

**Scope of Work**  
**Groundwater and Surface Water Fingerprinting of PCB Data at GE Site**  
**October 18, 2022 Draft**

**Background**

The mission of the Task Force is to identify and remove sources of PCBs to the Spokane River. PCB contamination in groundwater is known to exist at the National Priorities List contaminated site known as the General Electric Co. Spokane Apparatus Service Shop (“GE Site”). Cleanup actions at the site were accepted as complete in 1999 when it was not known that the site groundwater was a pathway for PCBs to reach surface water (EPA, 2022). However, recent fingerprinting of PCB loading to the Spokane River and PCB concentrations in regional groundwater found “a strong correlation between the homolog patterns at the GE site and the homolog patterns estimated by the mass balance assessment” for the affected reach of the river (LimnoTech, 2018). To date, the cleanup levels and remedies for the site have not been changed to reflect the apparent pathway to surface water (EPA, 2020).

EPA (2020) issued a technical directive under their Technical Support for Assessment and Watershed Protection contract to ascertain whether the ambient water and biofilm data indicate a release of PCBs to surface water from the GE Site to the Spokane River. The contractor selected to perform this work was subsequently found to have a conflict of interest and the work was never completed.

**Purpose**

The purpose of this authorization is to support completion of the work originally scoped by US EPA. The outcome of this effort will be an assessment of whether groundwater from the GE Site is delivering noticeable amounts of PCBs to the Spokane River and, if so, to provide an assessment of the magnitude of the load.

**Scope and Budget**

The scope of work consists of three components: 1) Mass Balance Assessment, 2) Polytopic Vector Analysis, and 3) Similarity Analysis between GE Groundwater and Imputed Un-Monitored Load.

The first component consists of conducting a mass balance assessment to back-calculate amount and nature of unmonitored PCB load to the Spokane River in the vicinity of the GE Site. The mass balance assessment will be similar to those conducted by the Task Force in the past, using monitoring data on Spokane River flow and PCB concentrations to estimate PCB in-river load (in units of mass per time, such as mg/day) at two locations in the river. Should the in-river load at the downstream station be greater than that at the upstream station, the difference in loads is attributed to an unmonitored load. The primary difference from prior mass balance assessments is that this assessment will be done on a congener-specific basis, where past assessments have been conducted in total PCBs or homologs. For purposes of this project, data from the 2018 and 2022 Task Force synoptic surveys at Upriver Dam and Greene St will be used to perform the mass balance assessment.

The second component consists of Polytopic Vector Analysis (PVA), a method of PCB fingerprinting designed to “un-mix” environmental samples into the original source contributions. LimnoTech will first prepare the PCB congener data for PVA by: integrating available data; performing error, completeness and consistency checks; and evaluating the impact of non-detect results and any other

adjustments. In addition, we will evaluate the variability of the groundwater PCB concentration data and decide whether these will be included in the input dataset or will be evaluated independently. We will also consider the benefits of using sediment data. The first outcome of this component will be an input dataset adapted to PVA requirements and tables and figures capturing the relevant statistical properties of the available data. LimnoTech will then construct a PVA-model of the input dataset consisting of the following steps: PCA and factor evaluation, outlier analysis, sample reproduction statistics, and iteration to optimal model size. LimnoTech will interpret the final model to answer the following questions:

- How many distinct sources and processes contribute to the observed PCB congener compositions (i.e., number of end members)?
- What is the PCB congener composition of each end member?
- What is the identity of each end member in terms of Aroclors and alteration mechanisms (degradation, weathering, uptake, etc.)
- Can some of these end members be linked uniquely to groundwater inputs, to the original groundwater composition at the GE source, or to the mass-balance changes by congener?
- What is the magnitude of the contribution of the GE-linked end members in the biofilm samples?
- What is the trend of the GE-linked contributions downstream of the suspected input?
- Can this contribution be used to estimate the significance of GE PCB inputs to the river as a whole?

The third component consists of a similarity analysis between GE groundwater and the back-calculated un-monitored load resulting from the mass balance assessment described above. Cosine theta similarity coefficients will be generated between the congener patterns derived from each of the mass balance assessments and the congener patterns observed in GE groundwater. Conclusions will be drawn regarding whether the incremental increase in water column load matches the GE groundwater contribution.

The final component will consist of a technical report documenting all analyses and providing final conclusions. A draft version of the report will be shared with the Technical Track Work Group and revised in response to comments received. The revised report will then be shared with the Task Force and further revised (as necessary) in response to comments received.

### **Deliverables and Schedule**

The expected deliverables and schedule for delivery are provided in Table 1.

Table 1. Deliverables and Schedule

<b>Deliverable</b>	<b>Completion Date</b>
Mass balance assessment	November 11, 2022
PVA modeling and interpretation	November 11, 2022
Similarity analysis between GE groundwater and imputed un-monitored load	December 2, 2022
Draft technical report documenting assessment	December 16, 2022
Final technical report documenting assessment	January 31, 2023

## Budget

The total cost for conducting this work is \$45,000. Itemized costs are provided in Table 2.

Table 2. Itemized Budget

<b>Item</b>	<b>Budget</b>
Mass balance assessment	\$12,500
PVA modeling and interpretation	\$22,500
Similarity analysis between GE groundwater and imputed un-monitored load	\$5000
Technical report documenting assessment	\$5000
<b>Total</b>	<b>\$45,000</b>

## References

- LimnoTech, 2018. Comparison of Homolog-Patterns for Groundwater Well Data and Suspected Loads. Technical memorandum prepared for the Spokane River Regional Toxics Task Force. January 22, 2018. [http://srrttf.org/wp-content/uploads/2018/01/GroundwaterFingerprintingMemo\\_Final\\_012218.pdf](http://srrttf.org/wp-content/uploads/2018/01/GroundwaterFingerprintingMemo_Final_012218.pdf)
- US EPA, 2020. Technical Direction (TD): TSWAP Contract EP-C-17-046 Task Order 7.