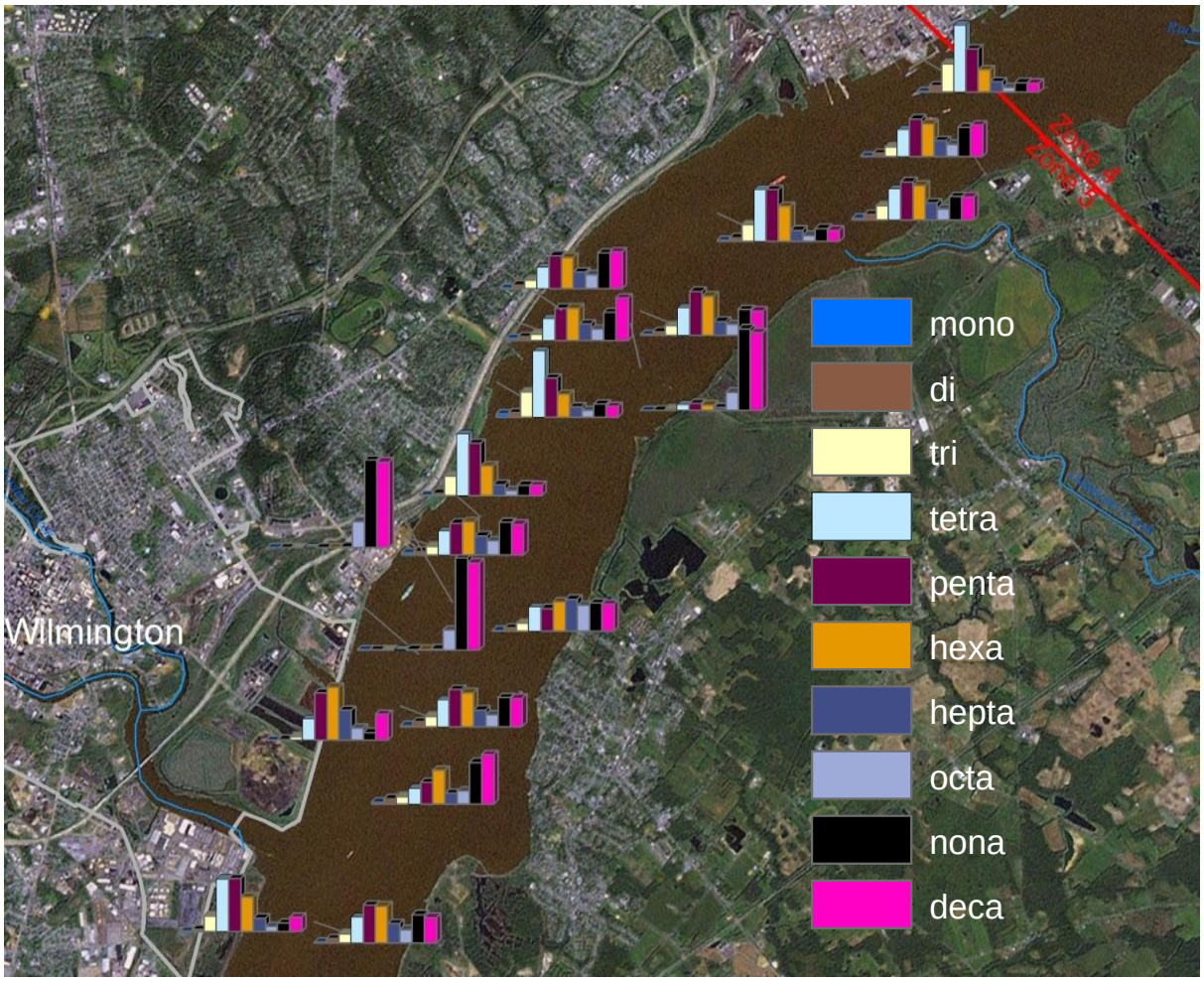


Figure 3: GIS spatial mapping by homolog (credit: DRBC)

DRBC PCB Database Modifications Required

DRBC staff using the current PCB database were proficient in the use of Microsoft Access. As a result, most of the reporting was done via custom-built queries and data exports. To make the PCB database more user-friendly and meet the needs of SRRTTF members, the following modifications are required:

- Add a fish tissue table to store taxonomy and other non-chemical related fish data
- Add a form for automated blank correction reporting method
- Add report summarizing method blank/rinsate blank (MB/RB) acceptability
- Add criteria selection forms and summary table reports for PCB data
- Add ability to export homolog and fish tissue data for generating spatial GIS reports
- Add ability to generate PCB data summaries by river zones
- Add other non-PCB parameters such as dissolved oxygen content (DOC), chemical oxygen demand (COD), total suspended solids (TSS), and total dissolved solids (TDS) to the master parameter table so that related data can be imported and reported

Next Steps

Having reviewed SRRTTF data compatibility and DRBC database functionality, the next required tasks will entail making necessary modifications to the database and running pilot tests of data loading and reporting tools (as outlined in the proposal). The following list represents the next steps to achieve those tasks:

- Make modifications to the DRBC database as outlined above
- Set up a conference call with Dr. Lisa Rodenburg to discuss database formatting that enables and streamlines her PMF analysis
- Provide a draft version of the modified database along with a quick reference guide to SRRTTF staff
- Contact data sources to discuss EDD structures and criticality and to convey what specific changes we need from each of them
- Develop protocol for entering location and chain of custody data
- Acquire revised EDDs of past data to load into database and to use for pilot testing

- Initiate pilot testing of database, generate example tables, graphical outputs and spreadsheets, and make recommendations for additional modifications, if any, to enhance functionality

Conclusion and Recommendations

A review of representative datasets provided by SRRTTF shows that the data is in 5 different formats. Fortunately, 3 of those data sets are from Axys laboratory, who have the capability to submit the EDDs in the preferred format. Pacific Rim and EIM EDDs will need a fair amount of work to convert them into database-friendly formats. We highly recommend conference calls and discussions with each laboratory to establish EDD protocol for future data and to investigate EDD resubmissions of existing data.

The preliminary method and rinsate blank data from SRRTTF, as well as sample data, indicate much lower levels of total PCBs than in DRBC data. As a result, the quality of method blank and rinsate blank data becomes crucial for proper data evaluation. We recommend that SRRTTF develop robust acceptability criteria for blanks. This will also help develop a better blank correction tool.

Evaluation and compilation of PCB data to support implementation of the SRRTTF Comprehensive Plan will benefit from tabular and graphical data summaries. Capabilities to export the appropriate data to GIS programs and tabular summaries for data analysis are critical components of the PCB database application. Reports should include summaries by homolog and total PCBs. In addition, both spatial and temporal data summaries are required to thoroughly evaluate the data.

Modifications to the existing DRBC PCB database primarily include the addition of tables to store non-chemical fish tissue data; addition of other chemical data such as TDS, TSS, TOC, DOC etc.; addition of criteria selection forms; and automation of tabular summary reports and simplification of data export features.

Appendix A: DRBC EDD Input Definitions

Table 5: Analytical_Result_EDD Input Definitions (in EDD order)

DATA FIELDS	FORMAT	DEFINITION
Sample_ID	TEXT	Client sample ID from Chain of Custody. Consists of 9 digit NPDES #, sample type, outfall, and collection date. Example: PA0123456-DW-001-12312004
Lab_Sample_Id	TEXT	Laboratory Identification to be provided by Lab
Laboratory Name	TEXT	Name of Laboratory to be provided by Lab
Sample_Matrix	LOOKUP	Sample_Matrix must match sample matrix from Chain of Custody: Water (whole) = whole water sample including suspended particulate fraction, Water (dissolved) = water which passes through a filter media, Water (XAD) = water which is passed through an XAD media, Water (Particulate) = particulate fraction of water sample which remains on filter media, Sediment = solids which are collected sub-aqueaously, Soil = soils which are collected sub-arially, Tissue (whole body) = entire fish or organism, Tissue (fillet) = fish fillet, Air (particulate) = particulate fraction of air sample which remains on filter media, Air (dissolved) =dissolved fraction of air sample which passes through filter media
Fish_Percent_Moisture	NUMERIC	Percentage of moisture content of sample (fish tissue)
Percent_Lipid	NUMERIC	Percentage of lipid content of sample
Bulk_Density	NUMERIC	Bulk density of sample
Density_Units	TEXT	Bulk density units (typically g/cm^3)
Sed_Percent_Moisture	NUMERIC	Percentage of moisture content of sample (sediment)
Grain_Size	NUMERIC	Average grain size of sample
Grain_Size_Units	TEXT	Grain size units (µm, mm)
Percent_TOC	NUMERIC	Percentage of total organic carbon content of sample
Qc_Code	LOOKUP	SA = sample, QADU = duplicate, MB = method blank, OPR = spike, MS = matrix spike, MSD = matrix spike duplicate, CCV = cal ver
Sample_Date	MM/DD/YY	Sample Date from Chain of Custody
Sample_Time	HH:MM	Sample Time from Chain of Custody
Analysis_Perfomed	TEXT	Analysis performed on sample (to be provided by Lab)
Extraction Date	MM/DD/YY	Date sample was extracted
Analysis_Date	MM/DD/YY	Sample analysis Date (to be provided by Lab)
Analysis_Time	HH:MM	Sample analysis Time (to be provided by Lab)
Sample_Size	NUMERIC	Weight/volume of the sample (To two decimal places)
Size_Units	TEXT	Sample size units (g, L, mL)
Initial_Cal_Date	MM/DD/YY	Date the initial calibration was run (to be provided by Lab)

Instrument Id	TEXT	Instrument identification (to be provided by Laboratory)
GC Column Id	TEXT	Gas Chromatograph Column identification (to be provided by the Laboratory)
Test Type	TEXT	Type of test values may include "initial, reextraction, and reanalysis"
Test Batch Type	TEXT	Lab Batch Type values may include "preparatory, analysis, and leach"
Batch_ID	TEXT	Batch Id (to be provided by the lab)
Cal_Ver_Lab_Sample_ID	TEXT	Calibration Verification Lab Sample ID associated with the sample (instrument run id to be provided by Laboratory)
Method_blank_lab _sample_ID	TEXT	Method Blank Lab Sample ID associated with the sample (instrument run id to be provided by Laboratory)
Compound	TEXT	Enter Full chemical compound name
IUPAC_PCB_#	TEXT	IUPAC PCB number from Table 1 EPA Method 1668 Revision A. 1999, for labeled analogs identify with "L" Example: "3L","77L"
CAS_#	TEXT	Columbia Analytical Services (CAS) number from Table 1 EPA Method 1668 Revision A. 1999
Concentration Found	NUMERIC	Analyte concentration found
Dilution Factor	NUMERIC	Numeric Dilution Factor applied to extract
UNITS	TEXT	Reporting units (PG/L, PCT_REC, PG/G_DRYWT, etc - use CARP conventions)
Data_Qualifiers	LOOKUP	See Data Qualifier Tab on Spreadsheet
EDL	NUMERIC	Estimated Detection Limit See EDL Definition Tab on Spreadsheet
Minimum_Level	NUMERIC	Minimum Level as calculated by Lab See ML Definition Tab on Spreadsheet
Conc_Lower_Limit	NUMERIC	Used for spikes and cal vers to show limits values are in percent recovery
Conc_Upper_Limit	NUMERIC	Used for spikes and cal vers to show limits values are in percent recovery
Ion_Abundance_Ratio	NUMERIC	Ion Abundance Ratio of the analyte (if present)
Ion_Abundance_Ratio Lower Limit	NUMERIC	Lower limit of Ion Abundance Ratio of the analyte in the Cal Ver associated with the sample
Ion_Abundance_Ratio Upper Limit	NUMERIC	Upper limit of Ion Abundance Ratio of the analyte in the Cal Ver associated with the sample
RRT	NUMERIC	Relative Retention Time of the analyte (if present)
RRT_Lower_Limit	NUMERIC	Lower limit of Relative Retention Time of the analyte in the Cal Ver associated with the sample
RRT_Upper_Limit	NUMERIC	Upper limit of Relative Retention Time of the analyte in the Cal Ver associated with the sample

Table 6: Location_Table_EDD Input Definitions (in EDD order)

DATA FIELDS	FORMAT	DEFINITIONS
Location ID	ALPHA-NUMERIC	State abbreviation NPDES # and outfall (example WA0123456-001)
Sampling Location Name	TEXT	Location name, Trib name, Air location, Ambient (Estuary) by RM, sediment. Ex: General Motors Repauno facility outfall 001
Owner	TEXT	Legal entity responsible for facility, or State and Agency
Street Address	TEXT	Street address (no P.O. Box addresses)
City	TEXT	City name
State	LOOKUP	Ex: WA
Zip Code	SPECIAL ZIP CODE	5-digit zip code
Municipality	TEXT	Municipality in which sampling location exists
Point of Contact	TEXT	Facility contact name and title
Contact Phone Number	NUMERIC	Phone number (example (609) 883-9500 ext 270)
Alternate Point of Contact	TEXT	Facility contact name and title
Alternate Contact Phone Number	TEXT	Phone number (example (609) 883-9500 ext 270)
Type of sampling location	LOOKUP	Type of sampling location: Industrial, Municipal, Tributary, Estuary (tidal mainstem), River (non-tidal mainstem), Air-Urban, Air-Rural
Latitude	NUMERIC	Decimal degrees located to an accuracy of +- 1 meter at 95% confidence level relative to NAD83. Please provide 6 digits after the decimal (example 40.123456). A conversion equation from degrees/minutes/seconds to decimal degrees is on the "Lat&Long Conversion" tab of Spreadsheet
Longitude	NUMERIC	Decimal degrees located to an accuracy of +- 1 meter at 95% confidence level relative to NAD83. Please provide 6 digits after the decimal (example -75.123456). A conversion equation from degrees/minutes/seconds to decimal degrees is on the "Lat&Long Conversion" tab of Spreadsheet
Zone	LOOKUP	Definition TBD by SRRTTF.
River Mile	NUMERIC	Definition TBD by SRRTTF.

Drainage Area	NUMERIC	To discharge location if applicable in square miles. Please provide two digits after the decimal point (example 2.22)
Sample Depth	NUMERIC	Sample depth of sample collection from water surface, if applicable in feet. Please provide two digits after the decimal point (example 6.8)
Permit Number	NUMERIC	NPDES # only (example WA0123456)
Discharge ID	NUMERIC	outfall number (example 001, or 001a)
Status	LOOKUP	Active, Inactive

Table 7: Chain_Custody_EDD Input Definitions (in EDD order)

DATA FIELDS	FORMAT	DEFINITIONS
Location ID	ALPHA-NUMERIC	State abbreviation NPDES # and outfall (example PA0123456-001)
Location ID (second outfall)	ALPHA-NUMERIC	State abbreviation NPDES # and outfall (example PA0123456-002) if necessary
Sample ID	ALPHA-NUMERIC	Consists of 9 digit NPDES #, sample type, outfall, and collection date. Example: WA0123456-DW-001-12312004
Sample ID (second Outfall)	ALPHA-NUMERIC	Consists of 9 digit NPDES #, sample type, outfall, and collection date. Example: WA0123456-DW-002-12312004 if necessary
Sample Date	MM/DD/YY	Date format example 12/31/04 (End Date for composite samples)
Sample Time	HH:MM	Time Format example 2:30 PM (End Time for composite samples)
Sample Collection Type	LOOKUP	Grab, 24-hr Comp
Weather category	LOOKUP	WW= wet weather, DW= Dry Weather, NA=Not Applicable
Source Category	LOOKUP	Definition TBD by SRRTTF.
Sample Type	LOOKUP	Samples types: SA= Sample TB= Trip Bank, RB Rinsate Blank, INF=Influent Sample, OTH= Other
Sample Matrix	LOOKUP	Water (whole) = whole water sample including suspended particulate fraction, Water (dissolved) = water which passes through a filter media, Water (XAD) = water which is passed through an XAD media, Water (Particulate) = particulate fraction of water sample which remains on filter media, Sediment = solids which are collected sub-aqueaously, Soil = soils which are collected sub-arially, Tissue (whole body) = entire fish or organism, Tissue (fillet) = fish fillet, Air (particulate) = particulate fraction of air sample which remains on filter media, Air (dissolved) =dissolved fraction of air sample which passes through filter media
Sample Size	NUMERIC	Volume in Liters or milliliters, Mass in kilograms or grams
Sample Units	TEXT	Units (Liters, milliliters, Kilograms, grams)

Sample Depth (ft)	NUMERIC	Depth sample collected from water surface if Applicable in feet (example 6.8) Provide 1 digit after the decimal
Precipitation (total amount on sampling date)	NUMERIC	Amount of precipitation to (0.01")
Precipitation station	TEXT	Precipitation station or gage used to determine amount of precipitation
Flow	NUMERIC	Total discharge from outfall during 24-hour event for continuous discharges or total flow during non-continuous event up to 24-hours (in MGD)
Notes	TEXT	Sampler's notes regarding conditions, description of collection methodology, identify previous rainfall event in excess of 0.1", any anomalies encountered
Analysis Requested	LOOKUP	1668A, Other
Laboratory Undertaking Analysis	TEXT	Laboratory name
Laboratory Address	TEXT	Street address (no P.O. Box addresses)
Laboratory Contact	TEXT	Laboratory contact name and title
Laboratory Contact Phone Number	TEXT	Phone number (example (609) 883-9500 ext 270)
Date sent to lab	MM/DD/YY	Date sample sent to lab Date format example 12/31/2004
Sampler	TEXT	Name of sampler
sampler affiliation	TEXT	Employer of sampler

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