

Technical Track Work Group – Project Descriptions for Polling

The following projects have been discussed by the Technical Track Work Group (TTWG) of the Task Force and scoped to different degrees. Table 1 presents a list of technical projects that are currently under consideration (shaded in orange) or already underway (in white). Two projects (shaded light green) will not be evaluated for implementation until results from other projects have been assessed. Project descriptions for each numbered project listed in Table 1 can be found on the following pages and are intended to be used to understand, discuss, evaluate and prioritize projects for implementation in the upcoming biennium.

Table 1 – TTWG Project Status

	Task	Status	Cost Estimate
1	Long-term Effectiveness Monitoring – future years	Underway – needs funding in future years	Fish: \$65k/yr Water: \$135k/yr
	Hot Spot Source Identification (See below)	See Options Below	
	<ul style="list-style-type: none"> • Sampling of Artificial Bottom Fill Material 	Underway	
2	<ul style="list-style-type: none"> • Sub-Bottom Object Detection Survey 	Pending future prioritization	\$20k
3	<ul style="list-style-type: none"> • Analysis of Existing Bottom Sediment Samples from Trent Bridge, other 	Pending future prioritization	\$5k
4	<ul style="list-style-type: none"> • Additional Stormwater Reconnaissance 	Pending future prioritization	Negligible
	<ul style="list-style-type: none"> • Near-bank Temperature Monitoring 	Completed	
5	<ul style="list-style-type: none"> • Groundwater elevation monitoring to determine periods of groundwater inflow – Mission Reach near Basalt – SVRPA interface 	Pending future prioritization	?
6	<ul style="list-style-type: none"> • Monitor Artesian Well – Mission Reach 		\$10k
	<ul style="list-style-type: none"> • Deeper dive into the origin of fill material 	Currently measuring PCBs in brick and rock in Mission, wait on this task	\$20
7	<ul style="list-style-type: none"> • Additional water column monitoring near hot spot– Mission Reach 	Pending future prioritization	\$50k
8	<ul style="list-style-type: none"> • Additional biofilm sampling 	Pending future prioritization	\$50-90k
	Sampling to Define Non-point Load during High River Flows	Pending future prioritization SPMDs at high flow may cover- wait on this task	\$30 - \$50k
9	PMF Phase 2B	Partially funded. Need additional funding	\$15k
10	Selective Low-flow Water Column Synoptic Sampling (including USGS Gage to 9-Mile Reach for Mass Balance)	Pending future prioritization	\$50 - 75k
11	Sources and Pathways of PCB-11: Phase I	Referred from TSCA workgroup, pending future prioritization	\$8k
12	Old School drywell, stormwater concentrations potential for transport – Phase I Assessment	Pending future prioritization	\$10k
	Significance of Groundwater Sources Upgradient of Kaiser	Completed	

1. Long-term Effectiveness Monitoring – Future Years

The Technical Track and Fish Work Groups developed recommendations regarding a long-term monitoring plan to address the Task Force’s objective of demonstrating progress toward achievement of applicable water quality criteria for PCBs in the Spokane River. The plan consists of monitoring the PCB content of one year old rainbow trout, along with water column PCB concentrations measured using semi-permeable membrane devices (SPMDs). Fish are to be collected once per sampling year and the water column will be sampled three times per sampling year (over three separate one month periods representing low, medium and high flow conditions). The Task Force approved funding for the first year of monitoring per this long-term plan in 2020. Fish were collected by Washington Department of Fish and Wildlife (WDFW) for purposes of PCB analysis in fall of 2020. SPMD sampling for the first year is ongoing, having started in the summer of 2020 and scheduled to end in the spring of 2021.

In order to meet the objective of providing a long-term trend assessment, this monitoring must continue periodically into the future. The Technical Track and Fish Work Group recommended that monitoring be conducted every other year, although no formal decision was made by the Task Force regarding future monitoring frequency. This task consists of continuing the monitoring of water column and fish tissue for PCBs into the future.

Hot Spot Source Identification (Project Numbers 2 – 8)

A number of potential tasks were identified by the Technical Track Work Group (TTWG) that support furthering the understanding of source(s) of elevated biofilm PCB concentrations in the Mission Reach. Two have these have already been addressed to various degrees:

- The Task Force has approved collection of artificial material present on the stream bottom of the river in the Mission Reach for PCB analysis. This is designed to identify whether PCBs present in the fill material could be the source of the biofilm PCBs.
- Ecology conducted near-bank stream temperature monitoring in the summer of 2020. intended to identify whether areas of groundwater inflow to the Mission Reach could be observed via the presence of colder near-bank water temperatures.

The remaining hot spot related tasks are described below.

2. Sub-Bottom Object Detection Survey – Hot Spot Source ID Task

PCB-containing objects (e.g., drums, transformers) buried in the stream bank and/or in the river bed are a hypothesized source of contamination in the Mission Reach. This task consists of using remote sensing technologies to search for the presence of these objects. The object detection survey would be conducted as part of a tiered approach. The first tier would consist of a survey by boat with a magnetometer sensor to identify possible ferrous objects. This would be followed, as necessary, by underwater imaging to visually identify sources. Potential sources identified by magnetometer, but not visually identified, would require subsequent assessment with ground penetrating radar.

Before proceeding with this task, an additional initial assessment would be required to ensure that the sensing devices would be able to distinguish between buried objects with the potential to contain PCBs and those with little likelihood of contributing significant PCB contamination (e.g., sheet metal).

3. Analysis of Existing Bottom Sediment Samples from Trent Bridge- Hot Spot Source ID Task

Ecology has obtained samples of natural bottom fill collected as part of pier replacement work being conducted at Trent Bridge by the Washington Department of Transportation. Visual inspection of the collected samples indicated that the substrate consisted primarily of glacial till material. These samples could be analyzed for PCB content to define the potential for natural bottom fill materials to serve as a source of PCB contamination in the Mission Reach.

4. Additional Stormwater Reconnaissance – Hot Spot Source ID Task

The near-bank stream temperature monitoring conducted by Ecology in the summer of 2020 identified the presence of several apparent outfall pipes in the stream bank area with the potential to discharge to the Spokane River. Many of these pipes did not appear to be part of the City's stormwater infrastructure, raising the concern that they could represent PCB sources to the river that had not been previously accounted for. The TTWG identified a task corresponding to better assessing the potential significance of these stormwater outfalls as a source of PCB contamination.

Jeff Donovan from the City of Spokane subsequently conducted an assessment that provided information of the nature and potential significance of these outfalls. He first identified the GIS location of the outfall pipes and characterized them as: 1) City MS4 Outfall, 2) CSO Outfall, 3) Private SW Outfall, or 4) Unknown. He then conducted a field reconnaissance survey during wet weather (0.3" rainfall event) to observe whether stormwater was being discharged from any of the pipes of unknown origin. No stormwater discharge was observed from the previously unidentified pipes during the survey.

Jeff's work largely accomplished the task identified by the TTWG. Future efforts on this task would consist of additional field reconnaissance during larger storm events to determine if stormwater is being discharged to the Spokane River from any of the outfalls of unknown origin.

5. Groundwater/River Elevation Monitoring to Support Refined Assessment of Groundwater Contribution – Mission Reach – Hot Spot Source ID Task

The extent of groundwater contribution to the Mission Reach is an important unknown, as groundwater inflow is necessary to provide a pathway for upland groundwater PCB contamination to reach the river. Existing coarse-scale estimates indicate that the net movement of water in the Mission Reach is from the river to the aquifer; however, sporadic well and river elevation data near Hamilton St. in the vicinity of the Spokane Valley Rathdrum Prairie Aquifer (SVRPA/Basalt interface) indicate that groundwater can enter the Mission Reach during select periods. The available data are insufficient to define either the spatial or temporal extent of this groundwater contribution to the river. This task consists of more robust monitoring of groundwater and river elevation. This monitoring could either be conducted with continuous elevation measurements at an existing monitoring well near Hamilton Street (which would provide better temporal understanding at a single location) and/or through installation of piezometers at new locations (which would provide better understanding of the spatial distribution of groundwater inflow).

If the Task Force can get access to the monitoring well near Hamilton Street Bridge, the data loggers would be purchased by the Task Force and Spokane County has volunteered to install the loggers and monitor the site, as it aligns well with the aquifer monitoring work they already do. The property was

owned at one time by Browns Building Materials, but the site is listed as Hamilton Street Bridge site on Ecology's website - <https://apps.ecology.wa.gov/gsp/Sitepage.aspx?csid=3509>

6. Monitor Artesian Well – Mission Reach – Hot Spot Source ID Task

The near-bank temperature float conducted by Ecology in Summer, 2020 identified the presence of a flowing well located on the south bank of the river between Hamilton St. and Spokane Falls Blvd. The presence of flow during dry weather conditions indicates that the origin is likely groundwater. The primary reason for discounting groundwater as a source of contamination to the Mission Reach is absence of a delivery mechanism. Because this well represents an apparent groundwater delivery mechanism, sampling it for PCB concentration would provide useful information on whether groundwater is delivering measurable quantities of PCBs to the Mission Reach.

7. Additional Water Column Monitoring near Hot Spot – Hot Spot Source ID Task

The preliminary 2020 SPMD water column results indicate the presence of elevated water column PCB concentrations near the Mission Reach Hot Spot. This measurement was taken at a single location where peak biofilm PCB concentrations were observed in 2018 and 2019. The spatial extent of these elevated water column concentrations are currently unknown, as similarly elevated concentrations have not been observed at the nearest upstream (Greene St.) or downstream station (USGS Gage). No other water column PCB data are available in the direct vicinity of the hot spot.

This task would consist of additional water column monitoring near the hot spot, with sufficient spatial resolution to define the areal extent of the elevated water column concentrations. This information would be beneficial in determining the absolute magnitude of the loading source, as a mass balance analysis cannot currently be conducted when the lateral extent of elevated water column concentrations is unknown. Sampling would likely be collected using grab samples during summer low flow conditions.

8. Additional Biofilm Sampling – Hot Spot Source ID Task

Coarsely spaced biofilm sampling conducted in 2018 identified greatly elevated biofilm PCB concentrations at a single location in the Mission Reach. Subsequent biofilm sampling in 2019 included greater sampling density in the vicinity of Mission Reach and showed elevated biofilm PCB concentrations at multiple locations in the reach. The 2019 sampling density was sufficient to indicate broad locations of concern, but insufficient to identify specific hot spots.

Additional biofilm sampling, conducted at sufficiently high spatial resolution, could be used to better identify locations of hot spots and provide information that could be used to infer the nature of the PCB source. Results of geostatistical analyses discussed above indicate that samples spaced approximately 100 feet apart would be required to pinpoint source location, making this option prohibitively expensive for analysis using Method 1668. This option may be more feasible if a less rigorous analytical method is used, as the superior detection limits and congener profiles provided by Method 1668 would not be required if the intent of the monitoring was solely to identify hot spots.

9. PMF Phase 2B

The Task Force currently has partially funded Dr. Lisa Rodenburg to conduct a holistic analysis of PMF and MLR results from multiple environmental compartments (i.e., surface water, influent/effluent, biofilm, fish, etc.) in conjunction with hydrologic, hydrogeologic, land use, spatial, temporal, and other associated factors to further the understanding of PCB sources and pathways within the Spokane River Watershed. \$15,000 out of an initial request of \$30,000 has been approved. Dr. Rodenburg has indicated that the initial funding may be sufficient for her to complete her analysis. This task would provide the remaining funding needed should the currently authorized amount be insufficient.

10. Selective Low-flow Water Column Synoptic Sampling

The Task Force conducted low flow synoptic surveys to support mass balance assessments in 2014, 2015, and 2018. Only the 2018 survey generated mass balance results for the segment of river between the USGS gage in Spokane and Nine Mile Dam. This survey showed the potential for an unknown PCB load of 60 mg/day for this segment, which (if accurate) is large relative to other sources.

The intent of this task is to conduct an additional low flow synoptic survey to support a mass balance assessment for the segment of river between the USGS gage and Nine Mile Dam, to provide confirmation of the unknown loading source. This task was originally scoped in 2019 and consisted of water samples being taken at the USGS gage, Nine Mile Dam and one intermediate Spokane River location. This would provide improved resolution to the 2018 survey results in terms of where the unknown load is entering.

11. Sources and Pathways of PCB-11: Phase I – Initial Investigations

PCB-11 is of particular interest in the Spokane River watershed because it is the most prominent congener found in the water column in the Spokane River. It is therefore necessary to identify the sources and pathways of PCB-11, in the Task Force’s interest of reducing the amount of PCBs in the Spokane River and ultimately bringing the Spokane River into compliance with applicable water quality standards for PCBs. This initial phase of PCB-11 investigations consists of conducting a mass balance for PCB-11 in the Spokane River, in order to verify whether the known sources fully explain observed instream loads.

Mass balance analyses have previously been conducted at a homolog scale for the 2014, 2015, and 2018 synoptic surveys. The results of these analyses specific to dichloro homologs provide some insight into the potential for their being unexplained sources of PCB-11, as PCB-11 is a major contributor to total dichloro homolog concentrations. Results are summarized below.

Magnitude of Unexplained Dichloro Homolog Load from Prior Mass Balance Assessments (mg/day)

Time Period	River Reach							
	Lake CdA to Post Falls	Post Falls to Barker	Barker to Mirabeau	Mirabeau to Plante’s Ferry	Plante’s Ferry to Upriver	Upriver to Greene	Greene to Spokane Gage	Spokane Gage to Nine Mile
2014	-0.4	0.8	-3.7		1.1		32.5	-
2015	-	-	0.3	-1.8	-20.0		-0.5	-
2018			0.2	0.5	-9.1	-2.4	8.7	21.1

These results indicate negligible (i.e., 1 mg/day or less) unexplained loads of dichloro homologs for all portions of the river upstream of Greene St., strongly implying that significant unknown sources are absent in these areas. The reaches downstream of Greene St. show the potential for an unexplained source, with:

- two out of the three surveys showing unexplained loads of at least 8.7 mg/day between Greene St. and the Spokane USGS Gage
- the only survey with results downstream of the Spokane USGS Gage showing an unexplained load of at least 21.1 mg/day.

The mass balance assessment discussed above considered all dichloro homologs, and are not specific to PCB-11. Further assessment is needed to determine the potential for unexplained sources of PCB-11.

This task consists of conducting mass balances for PCB-11 only, on the same low flow synoptic surveys of 2014, 2015 and 2018 as shown in the table above. Mass balances would be conducted for each individual river reach for which data exist. If the in-river PCB-11 mass load is not explained by known sources, then a subsequent effort can be made to identify unknown sources.

12. Preliminary Assessment of PCB Loading Significance from Stormwater Drywells

Much of the urban stormwater generated in the Spokane watershed is delivered to drywells rather than being directly discharged to the Spokane River. It has been implicitly assumed that PCBs in stormwater delivered to drywells are effectively trapped by surficial and subsurface organic matter prior to their being delivered via groundwater to the river. This assumption has never been explicitly verified, due to difficulties in sampling the transport pathway between the drywells and the river. The assumption of negligible contribution to the river is likely accurate for drywells consisting of grassed swales, but of uncertain accuracy for older chamber-type dry wells due to the low organic matter content of soils in the watershed.

This task consists of an initial assessment of the maximum loading potential of PCBs to the Spokane River from chamber-type dry wells. The task consists of three steps, with an optional fourth step:

1. Define the number and location and drainage area served by chamber-type dry wells
2. Calculate the annual runoff volume delivered to each of the wells
3. Convert runoff volume to annual PCB load by applying an average stormwater PCB concentration by drywell.
4. (Optional) To the extent the data allow, the loading estimates from Step 3 could be reduced to reflect the removal of stormwater solids from dry well via maintenance from vacuum trucks. This would require information on the annual amount of solids removed per drywell and an assume PCB concentration of drywell solids.

Summing the estimated annual PCB load from each of the drywells will provide an upper bound estimate of potential PCB delivery to the Spokane River. If the upper bound loading is small relative to other sources, drywells could be moved to a low priority category in terms of PCB control. If the upper bound loading is significant relative to other sources, this could trigger more detailed assessment of the potential for these PCBs to be delivered to the Spokane River.

Deferred TTWG Projects – Awaiting results from previous studies prior to evaluation for implementation

Deeper Dive into the Origin of Fill Material – Hot Spot Source ID Task

The river bottom in the Mission Reach contains large quantities of artificial fill material, both broken concrete and brick. This fill material could be the source of elevated biofilm PCB concentrations if the material was contaminated with PCBs prior to being put in the river. Limited initial investigations to identify the nature of the fill material were unsuccessful, but more could be done in this regard. This task would consist of: searches of historical material at the Spokane Library; surveying Task Force members and/or Ecology staff whether they have any information, or know of others with information, about the origin of the fill; and issuing a public call for information through the Spokane River Forum or via social media.

Given that the Task Force has authorized direct measurement of PCB concentration in this fill material, this task may be best postponed until results from that study are available.

Sampling to Define Non-point Load during High River Flows

Mass balance assessments conducted by the Task Force have identified the large majority of PCB loads to the Spokane River. These assessments were conducted solely using data from low flow conditions and provide no information about additional sources that may be entering the river during periods of higher flow. A mass-balance assessment of the 2016 monthly Spokane River sampling data indicated that significant PCB loads may be entering during non-low flow conditions from previously uncharacterized sources (e.g., bankside sub-surface sources that are mobilized during periods of higher water table elevation). The presence of these loads is currently somewhat speculative, as the 2016 surveys were not specifically intended to support mass balance assessments.

This task would consist of conducting synoptic surveys specifically intended to support mass balance assessments during high periods of high flow. Note that this task was identified prior to the decision to deploy semi-permeable membrane devices (SPMDs) during moderate and high flow periods. The SPMD deployment currently underway will provide additional information regarding the presence of these sources, so this task may be best delayed until the full year of SPMD results become available.