2022 Spokane River PCB Expanded Synoptic Survey and Mass Balance Assessment

Prepared for:

Spokane River Regional Toxics Task Force

June 21, 2023

PRELIMINARY DRAFT

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Executive Summary

The Spokane River and Lake Spokane have been placed on the State of Washington's 303(d) list of impaired waters because of elevated concentrations of polychlorinated biphenyls (PCBs) in fish tissue, as specified by Washington's Water Quality Assessment Listing Methodology to Meet Clean Water Act Requirements (Water Quality Program Policy 1-11)[1]. To address these impairments, the Washington State Department of Ecology (Ecology) has been pursuing a toxics reduction strategy that included the establishment of the Spokane River Regional Toxics Task Force (Task Force) to identify and reduce PCBs at their source in the watershed.

The Task Force conducted synoptic surveys and performed mass balance assessments in 2014, 2015, and 2018 to characterize both known and previously unknown sources of PCBs to the river. While these projects provided insight into characterizing PCB sources, some gaps in understanding still existed, namely: 1) whether previously unidentified PCB loads are entering the Spokane River between the Spokane USGS gage and Nine Mile Dam; 2) whether previously unidentified PCB loads are entering the Spokane River in the area termed the Mission Reach; and 3) which process(es) is causing the shift in observed homolog distributions in instream PCB concentrations between Plantes Ferry and downstream of Upriver Dam

This project consisted of a week-long synoptic PCB sampling event collecting grab samples under 2022 summer low flow conditions at eight Spokane River locations and four discharges into the river. Data on volume of flow was obtained for all samples at the time of their collection. Field data were processed via a mass balance assessment to calculate the magnitude of previously unidentified loads entering the river. Key findings from the mass balance assessment are:

- No new unidentified PCB loads were determined to be entering the Spokane River at a level to be discerned above the variability of underlying data.
- PCB concentrations decrease for most homologs between the monitoring stations located upstream and downstream of Upriver Dam.

Two other field activities were conducted as part of the overall effort to characterize previously unidentified sources. First, the discharge to the Mission Reach previously identified as an artesian well was sampled to determine if the elevated PCB concentration observed in 2021 still exists. Observed concentrations were 1,300 to 1,500 pg/l, compared to a concentration of 2,100 pg/l observed in 2021, indicating that this source is consistently discharging PCBs to the Spokane River at a concentrations order of magnitude larger than the concentrations in the river.

Second, solids from stormwater catch basins in the Springfield stormwater service area that were identified by the PCB detection dog as containing elevated PCB levels were collected and analyzed for PCB content. The PCB concentrations in these catch basins were not significantly higher than

[1]Fish tissue PCB concentrations are considered as part of narrative water quality standards.

PCB concentration observed historically from other Spokane-area catch basins. These data suggest that the Springfield service area is not delivering atypically high levels of PCBs to the Spokane stormwater system, although more detailed review of the nature of the historical data is recommended.

1 Introduction

Segments of the Spokane River and Lake Spokane have been placed on the State of Washington's 303(d) list of impaired waters due to elevated concentrations of polychlorinated biphenyls (PCBs) in fish tissue, as specified by Washington's Water Quality Assessment Listing Methodology to Meet Clean Water Act Requirements (Water Quality Program Policy 1-11)[2]. The Washington State Department of Ecology (Ecology) established the Spokane River Regional Toxics Task Force (Task Force) to pursue a toxics reduction strategy as an alternative to a traditional total maximum daily load. The Task Force was formed with the following vision statement:

> The Regional Toxics Task Force will work collaboratively to characterize the sources of toxics in the Spokane River and identify and implement appropriate actions needed to make measurable progress towards meeting applicable water quality standards…

The Task Force sponsored several synoptic sampling events to identify and quantify previously unknown sources of PCBs to the river. A synoptic survey was conducted in 2014 to identify potentially significant dry weather sources of PCBs to the Spokane River between Lake Coeur d'Alene and Nine Mile Dam. The results of this study showed the strong likelihood of a groundwater PCB source between Barker Road and Plantes Ferry. No information on potential groundwater PCB sources between the Spokane USGS gage and Nine Mile Dam could be obtained from this study because fluctuations in river flow caused by maintenance activities at Nine Mile Dam violated the steady state assumption of the study design (LimnoTech, 2015). The Task Force sponsored a subsequent synoptic survey in 2015 that confirmed the presence of a large incremental PCB load entering the Spokane River between Barker Road and Plantes Ferry. The 2015 survey also showed the potential presence of another groundwater loading source entering the river downstream of Plantes Ferry. A third synoptic survey was conducted in 2018 to address data gaps, including: 1) the specific nature of groundwater loading sources suspected between Plantes Ferry and Greene Street and 2) the potential for groundwater loading sources between the Spokane USGS gage and Nine Mile Dam. The results of the 2018 monitoring downstream of Plantes Ferry showed similar results to prior surveys, with a net loss of lower chlorinated homologs and a net gain of moderately chlorinated homologs. No explanation previously existed for this homolog shift. The 2018 mass balance analyses also indicated the potential for groundwater PCB loading in the portion of the river between the Spokane USGS gage and Nine Mile Dam (LimnoTech, 2019).

In addition to the mass balance assessments described above, the Task Force sponsored a study in 2021 to identify previously unknown sources of PCBs to the Mission Reach of the Spokane River. This study identified two potential previously unidentified sources: 1) PCB concentrations in an artesian well were measured at 2,100 pg/l, a level approximately ten times greater than PCB concentrations observed in the river, and 2) deployment of a PCB-detection dog qualitatively

[2]Fish tissue PCB concentrations are considered as part of narrative water quality standards.

identified areas of elevated PCB concentrations in the City of Spokane's Springfield stormwater service area that discharges to the Mission Reach.

Based upon the above information, the Task Force identified the need for additional studies to address the following data gaps:

- Whether previously unidentified PCB loads are entering the Spokane River between the Spokane USGS gage and Nine Mile Dam
- Whether previously unidentified PCB loads are entering the Spokane River in the Mission Reach
- Which process(es) causing the shift in observed homolog distributions between Plantes Ferry and downstream of Upriver Dam
- Whether PCB concentrations in the artesian well discharge remain greater than PCB concentrations in the Spokane River
- Whether PCB concentrations in the catch basins in the Springfield stormwater service area are elevated relative to other similar stormwater basins

The first three data gaps were addressed via conducting of a synoptic survey and semi-quantitative mass balance assessment designed to characterize previously unidentified sources of PCBs to the Spokane River. This study applied a similar methodology of performing mass balance assessments based upon synoptic sampling data as conducted in LimnoTech (2019). The latter two data gaps are addressed via direct monitoring of PCB concentrations in the artesian well discharge and catch basins in the Springfield stormwater service area, respectively.

This report documents the results of the above monitoring program and subsequent analyses. It is divided into sections of:

- Sampling activities
- Analytical results
- Data interpretation

2 Sampling Activities

The field monitoring program consisted of a week-long synoptic survey at eight Spokane River locations and a one-day sampling event at the artesian well and stormwater catch basins. Sampling activities are described below, divided into sections corresponding to:

- Sampling locations
- Monitoring dates
- Field sampling activities
- Quality assurance

2.1 Sampling Locations

Separate sampling locations were used for each individual component of this project:

- Synoptic Survey
- Artesian Well
- Springfield Catch Basin Sampling

Each is discussed below.

2.1.1 Synoptic Survey

River sampling locations consisted of eight stations between Plantes Ferry and Nine Mile Dam, described in Table 1 and shown in Figure 1.

Table 1. Sampling Locations for Synoptic Survey

Location Descriptor	Latitude	Longitude
Spokane River below Trent Ave. Bridge near Plantes Ferry	47.69708 °N	-117.2418 °W
Spokane River upstream of Upriver Dam	47.68672 °N	-117.32678 °W
Spokane River downstream of Upriver Dam	47.680847 °N	-117.334225 °W
Spokane River below Greene St. Bridge	47.67808 °N	-117.3628 °W
Spokane River at Division St.	47.66281 °N	-117.41133 °W
Spokane River at Spokane USGS Gage	47.65888 °N	-117.4497 °W
Spokane River between the Spokane USGS Gage and Nine Mile Dam	47.74049 °N	-117.52002 °W
Spokane River below Nine Mile Dam	47.780556 °N	-117.544445 °W

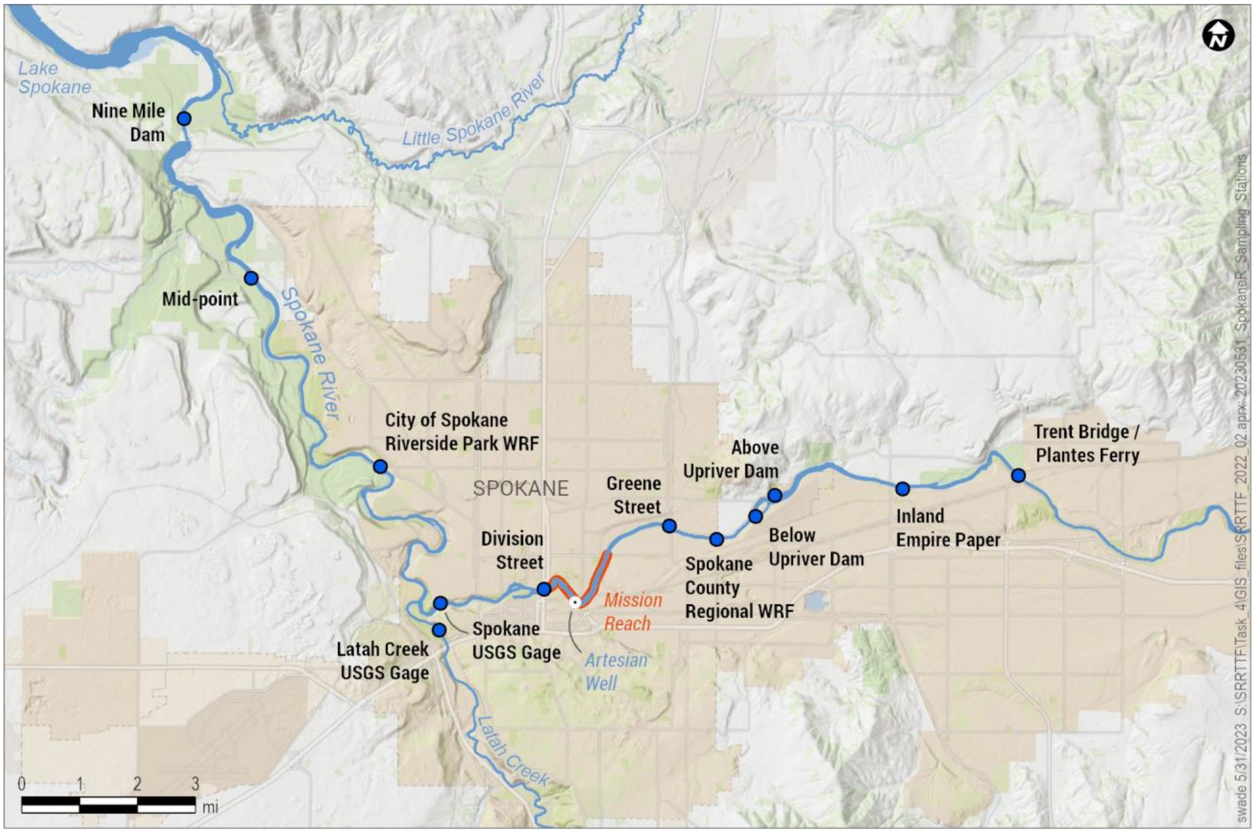

Figure 1. Map of Synoptic Survey Sampling Locations

The external sources of PCBs that were monitored consisted of three wastewater treatment plants and one tributary:

- Inland Empire Paper (47.68867 ºN, -117.2782 ºW)
- Spokane County Regional Water Reclamation Facility. Samples were collected at the facility itself (47.66705 ºN, -117.3532 ºW), while the location of the discharge to the river is north of the facility near Freya St. (47.675833ºN, -117.3469444ºW)
- City of Spokane Riverside Park Water Reclamation Facility (47.693547ºN, -117.471655ºW)
- Latah (Hangman) Creek Gage Station (47.6528668ºN, -117.44986ºW)

2.1.2 Artesian Well

The site that has been referred to as the artesian well is located between Hamilton St and Spokane Falls Blvd. on the south bank of the Spokane River (47.659803 ºN, -117.399263 ºW) as shown above in Figure 1 and is depicted in Figure 2. One sample and a field replicate were collected from the discharge, for a total of two samples.

Figure 2. Artesian well observed flowing into Mission Reach (photo from Tighe Stuart, Ecology)

2.1.3 Springfield Catch Basin Sampling

Solids were sampled in four catch basins located in the Springfield stormwater service area identified by the PCB detection dog, with catch basin locations shown in Figure 3.

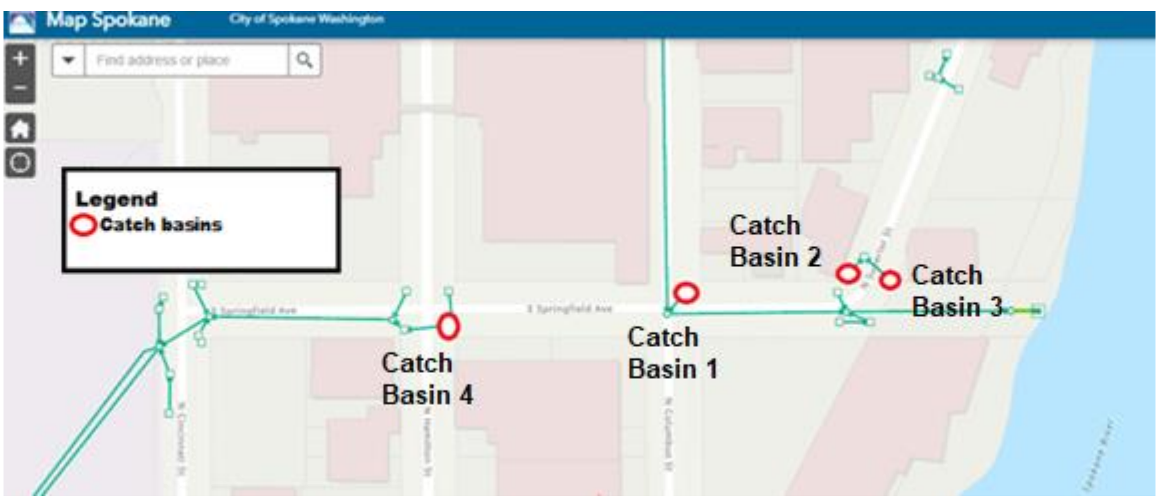

Figure 3. Catch Basins Sampled in the Springfield Basin

2.2 Monitoring Dates

The synoptic survey was conducted between August 29 and September 2, 2022. The river stations listed in Table 1 were sampled daily over that period. External sources were sampled every other day, i.e., August 29, August 31, and September 2. The artesian well was sampled on September 3, and the stormwater catch basins were sampled on September 7.

2.3 Field Sampling Activities

The field sampling activities as planned and implemented are detailed in the project QAPP (LimnoTech, 2022a). This section summarizes those activities. Samples from the Spokane River, external sources and the artesian well were all collected using a direct grab sampling technique. For locations without active stream gages, flow measurements were obtained daily in the field using a watercraft and a Sontek M9 River Surveyor acoustic doppler profiler. The Sontek flow meter was towed across the river along transects to get a complete water column measurement. Flow rate was calculated by a combination of the flow data and the bathymetric profile of the river bottom both of which are measured by the Sontek sensor (Gravity Marine, 2022). The M9 is accurate ±0.25% of measured velocity and ±1% of measured depth.

Sampling of catch basin sediment samples was performed under the oversight of staff from the City of Spokane. Sediment samples were collected in accordance with the operating procedures developed collaboratively by the City of Spokane and Ecology's Urban Waters Initiative (Fernandez, 2012) as described in City of Spokane (2014). Sediment samples were collected from random locations in each catch basin and mixed thoroughly using a stainless-steel spoon and bowl. Samples were transferred to a laboratory-provided jar and placed in ice and shipped to SGS/AXYS Analytical Laboratories, Ltd. in Sidney, British Columbia.

2.4 Quality Assurance

Field samples were shipped to SGS/AXYS for analysis of PCB concentrations (Method 1668). A separate set of samples were sent to SVL Analytical in Kellogg, ID for assessment of dissolved organic carbon, total organic carbon, and total suspended solids.

2.4.1 Data Quality Assessment - PCBs

All data were reviewed for quality assurance in accordance with the project QAPP and as noted in the laboratory EDD-Excel files provided in the appendix. Data quality indicators evaluated for PCBs included the following:

- Daily Calibration Verification
- Lab Control Sample Recovery
- Sample and Method Blank Surrogate Recovery
- Matrix Spike Sample Recovery
- Duplicate sample relative percent differences (RPDs)
- Completeness

All reviewed quality control (QC) results for PCBs comply with QAPP data quality indicators, with the following exceptions:

- 3 congener values were flagged for failing the duplicate sample relative percent difference criterion.
- 10 congeners were outside of the control limits for analyte retention times.

There are no changes to PCB result values as a result of this assessment, although data qualifiers were added to select samples as described above.

2.4.2 Blank Censoring

Total PCB concentrations were corrected for method blank contamination following the procedures defined in the QAPP. Specifically, individual congeners found in the sample at a concentration less than three times the associated blank concentration were flagged and excluded from calculation of homolog and total PCB concentration. All total PCB and homolog results reported below are blank corrected using the above method. It should be noted that there is no standard blank correction method, and numerous approaches are utilized, both nationally and within the Spokane River Basin. The selection of the most appropriate blank correction methodology must consider factors such as study objectives, sample matrix, sampling methodology, expected range of results, and tolerance for biased results.

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3
Analytical Results

This section summarizes the results of the synoptic survey/artesian well/stormwater catch basin monitoring, in terms of concentrations of total PCBs and individual homologs.

3.1 Synoptic Survey

Total PCB concentrations at the Spokane River stations are listed in Table 2 and plotted in Figure 4. Observed PCB concentrations for the external sources are listed in Table 3. Furthermore, a detailed listing of individual PCB homolog concentrations and conventional parameters for each date at each sampling location is provided in Appendix A, and full laboratory data sheets are provided in Appendix D.

PCB concentrations are 33 to 90 pg/l at Plantes Ferry. Moving downstream, concentrations are between 37 and 131 pg/l upstream of Upriver Dam, and between 21 and 101 pg/l downstream of Upriver Dam. PCB concentrations range from 7 to 441 pg/l at Greene St. and are between 29 and 140 pg/l at Division St. PCB concentrations at the Spokane USGS Gage are between 31 and 98 pg/l. PCB concentrations between the USGS Gage and Nine Mile Dam are between 27 and 263 pg/l. Concentrations at Nine Mile Dam are in the range of 30 to 110 pg/l. All the samples exceed the Washington water quality standard of 7 pg/l.

Three samples have concentrations more than 2.5x greater than any other sample measured at the same station and are treated as potential outliers. These outliers correspond to a concentration of 101 pg/l Upstream of Upriver Dam measured on August 31, a concentration of 441 pg/l below Greene St. measured on August 30, and a concentration of 263 pg/l measured between the USGS Gage and Nine Mile Dam on September 1. Separate mass balance assessments were conducted including and excluding these potential outlier values to estimate the uncertainty that these potentially anomalous values cause.

Table 2. Spokane River Total PCB Concentrations (pg/l)

Location	8/29	8/30	8/31	9/1	9/2
Below Trent Ave. Bridge near Plantes Ferry	33.048	66.782	83.743	67.415	89.643
Upstream of Upriver Dam	36.804	130.72	91.584	102.072	90.379
Downstream of Upriver Dam	34.738	22.76	101.019	30.578	20.604
Below Greene St. Bridge	21.458	440.769	44.479	25.159	7.347
Division St.	139.61	75.536	118.035	129.456	28.844
Spokane USGS Gage	75.391	89.356	97.813	70.304	31.328
Between USGS Gage and Nine Mile Dam	81.176	88.262	26.772	263.201	50.54
Below Nine Mile Dam	32.638	29.867	52.281	109.578	59.604

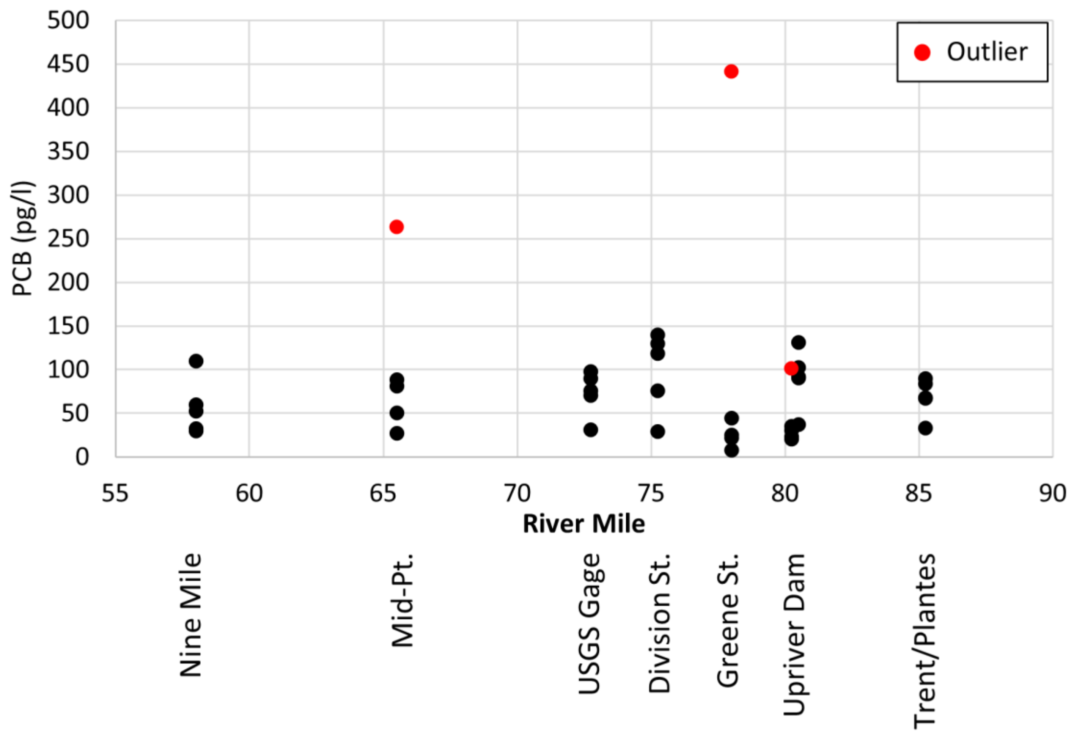

Figure 4. Spokane River Total PCB Concentrations (pg/l)

PCB concentrations measured in the external sources are shown in Table 3.

Table 3. Total PCB Concentrations in External Sources (pg/l)

Location	8/29	8/31	9/2
Inland Empire Paper	572	1,677	1,602
Spokane County Regional Water Reclamation Facility	253	200	121
Latah (Hangman) Creek	2.88	13.2	3.82
City of Spokane Riverside Park Water Reclamation Facility	221	199	139

3.1.1 Homolog Distributions

Homolog distributions are provided in Table 4, showing average concentration by homolog across all river stations. These data are provided in tabular format for each individual sample in Appendix A. Concentrations at locations Trent Ave, Above Upriver Dam, Below Upriver Dam, USGS Gage, Midpoint to Nine Mile Dam, and Nine Mile Dam are dominated by the tetra-chloro homolog, while concentrations at Greene St. and Division St. are dominated by the hexa-chloro homolog.

Table 4. Average PCB Concentration by Homolog Across All River Stations

	Nine Mile Dam	Mid-Pt. to Nine Mile Dam	USGS Gage	Division St.	Greene St.	Below Upriver Dam	Above Upriver Dam	Trent Ave.
Mono-	0	0	0	0	0	0	0	0
Di-	0.772	22.38	1.798	0.819	0	0.35	1.024	0
Tri-	2.76	2.797	6.209	8.711	4.092	6.148	11.862	22.084
Tetra-	17.437	40.505	27.492	24.345	17.652	23.964	40.755	41.120
Penta-	12.112	11.578	18.259	22.531	17.602	7.082	22.995	3.182
Hexa-	13.727	15.349	13.117	24.58	33.791	2.543	10.136	0.637
Hepta-	7.926	7.984	4.799	13.014	27.573	0.741	2.774	0.739
Octa-	1.567	1.054	0.952	3.045	5.609	1.014	0.601	0.198
Nona-	0.493	0.342	0.213	1.251	1.119	0.097	0.164	0.166
Deca-	0	0	0	0	0.404	0	0	0
Sum	56.794	101.99	72.838	98.296	107.842	41.94	90.312	68.126

3.2 Artesian Well

The total PCB concentrations observed in two samples collected at the artesian well were 1,300 and 1,500 pg/l. This corresponds to a concentration of 2,100 pg/l observed in 2021 (LimnoTech, 2022b).

3.2.1 Homolog Distributions

The homolog distribution for the two artesian well samples is provided in Figure 5, showing average concentration by homolog across both samples. These data are provided in tabular format for each individual sample in Appendix A.

The tri- and tetra-chloro homologs dominate the total concentration. A cosine similarity analysis between the artesian well samples and various Aroclors showed the closest match to Aroclor 1248 with a cosine similarity of 0.86. Analyses on the Artesian Well sample from 2021 showed a cosine similarity of 0.91 to Arochlor 1242 and a cosine similarity of 0.89 to Aroclor 1016. The 2022 artesian well samples showed much less similarity to these Aroclors, with a cosine similarity of 0.82 for Aroclor 1242 and 0.76 for Aroclor 1016.

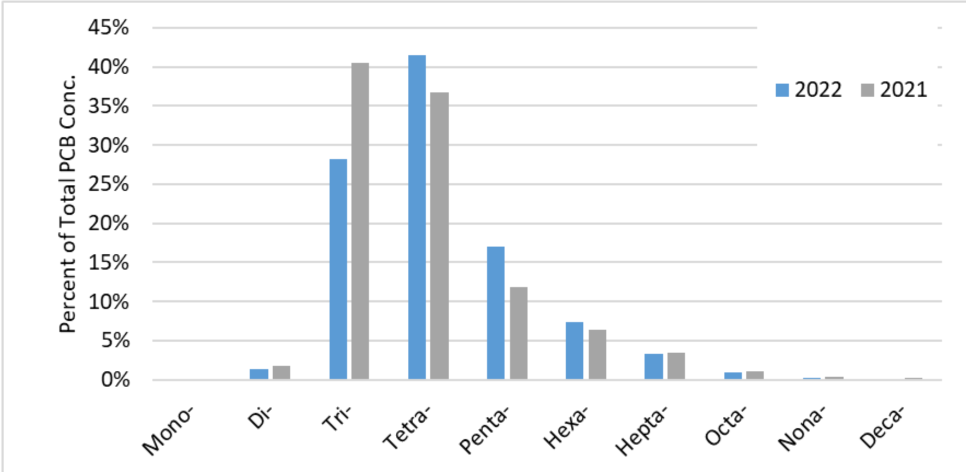

Figure 5. Blank-Corrected Homolog Concentrations for the 2021 and 2022 Artesian Well Samples

A detailed listing of individual PCB homolog concentrations for each of the artesian well samples is provided in Appendix A, and full laboratory data sheets are provided in Appendix D.

3.3 Stormwater Catch Basins

Total PCB concentrations at the Springfield stormwater catch basins are listed in Table 5. The total PCB concentrations observed range from 31.5 to 127 ug/kg.

Table 5. Total PCB Concentrations for the Stormwater Catch Basins

Location	Total PCB Concentration (ug/kg)
Catch Basin 1	127
Catch Basin 2	82.4
Catch Basin 3	94.3
Catch Basin 4	31.5

3.3.1 Homolog Distributions

Homolog distributions are provided in Table 6 for each of the catch basin samples. The hexa-chloro homolog had the highest concentrations in all four catch basins, with the penta-chloro homolog having the second-highest concentration.

Table 6. Concentration by Homolog for each Catch Basin Sample (ug/kg)

Homolog	Catch Basin 1	Catch Basin 2	Catch Basin 3	Catch Basin 4
Mono-	0.029	0.045	0.049	0.048
Di-	1.225	2.384	2.937	1.253
Tri-	1.092	1.609	1.369	1.200
Tetra-	9.852	6.140	5.251	3.278
Penta-	46.293	24.652	27.227	10.357
Hexa-	48.136	31.671	40.745	10.868
Hepta-	14.988	11.976	12.730	3.317
Octa-	3.876	3.264	3.177	0.907
Nona-	0.798	0.574	0.605	0.180
Deca-	0.208	0.116	0.187	0.045

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4
Mass Balance Assessment and Data Interpretation

The objective of the mass balance assessment is to use the results of the synoptic survey to identify stream reaches where unmonitored incremental loads lead to a significant increase in river concentrations. This section describes the application of the mass balance assessment and the interpretation of the artesian well and stormwater catch basin sampling. It is divided into subsections of:

- Conceptual approach to mass balance
- Application of mass balance
- Interpretation of the artesian well and stormwater catch basin data

4.1 Conceptual Approach to Mass Balance

The general conceptual approach of the mass balance assessment is to determine the presence of unmonitored loads (presumably from groundwater sources) by comparing the amount of mass passing through the Spokane River at two locations where flow and concentration measurements are available. The magnitude of the unmonitored load can be determined as the difference in monitored load at the downstream and upstream locations, as depicted below in Figure 6 and Equation 1. Q_u and Q_d represent the river flow at the upstream and downstream stations, respectively, while C_u and C_d represent the upstream and downstream PCB concentrations.

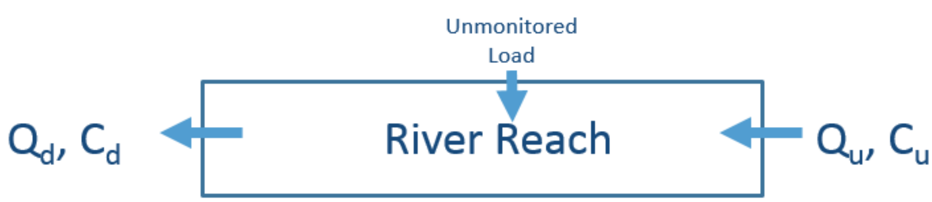

Figure 6. Simplified Description of Mass Balance Approach

The approach is described mathematically in Equation 1.

$$\text{Unmonitored load} = \text{Downstream load} - \text{Upstream load} \tag{1}$$

where:

Downstream load = Flow at downstream location (Q_d) x Concentration at downstream location (C_d)

Upstream load = Flow at Upstream location (Q_u) x Concentration at upstream location (C_u)

Equation 1 is based upon the assumption that environmental loss processes affecting PCBs are relatively insignificant between the two monitoring locations. This assumption was verified using low-flow hydraulic results from model of the Spokane River, observed data on suspended solids concentrations, and literature values for coefficients related to solids partitioning and volatilization.

The concept can be extended to address situations where a monitored load (e.g., wastewater treatment plant discharge) enters the reach between the upstream and downstream monitoring locations, as shown in Figure 7.

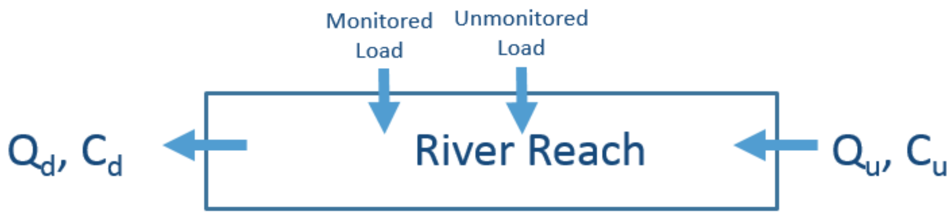

Figure 7. Mass Balance Approach in the Presence of a Monitored Load

In this situation, the mass balance equation is expanded to consider the monitored load as shown in Equation 2.

$$\text{Unmonitored load} = \text{Downstream load} - \text{Upstream load} - \text{Monitored Load} \tag{2}$$

4.2 Application of Mass Balance

Mass balance analyses were conducted on total PCBs and individual homologs. The data on flows are provided in Tables 7 and 8, which show individual daily flows as well as the average flow used for the mass balance assessments. Stream flow measurements were not available for below Trent Ave. Bridge, upstream and downstream of Upriver Dam, below Greene St., and between the USGS Gage and Nine Mile Dam on August 29 and 30 due to an equipment malfunction. Daily flow values generally remained within 3% of the average over the monitoring period, satisfying the requirement of the mass balance assessment that flows remain relatively steady.

Table 7. River Flows (cfs) Used in 2022 Mass Balance Assessment

Location	8/29	8/30	8/31	9/1	9/2	Average
Below Trent Ave. Bridge near Plantes Ferry	-	-	730	745	713	729
Upstream of Upriver Dam	-	-	650	633	630	638
Downstream of Upriver Dam	-	-	655	638	644	646
Below Greene St. Bridge	999	988	975	963	963	978
Division St.	-	-	725	740	721	729
Spokane USGS Gage	912	904	881	872	861	886
Between USGS Gage and Nine Mile Dam	-	-	1,225	1,104	1,010	1,113
Below Nine Mile Dam	1,150	1,177	1,138	1,142	1,125	1,146

Table 8. Point Source and Tributary Flows (cfs) from External Sources Used in 2022 Mass Balance Assessment

Location	8/29	8/30	8/31	9/1	9/2	Average
Inland Empire Paper	10.7	11.1	10.2	10.0	10.0	10.4
Spokane County Regional Water Reclamation Facility	10.8	10.7	10.8	10.9	10.7	10.8
Latah (Hangman) Creek	10.0	10.1	9.7	9.5	8.9	10
City of Spokane Riverside Park Water Reclamation Facility	41.4	43.0	39.8	39.8	40.1	40.8

The remainder of this section applies the conceptual approach described above, first to total PCBs, then on a homolog-specific basis.

4.2.1 Total PCB Mass Balance Assessment

Results of the total PCB mass balance assessment are shown in Table 9 and Figure 8. There is small positive incremental load (6.5 mg/day) of total PCBs in the in the reach between Trent Avenue and upstream of Upriver Dam. There is a larger negative incremental load (-74 to -98 mg/day, depending upon the inclusion of potential outliers) of total PCBs in the reach between upstream of Upriver Dam and downstream of Upriver Dam. There is also a small negative incremental load (-17.6 mg/day) of total PCBs in the in the reach between Division St and the Spokane USGS Gage. Results for the remaining reaches strongly depend upon the assumption made regarding the inclusion of potential outliers.

Table 9. Results of 2022 Mass Balance Assessment on Total PCBs

River Reach	Incremental Load (mg/day)	
	With Outliers	Without Outliers
Trent Avenue to Upstream of Upriver Dam	6.5	6.5
Upstream of Upriver Dam to Downstream of Upriver Dam	-74.8	-98.2
Downstream of Upriver Dam to Greene St.	186.8	10.9
Greene St. to Division St.	-20.0	154.0
Division St. to Spokane Gage	-17.6	-17.6
Spokane Gage to Mid-Point to Nine Mile Dam	101.3	-8.6
Mid-Point to Nine Mile Dam to Nine Mile Dam	-125.0	-13.5

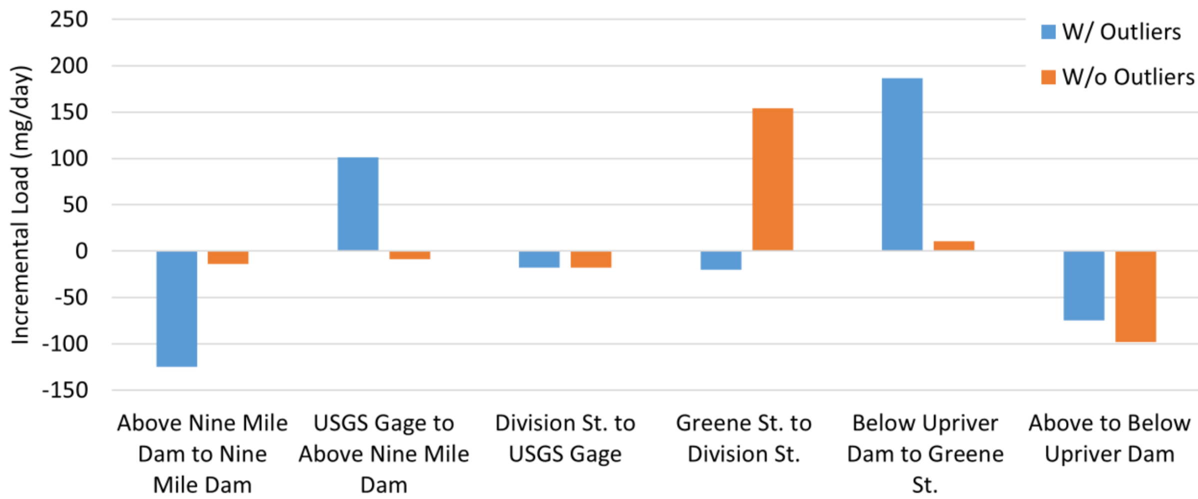

Figure 8. Results of 2022 Mass Balance for Total PCBs

4.2.2 Homolog-Specific Mass Balance Assessment

The mass balance assessment was also conducted on the individual homologs that comprise total PCB concentrations, with results summarized in Table 10 with outliers considered and Table 11 with outliers excluded. The uncertainty caused by potential outliers precludes drawing any firm conclusions for most reaches.

Table 10. Incremental Loads (mg/day) Estimated by Homolog-Specific Mass Balance Assessment for 2022 with Potential Outliers Included

	Mid-Point to Nine Mile Dam	Spokane Gage to Mid-Point	Division St. to Spokane Gage	Greene St. to Division St.	D/S of Upriver Dam to Greene St.	U/S to D/S of Upriver Dam	Trent Ave to U/S of Upriver Dam
Mono-	0	0	0	0.0	-0.4	0	-0.4
Di-	-59.7	54.8	2.4	1.7	-1.7	-1	-6.0
Tri-	-0.1	-11.6	-2.1	9.7	-1.1	-8.8	-27.7
Tetra-	-63.8	45	16.2	14.0	2.7	-25.8	-9.0
Penta-	1.5	-11.9	-0.6	10.3	30.5	-24.7	30.8
Hexa-	-4.5	12.7	-15.4	-19.2	76.8	-11.8	15.1
Hepta-	-0.2	11.1	-12.8	-30.4	64.8	-3.2	3.1
Octa-	1.4	0.8	-3.4	-5.4	11.8	0.7	0.6
Nona-	0.4	0.5	-1.8	0.3	2.5	-0.1	0.0
Deca-	0	0	0	-0.8	1.0	0	0.0
Sum	-125	101.3	-17.6	-20.0	186.8	-74.8	6.5

Table 11. Incremental Loads (mg/day) Estimated by Homolog-Specific Mass Balance Assessment for 2022 with Outliers Excluded

	Mid-Point to Nine Mile Dam	Spokane Gage to Mid-Point	Division St. to Spokane Gage	Greene St. to Division St.	D/S of Upriver Dam to Greene St.	U/S to D/S of Upriver Dam	Trent Ave to U/S of Upriver Dam
Mono-	0	0	0	0.0	-0.4	0	-0.4
Di-	-16.1	11.8	2.4	1.7	-1.9	-0.9	-6.0
Tri-	-0.2	-11.5	-2.1	14.3	-4.5	-10.7	-27.7
Tetra-	-31.6	13.2	16.2	22.3	-1.0	-31.6	-9.0
Penta-	15.8	-26	-0.6	44.9	1.5	-35.4	30.8
Hexa-	7.7	0.7	-15.4	40.4	11.6	-15.1	15.1
Hepta-	8.4	2.6	-12.8	22.4	4.7	-3.6	3.1
Octa-	2	0.2	-3.4	5.6	0.6	-0.7	0.6
Nona-	0.5	0.4	-1.8	2.4	0.2	-0.2	0.0
Deca-	0	0	0	0.0	0.0	0	0.0
Sum	-13.5	-8.6	-17.6	154.0	10.9	-98.2	6.5

One aspect of the homolog-specific mass balance that was not unduly confounded by the presence of outliers was the loss of PCBs across the range of homologs between the stations upstream and downstream of Upriver Dam (Figure 9). This loss could be caused by the active exchange between groundwater and surface water in the vicinity of Upriver Dam. Patmont et al (1985) estimated a seepage loss of 256 ± 56 cfs shortly upstream of the Upriver Dam, followed by 577 ±123 cfs of groundwater inputs immediately downstream of the dam. The simplistic hydraulic assumptions inherent to the mass balance approach applied in this study are incapable of accurately representing the alternating surface water and groundwater exchange around impoundments. A loss of higher PCB concentration surface water being immediately replaced by lower PCB concentration groundwater provides a plausible explanation for the apparent loss of PCBs from the river in the vicinity of Upriver Dam. Volatilization of PCBs as water passes through the dam and the presence of a subsurface coal fines layer installed as part of site remediation to address historical sediment PCB contamination have also been identified as mechanisms that could potentially remove PCBs from the water in this area.

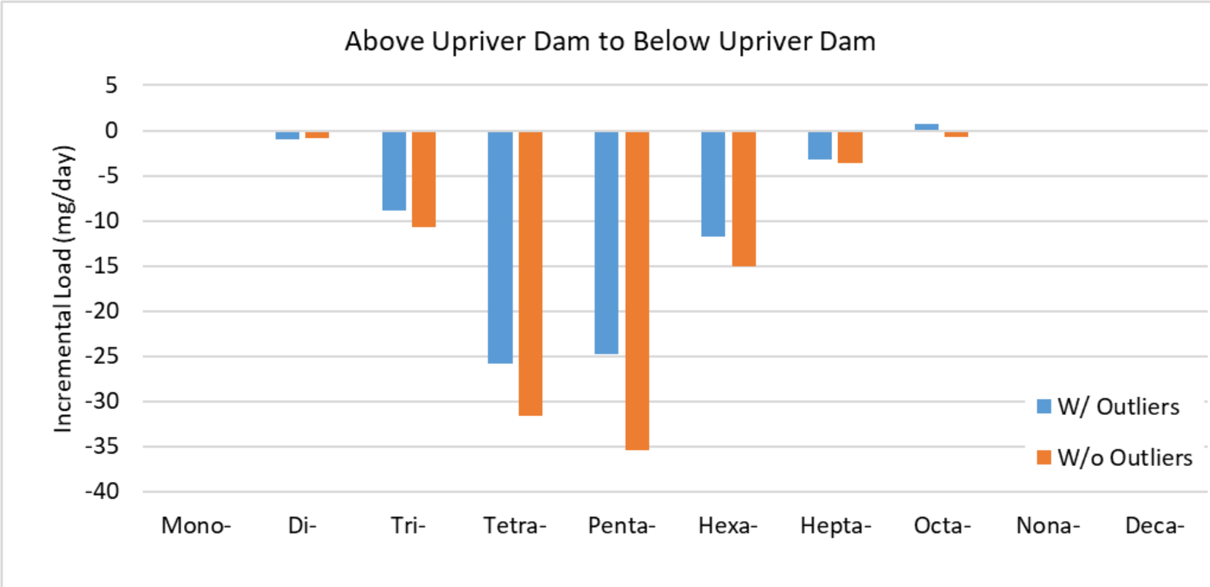

Figure 9. Homolog Mass Balance for the Reach Upstream and Downstream of Upriver Dam

4.2.3 PCB-11 Mass Balance

A separate mass balance assessment was also conducted on the congener PCB-11. This mass balance was confounded by: 1) PCB-11 concentrations were zero after blank censoring at all river stations except the midpoint between the Spokane USGS gage and Nine Mile and 2) the PCB-11 concentrations at this location include a potential outlier value. These limitations precluded any meaningful conclusions from being drawn regarding PCB-11.

4.2.4 Assessment of Potential Outliers

The results of the mass balance for most reaches depend strongly upon whether potential outlier concentrations are included in the assessment. The homolog distribution for each potential outlier was therefore compared to the distribution of the other samples at the station to provide some information on the nature of each outlier. The homolog distributions for the potential outliers were similar to the distribution of remaining samples at the stations upstream of Upriver Dam and at the mid-point between the Spokane Gage and Nine Mile (Figure 10). The homolog distribution for the potential outlier at Greene St was different than the distribution of the remaining samples (Figure 11), with the relative prevalence of the hexa- and hepta-chloro-homologs indicating the potential presence of Aroclor 1260 in the outlier sample.

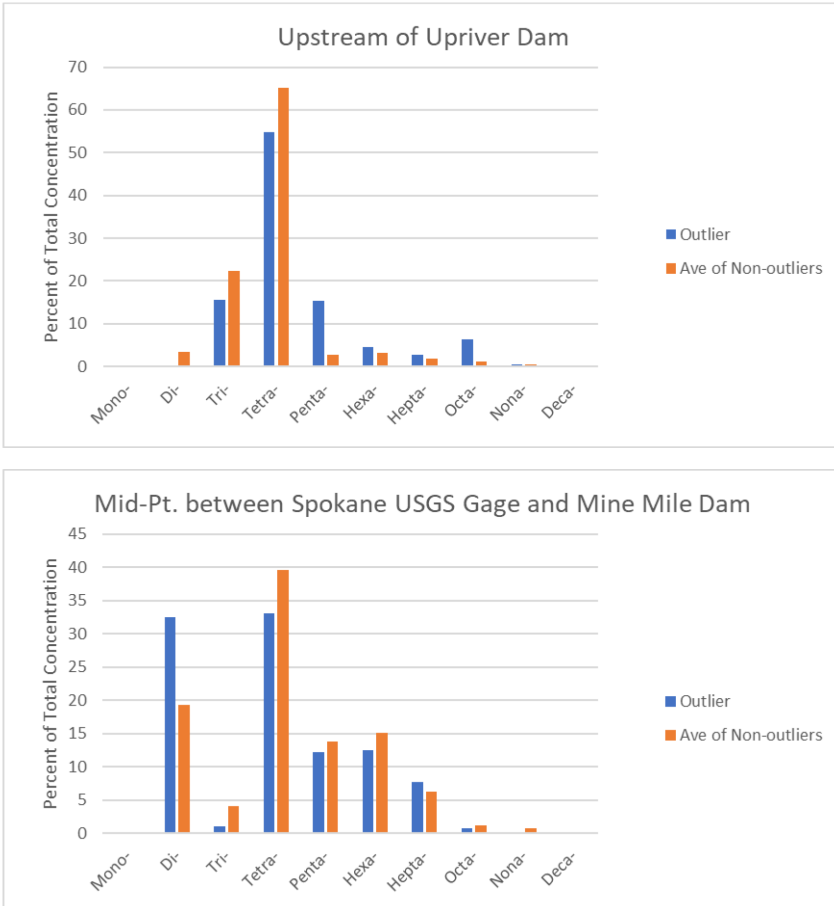

Figure 10. Comparison of Homolog Distributions between Potential Outliers and Other Samples for Cases where the Distributions Are Similar.

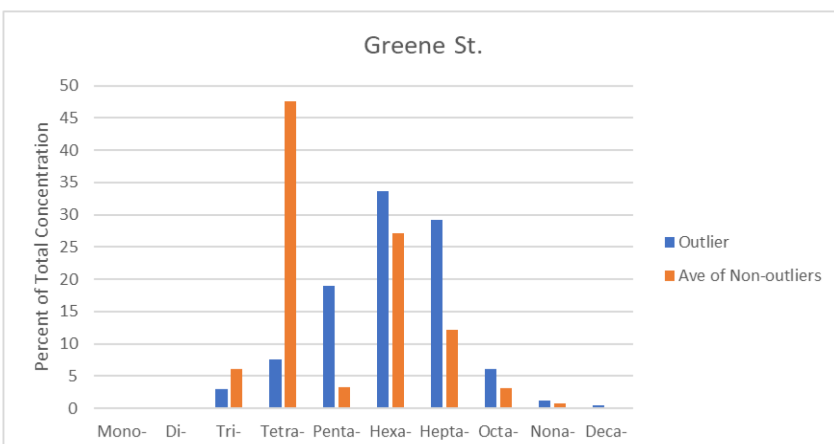

Figure 11. Comparison of Homolog Distribution between Potential Outliers for the Cases where the Distribution Are Dissimilar.

4.3 Interpretation of the Artesian Well and Stormwater Catch Basin Data

4.3.1 Artesian Well

Observed PCB concentrations in the artesian well were 1,300 to 1,500 pg/l, while average river PCB concentrations at the nearest upstream station of Greene St. ranged from 7 to 44 pg/l. (with a potential outlier concentration of 441 pg/l.) This indicates that well concentrations are an order of magnitude higher than in-river PCB concentrations and are contributing to an increase in Spokane River PCB concentrations. The presence of the potential outlier concentration at Greene St. limits the ability of the mass balance assessment to discern whether the artesian well is contributing a significant PCB load to the river. If the potential outlier is included in the mass balance assessment, there is no indication that an unknown load (artesian well or otherwise) is entering the river between Greene and Division Streets. If the potential outlier is excluded from the mass balance assessment, there is indication that an unknown load of approximately 150 mg/day is entering the river between Greene and Division Streets. It is noted that water quality monitoring conducted as part of Mission Reach PCB source identification did not observe an increase in water column PCB concentration between stations located upstream (WA 290 Left Bank) and downstream (East Spokane Blvd. Left Bank) of the artesian well discharge.

4.3.2 Stormwater Catch Basins

Historic catch basin PCB concentration data were available from two studies (City of Spokane, 2014; Urban Waters Initiative [Fernandez, 2012]) providing a total of 27 measurements. Sampling station names and reported total PCB concentrations are shown in Table 12. Total PCB concentrations at catch basins 1-4 in 2022 were compared against this historic data by plotting the 2022 data against the observed cumulative distribution frequency curve (CDF) of the historic data. All the 2022 total PCB concentrations are below the 65th percentile and arithmetic mean of the historic data, with three of the four catch basins having concentrations below the historic median (Figure 12). These data suggest that the Springfield service area is not delivering atypically high levels of PCBs to the Spokane stormwater system, although more detailed review of the nature of the historical data is recommended.

Table 12. Historic Catch Basin PCB Data

Source	Catch Basin Name	Total PCB (ug/kg)	Source	Catch Basin Name	Total PCB (ug/kg)
Urban Waters	Trent-TPC	5.82	City of Spokane	13-id-3	1185
Urban Waters	Cook - Sprg	980	City of Spokane	13-id-4	279
Urban Waters	FMCB	93	City of Spokane	13-id-11	5
Urban Waters	BrownCBAvg	12.4	City of Spokane	24-id-10	103
City of Spokane	1-C	754	City of Spokane	24-id-11	121
City of Spokane	2-C	296	City of Spokane	25-id-1	115
City of Spokane	8-C	115	City of Spokane	13-id-3	767
City of Spokane	11-C	179	City of Spokane	13-id-4	120
City of Spokane	12-C	731	City of Spokane	13-id-11	5.6
City of Spokane	1-C	464	City of Spokane	24-id-10	69.4
City of Spokane	2-C	126	City of Spokane	24-id-11	95.1
City of Spokane	8-C	87.9	City of Spokane	25-id-1	93.9
City of Spokane	11-C	74	City of Spokane	Garland-Normandie	13.1
City of Spokane	12-C	612			

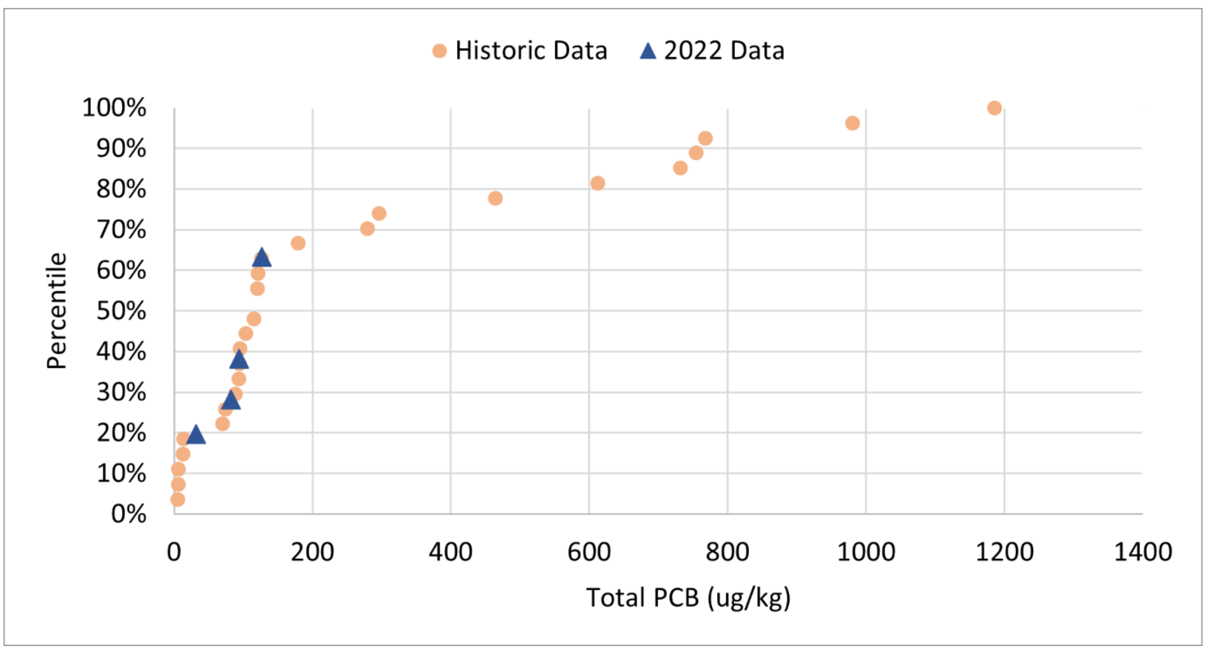

Figure 12. 2022 Catch Basin Data Compared to Cumulative Distribution Frequency Plot of Historic Catch Basin Data.

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5 Next Steps

Three actions are suggested for potential next steps to build upon the findings of this work:

1. Determine the magnitude of PCBs being loaded from the artesian well: The monitoring conducted for this project confirms that the artesian well is discharging PCBs to the Spokane River at a greatly elevated concentration but is unable to quantify the magnitude of the load. The magnitude of the load could be reasonably estimated simply via periodic monitoring of the rate of discharge flow. A more refined loading estimate could be attained via collection of additional PCB samples in conjunction with seasonal flow rate monitoring.
2. Determine the source of PCBs being loaded from the artesian well: The artesian well was not identified as a PCB source to the Spokane River at the time that the "Comprehensive Plan to Reduce Polychlorinated Biphenyls (PCBs) in the Spokane River" (LimnoTech, 2016) was developed. As such, neither the source of these PCBs nor potential efforts to control them were considered. Additional study to determine the source of these PCBs is recommended to inform future control activities.
3. More thoroughly assess the nature of the historical catch basin PCB data: The determination from this study that the Springfield service area is not contributing atypically high levels of PCBs to the Spokane stormwater system was based on a high-level assessment of the historical data. The historical data could be reviewed more thoroughly in terms of basin size, land use, etc. to verify that that the comparison made in this study is appropriate.

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6 References

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Appendix A:
Synoptic Survey Results - PCBs by Homolog

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Table A-1: Blank-Corrected Analytical Results for Spokane River below Trent Ave. Bridge near Plantes Ferry						
Station SR7	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	33.048	66.782	83.743	67.415	89.643	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	0	0	0	0	0	
Total Trichloro Biphenyls (pg/l)	0.262	30.01	23.509	23.569	33.071	
Total Tetrachloro Biphenyls (pg/l)	30.145	35.876	55.022	41.435	43.123	
Total Pentachloro Biphenyls (pg/l)	0.482	0.196	3.725	1.518	9.987	
Total Hexachloro Biphenyls (pg/l)	0.428	0.185	0.628	0.519	1.423	
Total Heptachloro Biphenyls (pg/l)	0.948	0.25	0.859	0.374	1.264	
Total Octachloro Biphenyls (pg/l)	0.533	0	0	0	0.459	
Total Nonachloro Biphenyls (pg/l)	0.25	0.265	0	0	0.316	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	0.57	0.64	0.61	0.60	<1.00	
Total Organic Carbon (mg/l)	1.75	<1.00	<1.00	<1.00	<1.00	
Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0	<1.0	1.0	

Table A-2: Blank-Corrected Analytical Results for Inland Empire Paper				
Station SR6	**8 / 29**	**8 / 31**	**9 /2**	
Total PCBs (pg/l)	572.058	1676.7	1601.525	
Total Monochloro Biphenyls (pg/l)	0	34.33	9.87	
Total Dichloro Biphenyls (pg/l)	205.24	417.7	291.4	
Total Trichloro Biphenyls (pg/l)	208.37	550.51	541.8	
Total Tetrachloro Biphenyls (pg/l)	146.17	456.9	502.16	
Total Pentachloro Biphenyls (pg/l)	9.212	143.09	163.73	
Total Hexachloro Biphenyls (pg/l)	1.02	53.125	61.547	
Total Heptachloro Biphenyls (pg/l)	1.478	17.998	23.706	
Total Octachloro Biphenyls (pg/l)	0.332	3.06	6.108	
Total Nonachloro Biphenyls (pg/l)	0.232	0	1.21	
Total Decachloro Biphenyls (pg/l)	0	0	0	
Dissolved Organic Carbon (mg/l)	67.9	87.3	70.2	
Total Organic Carbon (mg/l)	68.2	94.6	75.3	
Total Suspended Solids (mg/l)	2.4	10.0	13.2	

Table A-3: Blank-Corrected Analytical Results for Spokane River Upstream of Upriver Dam						
Station SR5b	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	36.804	130.72	91.584	102.072	90.379	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	0	5.12	0	0	0	
Total Trichloro Biphenyls (pg/l)	14.131	13.235	17.209	11.077	3.656	
Total Tetrachloro Biphenyls (pg/l)	19.209	63.427	41.587	39.514	40.04	
Total Pentachloro Biphenyls (pg/l)	0.227	36.298	21.987	30.895	25.57	
Total Hexachloro Biphenyls (pg/l)	0.73	10.303	6.045	15.087	18.517	
Total Heptachloro Biphenyls (pg/l)	1.714	1.781	3.357	4.761	2.255	
Total Octachloro Biphenyls (pg/l)	0.366	0.556	1.399	0.345	0.341	
Total Nonachloro Biphenyls (pg/l)	0.427	0	0	0.393	0	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	1.79	1.63	1.79	1.88	2.02	
Total Organic Carbon (mg/l)	1.70	1.77	1.74	1.82	1.81	
Total Suspended Solids (mg/l)	3.2	<1.0	6.8	4.0	5.6	

Table A-4: Blank-Corrected Analytical Results for Spokane River Downstream of Upriver Dam						
Station SR5a	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	34.738	22.76	101.019	30.578	20.604	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	0	0	0	0	1.75	
Total Trichloro Biphenyls (pg/l)	11.795	5.419	11.018	0.685	1.825	
Total Tetrachloro Biphenyls (pg/l)	21.717	16.727	38.603	28.169	14.606	
Total Pentachloro Biphenyls (pg/l)	0.227	0	34.021	1.163	0	
Total Hexachloro Biphenyls (pg/l)	0.286	0.22	10.71	0	1.497	
Total Heptachloro Biphenyls (pg/l)	0.448	0.394	1.945	0.561	0.357	
Total Octachloro Biphenyls (pg/l)	0.265	0	4.468	0	0.336	
Total Nonachloro Biphenyls (pg/l)	0	0	0.254	0	0.233	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	1.30	1.19	1.33	1.33	1.30	
Total Organic Carbon (mg/l)	1.26	1.29	1.17	1.20	1.18	
Total Suspended Solids (mg/l)	<1.0	<1.0	1.0	<1.0	1.2	

Table A-5: Blank-Corrected Analytical Results for Spokane County Regional Water Reclamation Facility				
Station SR5	**8 / 29**	**8 / 31**	**9 /2**	
Total PCBs (pg/l)	252.689	200.469	120.943	
Total Monochloro Biphenyls (pg/l)	24.8	4.76	18.5	
Total Dichloro Biphenyls (pg/l)	68.511	55.52	11.41	
Total Trichloro Biphenyls (pg/l)	49.463	52.786	34.988	
Total Tetrachloro Biphenyls (pg/l)	99.689	49.832	36.196	
Total Pentachloro Biphenyls (pg/l)	9.132	28.063	16.501	
Total Hexachloro Biphenyls (pg/l)	0	8.683	2.601	
Total Heptachloro Biphenyls (pg/l)	0.58	0.825	0.326	
Total Octachloro Biphenyls (pg/l)	0.514	0	0	
Total Nonachloro Biphenyls (pg/l)	0	0	0.421	
Total Decachloro Biphenyls (pg/l)	0	0	0	
Dissolved Organic Carbon (mg/l)	5.60	5.10	4.48	
Total Organic Carbon (mg/l)	5.34	5.01	4.46	
Total Suspended Solids (mg/l)	<1.0	<1.0	1.2	

Table A-6: Blank-Corrected Analytical Results for Spokane River below Greene St. Bridge						
Station SR4	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	21.458	440.769	44.479	25.159	7.347	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	0	0	0	0	0	
Total Trichloro Biphenyls (pg/l)	2.182	12.948	3.391	0.234	1.704	
Total Tetrachloro Biphenyls (pg/l)	12.915	33.468	27.776	12.354	1.747	
Total Pentachloro Biphenyls (pg/l)	0	83.86	3.05	1.102	0	
Total Hexachloro Biphenyls (pg/l)	4.755	148.02	6.574	7.11	2.495	
Total Heptachloro Biphenyls (pg/l)	1.606	128.75	3.046	3.394	1.07	
Total Octachloro Biphenyls (pg/l)	0	26.595	0.406	0.713	0.331	
Total Nonachloro Biphenyls (pg/l)	0	5.108	0.236	0.252	0	
Total Decachloro Biphenyls (pg/l)	0	2.02	0	0	0	
Dissolved Organic Carbon (mg/l)	1.50	1.12	1.10	1.09	1.06	
Total Organic Carbon (mg/l)	1.13	1.04	1.00	1.12	<1.00	
Total Suspended Solids (mg/l)	<1.0	4.2	<1.0	<1.0	1.0	

Table A-7: Blank-Corrected Analytical Results for Spokane River at Division St.						
Station SR3a	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	139.61	75.536	118.035	129.456	28.844	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	0.498	0	1.938	0	1.66	
Total Trichloro Biphenyls (pg/l)	20.21	5.593	14.089	1.767	1.894	
Total Tetrachloro Biphenyls (pg/l)	32.629	21.167	34.174	25.893	7.864	
Total Pentachloro Biphenyls (pg/l)	26.658	5.236	33.957	42.207	4.596	
Total Hexachloro Biphenyls (pg/l)	34.252	26.141	21.559	34.494	6.455	
Total Heptachloro Biphenyls (pg/l)	17.337	15.066	9.154	19.488	4.027	
Total Octachloro Biphenyls (pg/l)	5.829	1.725	2.357	4.104	1.208	
Total Nonachloro Biphenyls (pg/l)	2.197	0.608	0.807	1.503	1.14	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	1.05	1.16	1.14	1.07	1.06	
Total Organic Carbon (mg/l)	1.02	1.10	1.03	<1.00	1.18	
Total Suspended Solids (mg/l)	2.4	1.6	2.8	<1.0	<1.0	

Table A-8: Blank-Corrected Analytical Results for Spokane River at Spokane USGS Gage						
Station SR3	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	75.391	89.356	97.813	70.304	31.328	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	4.51	2.94	1.54	0	0	
Total Trichloro Biphenyls (pg/l)	2.066	9.953	16.634	0.577	1.815	
Total Tetrachloro Biphenyls (pg/l)	48.406	28.834	30.66	21.615	7.945	
Total Pentachloro Biphenyls (pg/l)	5.033	26.877	28.281	25.448	5.656	
Total Hexachloro Biphenyls (pg/l)	9.597	15.712	13.976	16.689	9.611	
Total Heptachloro Biphenyls (pg/l)	4.338	4.618	4.999	5.423	4.615	
Total Octachloro Biphenyls (pg/l)	1.045	0.422	1.723	0.263	1.308	
Total Nonachloro Biphenyls (pg/l)	0.396	0	0	0.289	0.378	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	1.07	1.13	1.49	1.13	1.24	
Total Organic Carbon (mg/l)	1.03	1.03	1.59	1.08	1.02	
Total Suspended Solids (mg/l)	<1.0	<1.0	<1.0	<1.0	<1.0	

Table A-9: Blank-Corrected Analytical Results for City of Spokane Riverside Park Water Reclamation Facility				
Station SR2	**8 / 29**	**8 / 31**	**9 /2**	
Total PCBs (pg/l)	221.079	199.007	138.515	
Total Monochloro Biphenyls (pg/l)	0	0	0	
Total Dichloro Biphenyls (pg/l)	42.103	13.356	13.279	
Total Trichloro Biphenyls (pg/l)	58.066	58.706	56.31	
Total Tetrachloro Biphenyls (pg/l)	78.347	67.511	27.951	
Total Pentachloro Biphenyls (pg/l)	38.127	44.64	32.456	
Total Hexachloro Biphenyls (pg/l)	2.835	10.942	6.741	
Total Heptachloro Biphenyls (pg/l)	1.082	3.852	1.232	
Total Octachloro Biphenyls (pg/l)	0.519	0	0.319	
Total Nonachloro Biphenyls (pg/l)	0	0	0.227	
Total Decachloro Biphenyls (pg/l)	0	0	0	
Dissolved Organic Carbon (mg/l)	2.37	2.67	2.29	
Total Organic Carbon (mg/l)	2.40	2.64	2.42	
Total Suspended Solids (mg/l)	1.8	2.0	3.0	

Table A-10: Blank-Corrected Analytical Results for Latah (Hangman) Creek				
Station HC1	**8 / 29**	**8 / 31**	**9 /2**	
Total PCBs (pg/l)	2.878	13.229	3.82	
Total Monochloro Biphenyls (pg/l)	0	0	0	
Total Dichloro Biphenyls (pg/l)	0	1.35	0	
Total Trichloro Biphenyls (pg/l)	0	1.403	0	
Total Tetrachloro Biphenyls (pg/l)	1.469	0.891	0	
Total Pentachloro Biphenyls (pg/l)	0	2.61	0	
Total Hexachloro Biphenyls (pg/l)	0.239	4.249	1.209	
Total Heptachloro Biphenyls (pg/l)	0.614	2.322	1.545	
Total Octachloro Biphenyls (pg/l)	0.236	0	0.357	
Total Nonachloro Biphenyls (pg/l)	0.32	0.404	0.709	
Total Decachloro Biphenyls (pg/l)	0	0	0	
Dissolved Organic Carbon (mg/l)	4.59	4.87	4.25	
Total Organic Carbon (mg/l)	4.69	4.31	4.23	
Total Suspended Solids (mg/l)	<1.0	<1.0	1.2	

Table A-11: Blank-Corrected Analytical Results for Spokane River between USGS Gage and Nine Mile Dam						
Station SR1a	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	81.176	88.262	26.772	263.201	50.54	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	24.89	0	1.51	85.5	0	
Total Trichloro Biphenyls (pg/l)	5.158	3.89	2.004	2.592	0.343	
Total Tetrachloro Biphenyls (pg/l)	46.154	44.339	9.819	87.081	15.132	
Total Pentachloro Biphenyls (pg/l)	0	5.507	2.924	32.282	17.177	
Total Hexachloro Biphenyls (pg/l)	2.775	22.325	6.085	32.934	12.628	
Total Heptachloro Biphenyls (pg/l)	1.565	9.617	3.913	20.441	4.386	
Total Octachloro Biphenyls (pg/l)	0.634	1.62	0.517	1.936	0.564	
Total Nonachloro Biphenyls (pg/l)	0	0.964	0	0.435	0.31	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	1.35	1.04	1.15	1.21	0.98	
Total Organic Carbon (mg/l)	2.91	1.01	1.10	1.04	1.11	
Total Suspended Solids (mg/l)	1.0	1.2	<1.0	1.2	2.2	

Table A-12: Blank-Corrected Analytical Results for Spokane River at Nine Mile Dam						
Station SR1	**8 / 29**	**8 / 30**	**8 / 31**	**9 / 1**	**9 /2**	
Total PCBs (pg/l)	32.638	29.867	52.281	109.578	59.604	
Total Monochloro Biphenyls (pg/l)	0	0	0	0	0	
Total Dichloro Biphenyls (pg/l)	0	0	2.679	1.18	0	
Total Trichloro Biphenyls (pg/l)	4.871	3.877	1.37	2.072	1.612	
Total Tetrachloro Biphenyls (pg/l)	14.423	14.726	20.751	27.636	9.648	
Total Pentachloro Biphenyls (pg/l)	0.211	0.331	14.59	35.257	10.17	
Total Hexachloro Biphenyls (pg/l)	5.262	5.111	8.337	27.448	22.477	
Total Heptachloro Biphenyls (pg/l)	6.923	4.288	3.593	12.913	11.911	
Total Octachloro Biphenyls (pg/l)	0.948	1.283	0.666	2.262	2.677	
Total Nonachloro Biphenyls (pg/l)	0	0.251	0.295	0.81	1.109	
Total Decachloro Biphenyls (pg/l)	0	0	0	0	0	
Dissolved Organic Carbon (mg/l)	1.19	1.22	1.23	2.15	1.12	
Total Organic Carbon (mg/l)	1.21	1.26	1.12	1.63	1.00	
Total Suspended Solids (mg/l)	<1.0	7.8	<1.0	1.8	1.4	

Table A-13: Blank-Corrected Analytical Results for Artesian Well						
Station AW	9/30	9/30-R				
Total PCBs (pg/l)	1549.569	1307.64				
Total Monochloro Biphenyls (pg/l)	0	0				
Total Dichloro Biphenyls (pg/l)	21.69	17.66				
Total Trichloro Biphenyls (pg/l)	436.282	338.584				
Total Tetrachloro Biphenyls (pg/l)	643.209	550.577				
Total Pentachloro Biphenyls (pg/l)	263.727	237.302				
Total Hexachloro Biphenyls (pg/l)	114.544	105.065				
Total Heptachloro Biphenyls (pg/l)	50.888	43.303				
Total Octachloro Biphenyls (pg/l)	14.076	12.457				
Total Nonachloro Biphenyls (pg/l)	3.303	2.692				
Total Decachloro Biphenyls (pg/l)	1.85	0				
Dissolved Organic Carbon (mg/l)	1.77	1.71				
Total Organic Carbon (mg/l)	1.72	1.59				
Total Suspended Solids (mg/l)	1.4	1.8				

Table A-14: Blank-Corrected Analytical Results for Stormwater Catch Basin						
Station CB1	9/7					
Total PCBs (pg/g)	126496.876					
Total Monochloro Biphenyls (pg/g)	29.25					
Total Dichloro Biphenyls (pg/g)	1225.488					
Total Trichloro Biphenyls (pg/g)	1092.194					
Total Tetrachloro Biphenyls (pg/g)	9852.061					
Total Pentachloro Biphenyls (pg/g)	46292.546					
Total Hexachloro Biphenyls (pg/g)	48135.548					
Total Heptachloro Biphenyls (pg/g)	14988.194					
Total Octachloro Biphenyls (pg/g)	3875.595					
Total Nonachloro Biphenyls (pg/g)	798					
Total Decachloro Biphenyls (pg/g)	208					
Percent Solids (%)	98.8					
Percent Organic Carbon (%)	6.81					

Table A-15: Blank-Corrected Analytical Results for Stormwater Catch Basin						
Station CB2	**9/7**					
Total PCBs (pg/g)	82430.929					
Total Monochloro Biphenyls (pg/g)	44.9					
Total Dichloro Biphenyls (pg/g)	2383.609					
Total Trichloro Biphenyls (pg/g)	1608.691					
Total Tetrachloro Biphenyls (pg/g)	6140.274					
Total Pentachloro Biphenyls (pg/g)	24651.763					
Total Hexachloro Biphenyls (pg/g)	31671.3					
Total Heptachloro Biphenyls (pg/g)	11976.443					
Total Octachloro Biphenyls (pg/g)	3263.649					
Total Nonachloro Biphenyls (pg/g)	574.3					
Total Decachloro Biphenyls (pg/g)	116					
Percent Solids (%)	98.7					
Percent Organic Carbon (%)	8.37					

Table A-16: Blank-Corrected Analytical Results for Stormwater Catch Basin						
Station CB3	**9/7**					
Total PCBs (pg/g)	94276.033					
Total Monochloro Biphenyls (pg/g)	48.8					
Total Dichloro Biphenyls (pg/g)	2936.864					
Total Trichloro Biphenyls (pg/g)	1368.994					
Total Tetrachloro Biphenyls (pg/g)	5251.267					
Total Pentachloro Biphenyls (pg/g)	27226.731					
Total Hexachloro Biphenyls (pg/g)	40745.11					
Total Heptachloro Biphenyls (pg/g)	12729.726					
Total Octachloro Biphenyls (pg/g)	3176.841					
Total Nonachloro Biphenyls (pg/g)	604.7					
Total Decachloro Biphenyls (pg/g)	187					
Percent Solids (%)	96.7					
Percent Organic Carbon (%)	8.54					

Table A-17: Blank-Corrected Analytical Results for Stormwater Catch Basin							
Station CB4	**9/7**						
Total PCBs (pg/g)	31452.614						
Total Monochloro Biphenyls (pg/g)	47.7						
Total Dichloro Biphenyls (pg/g)	1253.197						
Total Trichloro Biphenyls (pg/g)	1200.04						
Total Tetrachloro Biphenyls (pg/g)	3278.405						
Total Pentachloro Biphenyls (pg/g)	10356.56						
Total Hexachloro Biphenyls (pg/g)	10867.822						
Total Heptachloro Biphenyls (pg/g)	3317.43						
Total Octachloro Biphenyls (pg/g)	906.56						
Total Nonachloro Biphenyls (pg/g)	180.2						
Total Decachloro Biphenyls (pg/g)	44.7						
Percent Solids (%)	99.4						
Percent Organic Carbon (%)	6.96						

Appendix B:
Quality Assurance Project Plan

Provided separately as an electronic document

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Appendix C:
Laboratory Results

Provided separately as electronic spreadsheets

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