

## Most Recent Summary of Tasks for State FY 2020 – 2021 Biennium for SRRTTF Activities to Potentially Be Included in Ecology Contract Agreement with ACE

At the June 26, 2019 SRRTTF meeting, the Technical Track Work Group (TTWG) presented a list of tasks to be considered for the FY 2020-2021 ACE-SRRTTF contract with Ecology. The Task Force approved moving forward on two tasks that were supported with SRSP funding:

- Support for expanding the scope of Ecology's 2019 Biofilm Assessment project (\$12,000)
- Preparation of a QAPP for multimedia sampling and analysis in coordination with the 2019 Biofilm Assessment project (\$8000)

The Task Force approved five other tasks contingent upon having an agreement in place in time to do the work:

- Water quality monitoring for biofilm (\$28,000)
- Groundwater seep monitoring (\$8000)
- Sediment sampling (\$11,000)
- Water quality monitoring for mass balance during high flows (synoptic sampling) (\$35,000)
- Data processing and reporting (\$13,000)

Other tasks presented at the Task Force meeting included:

- Additional review of known contaminated sites
- Historical information search to identify potential source locations
- Focus on identifying and removing unknown sources
- Design and establish a long-term monitoring program/network to set baseline and track concentrations in fish and water (sediment and biofilm)
- Tell more detailed story about reducing PCBs/measuring progress made
- Conduct additional R&D on emerging technologies

The TTWG reviewed these tasks and other options to create a draft list of tasks (scope, schedule, and budget) for inclusion in the Ecology contract. Some of these tasks were combined and included in the draft recommendation provided below.

**This draft recommendation was deemed by TTWG on July 31 as not ready for approval as a consensus recommendation to the full Task Force. Instead the TTWG asked this scope of work, along with prior tasks modified in the draft recommendation, and the process by which the scope of work was developed be discussed at the August 27 Task Force meeting. Additionally, the Positive Matrix Factorization (PMF) Phase 2 scope of work was discussed at the July 31 TTWG call, noting this scope**

was not yet included in the contract as a task. It has since been developed and is provided at the end of this document for Task Force consideration (as Attachment 2).

To develop the draft recommendation, tasks were identified and then included in various combinations and options based on several input factors:

- Available Scopes and Budgets for Projects
- Output From the PCB Workshop
- Available Funding as Provided by the Legislature and related constraints
- Input from the Task Force’s Technical Consultant – LimnoTech
- Consideration of Technical and Non-Technical Task Force Project Needs

The TTWG considered technical tasks commonly identified as important from the breakout sessions at the PCB Workshop, along with non-technical education and outreach activities. The three options that were identified are discussed below, followed by the draft summary recommendation with budget. Table 1 provides a cross-walk of tasks carried forward or not carried forward in the draft recommendation. Associated budgets and descriptions of tasks prior to modification or not included in the draft recommendation for the three options are provided in Attachment 1. Please note that that not all the Tasks in Options A, B and C were carried forward in the draft recommended scope for this initial grant agreement, so the task numbering has been updated to reflect the modifications.

Table 1

	Option A	Option B	Option C	Draft Recommendation
Task	Description			
	Provide Support for Expanding the Scope of Ecology’s Environmental Assessment Program’s (EAP’s) 2019 Biofilm Assessment for the Spokane River			
1	Conduct Multimedia Sample Collection and PCB Analyses in Coordination with EAP 2019 Biofilm Sampling Project			
	Green Chemistry Advancement			
2	Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data			Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data (reduced scope)
3	Water Column Sampling at Higher (non-low flow) Flow Conditions			Education and Outreach Initiatives
4	Focus on Identification and Removal of Unknown Sources	Education and Outreach Initiatives		Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm
5	Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm			LimnoTech Technical Support
6	LimnoTech Technical Support			ACE Administration
7	ACE Administration			N/A

**Commented [BF1]:** Note: This task was originally budgeted at a lower amount but Ecology EAP staff in subsequent discussions noted an error in the cost estimate had been made and the budget for this effort should be adjusted to \$17,000, as provided in the Recommendation Budget.

### Potential Option A

This option included tasks associated with sampling and investigations that further identify sources of PCBs. Cost estimates were provided by LimnoTech and many of these tasks had wide ranges for cost based on the potential range of scopes. In order to balance the scopes with available budget, generally mid-range estimates were used. As a result, the detailed scopes for each task would have been constrained to fit the available budget. The most significant upfront scope adjustment was made for the 2019 multimedia sampling effort, which would be conducted in coordination with Ecology's biofilm project. In early option scoping discussions by the group, it was proposed to conduct synoptic sampling in the Spokane Gage to Nine Mile reach to support a mass balance assessment to confirm groundwater loads identified in the 2018 synoptic survey, but this task was not included in Option A or the other two options. The incremental cost of the add-on synoptic sampling would have required that two other tasks related to Unidentified Sources, at a minimum, be deferred.

### Potential Option B

This option replaces one of two tasks related to unidentified sources and with an education and outreach related task. Task budgets for two technical tasks were also adjusted, including more focused scopes with respect to sampling river water column and designing and conducting long term monitoring related to fish, water, and sediments and conducting the selected monitoring on a pilot basis.

### Potential Option C

This option is the same as Potential Option B except the additional source identification work (Task 2) is delayed by one year, until after data collected in 2019 is gathered and analyzed. The additional funds from Task 2 were shifted to Task 5, (develop a more expanded scope for determining how best to design and conduct long term monitoring related to fish, water, and sediments; and conducting the selected monitoring on a more expanded pilot basis).

## Draft Recommendation (Not Approved by Consensus by TTWG)

The draft recommendation provided here could be included in the contract agreement with Ecology. These tasks may be refined or modified and additional tasks may be added to the contract during FY 2020-2021 up to the \$500,000 limit.

## Draft Statement of Work and Deliverables

This Statement of Work (SOW) describes the planned CONTRACTOR activities through June 30, 2021. The Spokane River Regional Toxics Task Force (SRRTTF) is a group of governmental agencies, private industries, environmental organizations who developed a plan to bring the Spokane River into compliance with water quality standards for polychlorinated biphenyls (PCBs). The objective of this statement of work is to identify and remove sources of PCBs in the Spokane River per the Spokane River Regional Toxics Task Force's 2016 Comprehensive Plan. Funding for this work is provided by the State General Fund.

The CONTRACTOR is leveraging funding from this contract with funding from other resources. The tasks will be completed using a combination of funding sources. Therefore if funding for this contract expires but all deliverables are not achieved, the additional funding sources will be used to complete the task and will be reported after completion. The activities funded by ECOLOGY under this contract are described below along with its corresponding budget.

Based on current understandings of scope for each task (Task 1 through Task 6), the budget for each task may need to be revised in the future. Should a scope revision for any task result in the allocated funding for that task not being fully utilized, the surplus funding will be reallocated as appropriate to other tasks. Any reallocation of budget must be mutually agreed upon between the parties.

**Task 1: Conduct Multimedia Sample Collection and PCB Analyses in Coordination with EAP 2019 Biofilm Sampling Project**

In support of SRRTTF’s Comprehensive Plan Element 6.3 and using this element to guide the work to better define the pathway between source areas, delivery mechanisms, and environmental response, the CONTRACTOR in collaboration with Ecology’s Environmental Assessment Program (EAP) will assure completion of the following:

- Preparation of a Quality Assurance Project Plan (QAPP) or QAPP Amendment as appropriate, that among other things, identifies the locations, frequencies, parameters, other supporting data collection, sample collection methodologies, and analytical methods for river water column samples, sediment samples, and groundwater seep samples. Focus area for this work is the Upriver Dam to Spokane Gage reach of the river
- Execute sampling events as described in the QAPP referenced above in coordination with EAP’s 2019 biofilm sampling event
- Prepare report on results of analyses for each media and comparisons of the findings in each media with respect to how they may relate to each other and the EAP biofilm study results

**Deliverables and Due Dates:**

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Progress project status report(s) of Task activities and associated costs identified within conjunction with progress billings	As progress billings to be submitted no less frequently than every 4 months
QAPP for multimedia sample collection, sample analysis, and data analysis	August 15, 2019
Draft report on results of analyses for each media and comparisons of the findings in each media with respect to how they may relate to each other and the EAP biofilm study results	March 31, 2020

Data uploaded to Ecology's Environmental Information Management System (EIM)	June 30, 2020
Final report on sampling and analysis results	June 30, 2020

**Task 2: Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data**

In support of SRRTTF's Comprehensive Plan Element 5.14<sup>1</sup>, the CONTRACTOR will assure completion of the following:

- Define land uses that could have served as a source of PCB and conduct a search of historical land use records or related information to determine locations of potential sources in the vicinity of the Spokane River with a focus on specific areas adjacent to locations where 2018 and 2019 monitoring showed elevated concentrations.
- In combination with land use information, use the EAP/SRRTTF 2018 and 2019 sampling results (water column/biofilm/sediment) to consult with TCP (Comprehensive Plan Element 5.14.1.b) develop a future sampling plan to target key sites identified (Comprehensive Plan Element 5.14.1.c)

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the review of EAP/SRRTTF 2018 and 2019 sampling results in conjunction with the review of historical land use and the identification of sites of interest for targeted sampling	February 28, 2021
Develop a targeted sampling plan based on the findings of the site identification effort	May 31, 2021

**Task 3: Education and Outreach**

In support of SRRTTF's efforts to provide public education and outreach on PCB, the CONTRACTOR will assure completion of the following:

- Conduct Spring 2020 education campaign through the Spokane River Forum
- Develop and provide a school education curriculum on PCB
- Hold a "State of the River" meeting in partnership with the Spokane River Forum

Deliverables and Due Dates:

---

<sup>1</sup> This effort can be considered an extension of data mining activities discussed in Comprehensive Plan Element 5.14.1.a.

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the content as well as any associated statistics on effectiveness for the Spring Campaign	June 30, 2020
A report documenting the materials developed for the "State of the River" meeting	May 31, 2021
A report documenting the materials produced and any associated statistics on effectiveness of the curriculum	May 31, 2021

**Task 4:** Design a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm

In support of SRRTTF's Comprehensive Plan Element 6.1 and 6.3, the CONTRACTOR will assure completion of the following:

- Assess methodologies and media that could be used for monitoring/tracking of concentrations and loading of PCBs
- Select the media and develop plan(s) for monitoring/tracking concentrations in PCB

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the results of the assessment of methodologies and media for potential long-term monitoring/tracking of PCB concentrations and loading	April 30, 2020
Prepare a QAPP for conducting long-term monitoring/tracking of PCB concentrations	June 30, 2020

**Task 5:** LimnoTech Technical Support

LimnoTech is the SRRTTF's contractor for technical advice and as such participates in SRRTTF and Technical Track Work Group meetings. The SRRTTF requires LimnoTech's technical expertise to make informed decisions. In addition to directly managing technical projects such as sampling and data analysis, LimnoTech may be called upon to manage other projects that would benefit from their overall knowledge of the PCB data and information that the SRRTTF's previous work has generated. This task will help pay for analysis and information requests that arise which are outside the scope of other tasks in this contract.

- Draft and final technical memorandums will be generated as requested by the SRRTTF. The memorandums will be provided to the Contract Manager 30 days after they are completed

- Project management as needed

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
Draft and final technical memorandums generated	30 days after issuance

**Task 6: ACE Administration**

The CONTRACTOR will incur administrative costs as a result of contract requirements and contracting with third parties to carry out requirements of previously described tasks. For example, for the previously described tasks, third party preparation of requests for proposals for sampling and laboratory services will be incurred. In addition, expenses for such contract requirements for insurance will be incurred. The CONTRACTOR may seek reimbursement for these administrative expenses.

- The CONTRACTOR is responsible for entering all surface, flow, and groundwater quality data generated as a result of this contract into ECOLOGY’s Environmental Information Management System.
- Facilitation services for all SRRTTF and other Work Group meetings may be funded by this contract and other sources of funding.

Deliverables and Due Dates:

<b>Recommendation</b>					
<b>Basis - June 26, 2019 Task Force Direction</b>					
<b>Task</b>	<b>Description</b>	<b>Legislative Funds</b>		<b>Other TF Funding</b>	
		<b>FY 1</b>	<b>FY 2</b>	<b>FY 1</b>	<b>FY 2</b>
	Provide Support for Expanding the Scope of Ecology's Environmental Assessment Program's (EAP's) 2019 Biofilm Assessment for the Spokane River	\$0	\$0	\$17,000	
1	Conduct Multimedia Sample Collection and PCB Analyses in Coordination with EAP 2019 Biofilm Sampling Project	\$55,000	\$0	\$8,000	
	Green Chemistry Advancement	\$0	\$0	\$25,000	
2	Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data	\$0	\$20,000		
3	Education and Outreach Initiatives	\$25,000	\$25,000		
4	Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm	\$48,000			
5	LimnoTech Technical Support	\$20,000	\$40,000	\$20,000	
6	ACE Administration	\$42,000	\$84,000	\$42,000	
	<b>Total Cost</b>	<b>\$190,000</b>	<b>\$169,000</b>	<b>\$112,000</b>	<b>\$0</b>
	Subtotal		\$359,000	\$112,000	
Uncommitted TF Funds Remaining ~ \$28, 000 ACE funding and \$141,000 State Legislature funding					



Attachment 1

Budget Summaries and Original Task Descriptions (for tasks modified and not provided in draft recommendation summary) for Options A, B and C

Potential Option A					
Basis - June 26, 2019 Task Force Direction					
Task	Description	Legislative Funds		Other TF Funding	
		FY 1	FY 2	FY 1	FY 2
	Provide Support for Expanding the Scope of Ecology's Environmental Assessment Program's (EAP's) 2019 Biofilm Assessment for the Spokane River	\$0	\$0	\$17,000	
1	Conduct Multimedia Sample Collection and PCB Analyses in Coordination with EAP 2019 Biofilm Sampling Project	\$55,000	\$0	\$8,000	
	Green Chemistry Advancement	\$0	\$0	\$25,000	
2	Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data	\$15,000	\$36,000		
3	Water Column Sampling at Higher (non-low flow) Flow Conditions	\$78,000	\$0		
4	Focus on Identification and Removal of Unknown Sources	\$10,000	\$50,000		
5	Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm	\$30,000	\$40,000		
6	LimnoTech Technical Support	\$20,000	\$40,000	\$20,000	
7	ACE Administration	\$42,000	\$84,000	\$42,000	
	<b>Total Cost</b>	\$250,000	\$250,000	\$112,000	\$0
Uncommitted TF Funds Remaining ~ \$28,000					

**Task 2:** Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data

In support of SRRTTF's Comprehensive Plan Element 5.14, the CONTRACTOR will assure completion of the following:

- Define land uses that could have served as a source of PCB and conduct a search of historical land use records or related information to determine locations of potential sources in the vicinity of the Spokane River with a focus on the Upriver Dam to Spokane Gage reach of the river
- In combination with land use information, use the EAP/SRRTTF 2018 and 2019 sampling results (water column/biofilm/sediment) to develop a biofilm/sediment sampling plan to target key sites identified
- Implement targeted biofilm/sediment sampling plan and interpret results

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting land use types identified as potentially being a source of PCB and the results of historical and use records	March 31, 2020
A report documenting the review of EAP/SRRTTF 2018 and 2019 sampling results in conjunction with the review of historical land use and the identification of sites of interest for targeted sampling	March 31, 2020
Develop and implement a targeted biofilm/sediment sampling event based on the findings of the site identification effort	September 30, 2020
Draft report on results and interpretation of targeted biofilm/sediment sampling event	March 31, 2021

**Task 3:** Water Column Sampling at Higher (non-low flow) Flow Conditions

In support of SRRTTF's Comprehensive Plan Element 5.14, the CONTRACTOR will assure completion of the following:

- Develop a sampling and analysis plan (QAPP Addendum) to address the potential of source contribution during non-low flow conditions and implement the plan over a single river reach for a single high flow season
- Interpret the first season results to determine if any new unknown sources are identified

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
Prepare a QAPP Addendum for non-low flow sampling and analysis including targeted river reach sampling locations (first season)	September 30, 2019
A report documenting the results of non-low flow first season results and the interpretation of the results of the targeted sampling events	May 31, 2020

**Task 4:** Focus on Identification and Removal of Unknown Sources

In support of SRRTTF's Comprehensive Plan Element 5.14, the CONTRACTOR will assure completion of the following:

- Based on data collected through the 2019 sampling events, identify candidate reaches/areas for consideration of upland investigations
- Determine methodologies for conducting potential upland investigations
- Develop sampling and analysis plans for potential upland investigations

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the results of the candidate reaches/site consideration for upland investigation analysis	April 30, 2020
A report documenting the methodologies that could be utilized for conducting potential upland investigations	October 31, 2020
Prepare a QAPP for conducting potential upland investigations	November 30, 2020

**Task 5:** Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm

In support of SRRTTF's Comprehensive Plan Element 6.1 and 6.3, the CONTRACTOR will assure completion of the following:

- Assess methodologies and media that could be used for monitoring/tracking of concentrations in PCB
- Select the media and develop plan(s) for monitoring/tracking concentrations in PCB
- Implement a pilot sustainable long-term monitoring/tracking plan(s)

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the results of the assessment of methodologies and media for potential long-term monitoring/tracking of PCB concentrations	April 30, 2020
Prepare a QAPP for conducting long-term monitoring/tracking of PCB concentrations	June 30, 2020
A report documenting the results obtained from the pilot long-term monitoring/tracking program	June 30, 2021

Potential Option B					
Basis - June 26, 2019 Task Force Direction					
Task	Description	Legislative Funds		Other TF Funding	
		FY 1	FY 2	FY 1	FY 2
	Provide Support for Expanding the Scope of Ecology's Environmental Assessment Program's (EAP's) 2019 Biofilm Assessment for the Spokane River	\$0	\$0	\$17,000	
1	Conduct Multimedia Sample Collection and PCB Analyses in Coordination with EAP 2019 Biofilm Sampling Project	\$55,000	\$0	\$8,000	
	Green Chemistry Advancement	\$0	\$0	\$25,000	
2	Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data	\$15,000	\$36,000		
3	Water Column Sampling at Higher (non-low flow) Flow Conditions	\$60,000	\$0		
4	Education and Outreach Initiatives	\$25,000	\$25,000		
5	Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm	\$33,000	\$65,000		
6	LimnoTech Technical Support	\$20,000	\$40,000	\$20,000	
7	ACE Administration	\$42,000	\$84,000	\$42,000	
	<b>Total Cost</b>	<b>\$250,000</b>	<b>\$250,000</b>	<b>\$112,000</b>	<b>\$0</b>
Uncommitted TF Funds Remaining ~ \$28, 000					

**Task 2:** Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data

In support of SRRTTF's Comprehensive Plan Element 5.14, the CONTRACTOR will assure completion of the following:

- Define land uses that could have served as a source of PCB and conduct a search of historical land use records or related information to determine locations of potential sources in the vicinity of the Spokane River with a focus on the Upriver Dam to Spokane Gage reach of the river
- In combination with land use information, use the EAP/SRRTTF 2018 and 2019 sampling results (water column/biofilm/sediment) to develop a biofilm/sediment sampling plan to target key sites identified
- Implement targeted biofilm/sediment sampling plan and interpret results

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting land use types identified as potentially being a source of PCB and the results of historical and use records	March 31, 2020
A report documenting the review of EAP/SRRTTF 2018 and 2019 sampling results in conjunction with the review of historical land use and the identification of sites of interest for targeted sampling	March 31, 2020
Develop and implement a targeted biofilm/sediment sampling event based on the findings of the site identification effort	September 30, 2020
Draft report on results and interpretation of targeted biofilm/sediment sampling event	March 31, 2021

**Task 3: Water Column Sampling at Higher (non-low flow) Flow Conditions**

In support of SRRTTF's Comprehensive Plan Element 5.14, the CONTRACTOR will assure completion of the following:

- Develop a sampling and analysis plan (QAPP Addendum) to address the potential of source contribution during non-low flow conditions and implement the plan over a single river reach for a single high flow season
- Interpret the first season results to determine if any new unknown sources are identified

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
Prepare a QAPP Addendum for non-low flow sampling and analysis including targeted river reach sampling locations (first season)	September 30, 2019
A report documenting the results of non-low flow first season results and the interpretation of the results of the targeted sampling events	May 31, 2020

**Task 5: Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm**

In support of SRRTTF's Comprehensive Plan Element 6.1 and 6.3, the CONTRACTOR will assure completion of the following:

- Assess methodologies and media that could be used for monitoring/tracking of concentrations in PCB
- Select the media and develop plan(s) for monitoring/tracking concentrations in PCB
- Implement a pilot sustainable long-term monitoring/tracking plan(s)

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the results of the assessment of methodologies and media for potential long-term monitoring/tracking of PCB concentrations	April 30, 2020
Prepare a QAPP for conducting long-term monitoring/tracking of PCB concentrations	June 30, 2020
A report documenting the results obtained from the pilot long-term monitoring/tracking program	June 30, 2021

Potential Option C					
Basis - June 26, 2019 Task Force Direction					
Task	Description	Legislative Funds		Other TF Funding	
		FY 1	FY 2	FY 1	FY 2
	Provide Support for Expanding the Scope of Ecology's Environmental Assessment Program's (EAP's) 2019 Biofilm Assessment for the Spokane River	\$0	\$0	\$17,000	
1	Conduct Multimedia Sample Collection and PCB Analyses in Coordination with EAP 2019 Biofilm Sampling Project	\$55,000	\$0	\$8,000	
	Green Chemistry Advancement	\$0	\$0	\$25,000	
2	Additional Contaminated Site Investigation for Purposes of Future Identification and Removal Focusing on Historical Information and Biofilm and Sediment Data	\$0	\$20,000		
3	Water Column Sampling at Higher (non-low flow) Flow Conditions	\$60,000	\$0		
4	Education and Outreach Initiatives	\$25,000	\$25,000		
5	Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm	\$48,000	\$81,000		
6	LimnoTech Technical Support	\$20,000	\$40,000	\$20,000	
7	ACE Administration	\$42,000	\$84,000	\$42,000	
	<b>Total Cost</b>	\$250,000	\$250,000	\$112,000	\$0
Uncommitted TF Funds Remaining ~ \$28, 000					

**Task 3:** Water Column Sampling at Higher (non-low flow) Flow Conditions

In support of SRRTTF's Comprehensive Plan Element 5.14, the CONTRACTOR will assure completion of the following:

- Develop a sampling and analysis plan (QAPP Addendum) to address the potential of source contribution during non-low flow conditions and implement the plan over a single river reach for a single high flow season
- Interpret the first season results to determine if any new unknown sources are identified

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.



Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
Prepare a QAPP Addendum for non-low flow sampling and analysis including targeted river reach sampling locations (first season)	September 30, 2019
A report documenting the results of non-low flow first season results and the interpretation of the results of the targeted sampling events	May 31, 2020

**Task 5:** Design and Initiate a Long-Term Monitoring/Tracking Program for PCB Concentrations Considering Fish, Water, Sediment, and Biofilm

In support of SRRTTF's Comprehensive Plan Element 6.1 and 6.3, the CONTRACTOR will assure completion of the following:

- Assess methodologies and media that could be used for monitoring/tracking of concentrations in PCB
- Select the media and develop plan(s) for monitoring/tracking concentrations in PCB
- Implement a pilot sustainable long-term monitoring/tracking plan(s)

Deliverables and Due Dates:

Copies of the following deliverables are to be provided to the ECOLOGY Contract Manager.

Deliverable	Due Date
Project status reports in conjunction with progress billings	As progress billing submitted
A report documenting the results of the assessment of methodologies and media for potential long-term monitoring/tracking of PCB concentrations	April 30, 2020
Prepare a QAPP for conducting long-term monitoring/tracking of PCB concentrations	June 30, 2020
A report documenting the results obtained from the pilot long-term monitoring/tracking program	June 30, 2021

Attachment 2  
PMF Phase 2 Analysis Scope of Work

**Lisa A. Rodenburg**  
Professor  
Department of Environmental Sciences  
ENRS Room 348  
School of Environmental and Biological Sciences  
Rutgers, The State University of New Jersey  
14 College Farm Rd.  
New Brunswick, NJ 08901

www.envsci.rutgers.edu  
lisa.rodenburg@rutgers.edu  
848-932-5774  
Fax: 732-932-8644



Mike Hermanson  
Water Resources Manager  
Spokane County Water Resources  
509.477.7578

Mike,

This letter constitutes my proposed scope of work for fingerprinting of PCB sources in the Spokane River basin for the Spokane River Regional Toxics Task Force (SRRTTF). Below I have listed all of the media that could be investigated. Please advise at your earliest convenience which media you would like me to examine.

Type of Proposal: Time and Material/Labor Hour

Place of performance: 46 Stella Drive, Bridgewater, NJ 08807

Period of performance: January 15, 2019 to June 30, 2020

Offeror is a Sole Proprietor

Point of contact: Lisa A. Rodenburg

46 Stella Drive, Bridgewater, NJ 08807 Cell: 908-581-0825

Sincerely,

A handwritten signature in cursive script that reads "Lisa Rodenburg".

Lisa Rodenburg

## **WORK PLAN**

The Spokane River Regional Toxics Task Force (SRRTTF) has requested a cost estimate and work plan for a study to examine PCB sources to various media (water, sediment, fish, etc.) of the Spokane River. Phase 1 of the study, already complete, consisted of examining the effects of blank contamination on the fingerprinting of PCB sources to the ambient water of the Spokane River, using data collected through 2017. This cost estimate and work plan addresses phase 2 of the study. In phase 2 Dr. Rodenburg will interpret the results of the factor analysis on the data set(s) on PCBs in various media of the Spokane River already performed and will perform new analysis on any new data sets that the SRRTTF requests. This study will build upon the PCB fingerprinting study for the Green-Duwamish River that Dr. Rodenburg recently completed for the Washington State Department of Ecology.<sup>1</sup> The compartments for which PCB data have already been analyzed are listed below.

The following compartments were investigated using PMF (Positive Matrix Factorization):

- surface water samples collected by the SRRTTF
- samples from the sewer system of the Spokane City WWTP
- the water column
- tissue from fish caught in the Spokane River in the vicinity of the city of Spokane
- stormwater samples from the city of Spokane
- groundwater at the Kaiser facility
- outfalls at the Kaiser facility

The following compartments were investigated using MLR (Multiple Linear Regression):

- Two CSO samples were collected using a different method than other CSO samples and were analyzed separately.
- Twenty-three stormwater samples were collected using a different method than other stormwater samples and were analyzed separately.
- eight samples of solids from storm drains and collection basins
- treated effluent from the City of Spokane's WWTP
- bulk atmospheric deposition samples collected in and near Spokane
- samples of biofilm and caddis and mayfly larvae collected in the Spokane River
- river sediment from the Spokane River near Spokane
- groundwater from the GE facility
- samples from the Inland Empire Paper wastewater treatment facility
- surface water sampled using the CLAM device
- municipal products tested by the City of Spokane

Phase 1 involved analysis of the PCB data from the ambient water column of the Spokane River collected through 2017, including blanks. The purpose of phase 1 was to determine whether PMF could be successfully used on this data set despite the blank contamination issues, and if so, to identify which approach (or combination of approaches) best addresses the impact of blank contamination on the analysis of low levels of PCB measured in the Spokane River water column. In the Spokane River, the sum of 209 PCB congeners ( $\Sigma$ PCBs) was an average of 171 pg/L in the data set analyzed here (ND = 0, no blank correction), with an average of 88 pg/L found in the blanks. The analysis identified several sources of PCBs to the blanks themselves. The final recommendations were to conduct PMF analysis on three data sets: 1) the blank data itself, 2) the ambient water data uncorrected for blank contamination, and 3) the ambient water data corrected for blank contamination by censoring the data at one times the method-specific blank concentration. Comparison of the results of the analysis of these three data sets will allow the most accurate determination of PCB sources to the river as opposed to PCB sources to the blanks.

Phase 2 therefore followed this recommended approach in analyzing the ambient water data. For all other compartments, blank-corrected data was analyzed. Such data was either blank corrected before entering in the EIM database (i.e. MEL amended data) or were blank corrected by other means.

### **Tasks**

Dr. Rodenburg will evaluate the existing data on PCB concentrations in various media of the Spokane River in order to:

1. conduct fingerprinting in any new environmental compartments selected by the SRRTTF via Positive Matrix Factorization or Multiple Linear Regression; and
2. use fingerprinting results in a holistic way to understand PCBs sources to the Spokane River and make recommendations for management strategies for controlling these sources.

### **Task 1: Data usability**

This study will focus on those studies using EPA method 1668 (various revisions). Further investigation of the data will address questions such as:

- Is there enough data for each compartment? Ideally at least 100 samples would be available for each environmental compartment, but PMF analysis can be conducted on as little as 25 samples. Compartments with fewer samples can be examined using MLR.
- Was the same SPB-octyl GC column used for all measurements? Method 1668 allows the use of alternate columns with different congener co-elution patterns. The most widely used alternate columns are the DB-5 and SGE-HT8. Data collected on more than one column can be pooled and used collectively, but some information is lost in this process.<sup>2</sup>
- Is there evidence of serious blank contamination? This task will rely heavily on the Phase 1 blank contamination study results.

- Are detection limits provided for all measurements? If not, the data is still usable but with limitations.
- Are surrogate recoveries provided for all samples? If not, the data is still usable but with limitations.
- Are the number of non-detect values low enough? Too many non-detects can render the data useless.

## **Task 2: Fingerprinting**

Dr. Rodenburg has already performed factor analysis on the environmental matrixes listed above. Under this SOW she will conduct fingerprinting analysis on any additional matrixes requested by SRRTTF. When sufficient samples are available, fingerprinting will be performed using PMF. When less than about 20 samples are available for any one environmental compartment, fingerprinting will be done via mass balance model (MLR).

### **PMF**

Fingerprinting via PMF will utilize the PMF2 software.<sup>3</sup> In many cases, PMF analysis is an iterative process. The initial 'ideal' data set may not converge on a solution, or may converge on a solution that is a poor representation of the data or that is not useful. In such cases, Dr. Rodenburg will communicate with the SRRTTF PMF Work Group about the problem and attempt to obtain a better model solution, typically by excluding congeners or samples that are particularly poorly described by the model.

Another problem sometimes encountered in the first round of PMF runs is that samples from very different source types or with concentrations that differ by orders of magnitude cannot always be accurately described by the PMF model. If this occurs, the solution is to divide the data set into two or more smaller data sets in which the samples are more homogeneous. For example, some data sets containing storm water data could contain samples collected in rural areas displaying very low concentrations (< 1 ng/L), while more urban samples may contain >1,000 ng/L PCBs. In such a case, it might be advantageous to separate the samples into two or more data sets containing urban versus rural samples. If this occurs, Dr. Rodenburg will communicate with the SRRTTF PMF Work Group about the problem and work with them to find a solution.

Because there are several ways the PMF model can underperform, the final report will list all excluded congeners and samples, and will provide an evaluation of the goodness-of-fit of the model on the basis of the sum of PCBs as well as individual congeners. This will be used to provide an assessment of the quality and reliability of the model output.

### **MLR**

When fewer than 20 samples are available, fingerprinting will be performed using multiple linear regression (MLR). For this purpose, the fingerprints will be generated from either the Aroclor congener patterns of Rushneck et al.<sup>4</sup> or from the PMF output from other data sets for which sufficient data is available to run PMF. MLR will utilize a non-negativity constraint, i.e. the coefficients of the regression will be constrained to be equal to or greater than zero. This allows the MLR to approximate a mass balance model and is consistent

with the approach of PMF, which also constraints coefficients to be equal to or greater than zero.

**Table 2:** Number of samples and PCB peaks already analyzed by environmental compartment and fingerprinting method.

<b>Media</b>	<b># of samples</b>	<b># peaks</b>	<b>Fingerprinting method</b>
Surface water	191	68	PMF
Spokane City WWTP influent and CSO samples	236	83	PMF
Fish tissue	105	104	PMF
Spokane stormwater	106	91	PMF
Kaiser groundwater	166	70	PMF
Kaiser outfalls	225	83	PMF
CSOs	2	101	MLR
Stormwater	23	149	MLR
Storm drain solids	8	108-159	MLR
City of Spokane Treated Effluent	7	75-120	MLR
Bulk atmospheric deposition	21	148	MLR
Biofilm	21	152	MLR
Caddis and mayfly larvae	3	152	MLR
River sediment	44	101-177	MLR
GE groundwater	8	128	MLR
IEP waste treatment train	40	122-154	MLR
Surface water CLAM samples	7	126	MLR
Municipal products study	104	156-174	MLR

**Cost estimate**

The T&M budget is broken down by task.

Task 1 involves conducting new analyses of environmental compartments via PMF or MLR. The analysis takes about 1 hour per 20 samples. Cost for this task depends on how many new data sets SRRTTF wants to analyze. A maximum estimate would be 1,000 new samples analyzed over 50 hours. At \$200 per hour, this comes to \$10,000.

Task 2 involves writing a report that uses the fingerprinting results in a holistic way to understand PCBs sources to the Spokane River and make recommendations for management strategies for controlling these sources. The time required to write this report for all environmental compartments that have already been analyzed is estimated to be no more than 150 hours. At \$200 per hour, this comes to \$30,000.

### **Outcomes**

Modeling will be used to provide the following work products:

- Identification of distinct PCB chemical signatures in the media evaluated based on the fingerprint analysis. This task is address by the F-matrix output of the PMF program. The PCB fingerprints will be identified by comparison with the Aroclor fingerprints of Rushneck et al.<sup>4</sup> and other PCB sources in the scientific literature as well as by Dr. Rodenburg's expertise.
- Determination of the relative contribution of these source signatures to PCB contamination in the Spokane River watershed. This task is address by the G-matrix output of the PMF program (or by the MLR output), which provides the contribution of each fingerprint to each sample. These can be expressed either as concentrations (in the same units used in the input) or as normalized concentration (i.e. percent of total PCBs).
- Identification of potentially known/unknown sources of and/or pathways for PCBs in the Spokane River, based on spatial patterns and magnitude of source signatures, to help inform source control priorities. Other ancillary data will be used to understand the model output including conditions during sampling such as river flow, meteorological conditions, etc. Ancillary data such as organic carbon content of samples and total suspended particulate concentrations may also be useful.
- All relevant computer generated files (e.g., model input/output and GIS) in electronic format will be provided to SRRTTF.
- Dr. Rodenburg will also provide a comparison of the major PCB sources in the Spokane River versus the main sources to other urban waterways in the US, especially the Green-Duwamish River, Delaware River Basin, the New York/New Jersey Harbor, and the Portland Harbor Superfund Site based on her experience with these watersheds.

### **Summary**

The proposed work will allow an in-depth understanding of the sources and fate of PCBs in the Spokane River. Dr. Rodenburg is a recognized expert in PCB data management and analysis via factor analysis. She pioneered the use of PMF to understand PCB sources with her work in the Delaware River Basin.<sup>5-8</sup> Through her collected published works, she is the only researcher who has attempted to understand PCB sources on the watershed scale in complex systems involving multiple potentially responsible parties (PRPs) and in a variety of environmental media (water, sediment, fish, air, and permitted discharges). Given sufficient data quality and quantity, Dr. Rodenburg should be able to provide the same level



of understanding of PCBs sources to this system as she achieved in the Delaware River Basin and Green-Duwamish River.

## References

1. Rodenburg, L. A.; Leidos *Green-Duwamish River Watershed PCB Congener Study: Phase 2 Source Evaluation*; Seattle, WA, 2017.
2. Rodenburg, L. A.; Du, S. Y.; Lui, H.; Guo, J.; Oseagulu, N.; Fennell, D. E., Evidence for Dechlorination of Polychlorinated Biphenyls and Polychlorinated Dibenzo-p-Dioxins and -Furans in Wastewater Collection Systems in the New York Metropolitan Area. *Environmental Science & Technology* **2012**, *46*, (12), 6612-6620.
3. Paatero, P.; Tapper, U., Positive Matrix Factorization - a Nonnegative Factor Model with Optimal Utilization of Error-Estimates of Data Values. *Environmetrics* **1994**, *5*, 111-126.
4. Rushneck, D. R.; Beliveau, A.; Fowler, B.; Hamilton, C.; Hoover, D.; Kaye, K.; Berg, M.; Smith, T.; Telliard, W. A.; Roman, H.; Ruder, E.; Ryan, L., Concentrations of dioxin-like PCB congeners in unweathered Aroclors by HRGC/HRMS using EPA Method 1668A. *Chemosphere* **2004**, *54*, 79-87.
5. Du, S.; Belton, T. J.; Rodenburg, L. A., Source apportionment of polychlorinated biphenyls in the tidal Delaware River. *Environmental Science & Technology* **2008**, *42*, 4044-4051.
6. Praipipat, P.; Rodenburg, L. A.; Cavallo, G. J., Source Apportionment of Polychlorinated Biphenyls in the Sediments of the Delaware River. *Environ. Sci. Technol.* **2013**, *47*, 4277-4283.
7. Du, S.; Wall, S. J.; Cacia, D.; Rodenburg, L. A., Passive Air Sampling for Polychlorinated Biphenyls in the Philadelphia, USA Metropolitan Area. *Environ. Sci. Technol.* **2009**, *43*, 1287-1292.
8. Rodenburg, L. A.; Du, S.; Fennell, D. E.; Cavallo, G. J., Evidence for Widespread Dechlorination of Polychlorinated Biphenyls in Groundwater, Landfills, and Wastewater Collection Systems. *Environ. Sci. Technol.* **2010**, *44*, 7534-7540.