

The United States Environmental Protection Agency (EPA), Wisconsin Department of Natural Resources (WDNR), and EPA contractors Toeroek and Tetra Tech are in receipt of Tyco's "Passive Arsenic Sampling Pilot Test Work Plan and Alternatives Evaluation" submitted March 30, 2018 and provide the following comments:

GENERAL COMMENT

The Agencies are concerned with the Vertical Barrier Wall (VBW) coverage outlined in the conceptual full-scale passive sampler testing. EPA expressed in the February 14, 2018 meeting that Tyco is expected to test for leaks along 15% of the VBW seams/joints. Previously, Tyco had estimated that the dye test would cover 27-28% of the VBW, depending on injection variables (CH2M Hill, 2015). Tyco's full scale DGT proposal involves deploying five DGT samplers with 6-inch exposure windows on 33 seams (10% of the 330 seams located on the 1,518 foot VBW in the Main Plant). Assuming the average height of the VBW under the river stage is 35 feet (420 inches), there are approximately 138,600 inches of seams where groundwater may be leaking to the river (seam height of 420 inches X 330 seams). Tyco's full scale proposal would monitor 0.7% of the total seam length along the VBW in the Main Plant (6-inch exposure window per DGT X 5 DGTs per seam X 33 seams with DGTs deployed = 990 inches; 990 inches / 138,600 inches = 0.007). In order for the full scale test to be approved, Tyco must meet EPA's goal of monitoring 15% of the VBW.

The WDNR is also concerned that the significance of pore water sampling is not being recognized as an important part of the assessment of the potential for sediment recontamination and surface water impacts due to groundwater migration from the site.

SPECIFIC COMMENTS

- 1. Page 2, Conceptual Full-Scale Passive Sampler Testing, paragraph 1:**
The sentence "Furthermore, passive sampling along the river bottom will be conducted to assess whether the VBW is effective at preventing surface water exceedances at the river bottom." This statement should be amended to also include sediment recontamination: "...to assess whether the VBW is effective at preventing sediment recontamination *and* surface water exceedances at the river bottom."
- 2. Page 2, Conceptual Full-Scale Passive Sampler Testing, third bullet item:**
In the full-scale work plan, clarify that DGT samplers will be co-located with sediment samples at the sediment surface/river bottom interface along the Main Channel and Turning Basin.
- 3. Page 2, Conceptual Full-Scale Passive Sampler Testing, item #4:**
Tyco indicates that DGT samplers will be placed at the surface water/river bottom interface. DGT samplers placed to measure pore water TWA arsenic concentrations should be placed in a manner that pore water, and not surface water, will flow through the binding gel.
- 4. Page 3, Conceptual Full-Scale Passive Sampler Testing, first paragraph:**
DGTs should be fastened to the wall to limit interaction between the surface water and binding gel; only groundwater should flow through the binding gel.

5. **Page 3, Conceptual Full-Scale Passive Sampler Testing, Paragraph 2:**
Tyco describes how TWA surface water concentrations will be used, but does not provide any information on how TWA pore water concentrations will be used.
6. **Page 3, Background on DGT Passive Samplers, paragraph 4:**
Two configurations of DGT samplers are described. One is a disk with a 2 cm diameter exposure window on one side, equivalent to 3.14 sq.cm. or 0.49 sq.in. The second configuration is rectangular with a 15 cm by 1.8 cm exposure window, equivalent to 27 sq.cm. or 4.2 sq.in.

On page 6, in the “Field Pilot Testing” section, the exposed areas of the two different configurations are described as a 2 inch diameter window and a 6 inch exposure window. Tyco should provide accurate and consistent information on the size/units of the exposed area of the DGTs.
7. **Page 4, Background/Rationale and Goals for Pilot Test, Last Paragraph:**
This section states that the laboratory components of the pilot test will be used to determine the efficacy of DGTs for the river bottom testing. It is unclear how this goal will be met given that the laboratory components of the pilot test presented in this work plan do not include an assessment of DGTs placed in sediment for porewater analysis. This section also states that the “planned deployment for sediment sampling is standard.” The work plan should be revised to state that the planned deployment of DGTs into sediment for porewater sampling is standard.
8. **Page 4, Background/Rationale and Goals for Pilot Test, last paragraph and Figure 3:**
The pilot field test appears to only include deployment of DGT samplers on the VBW. The DNR recommends field testing the deployment of samplers at the river bottom interface for both surface and pore water analysis.
9. **Page 4, Proposed Pilot Test Methods, last paragraph:**
Information collected on arsenic speciation in two monitoring wells from 2000 is being used for the basis of selecting wells to collect groundwater samples. These samples will then be used to determine the impact of organic arsenic species on the effectiveness of two different binding gels. Tyco should confirm the speciation by analyzing for the inorganic/organic arsenic concentrations when they collect samples from the monitoring wells used.
10. **Page 5, Laboratory Site Groundwater Arsenic Absorption Study, Table 1:**
Groundwater samples from two monitoring wells (MW117M and MW108M) will be collected and used to assess arsenic uptake by DGTs with different binding gels in a laboratory pilot test. This section and Table 1 refer to percentage of organic arsenic in MW010M and MW005M instead of MW117M and MW108M. Provide percentage of organic arsenic for wells that are to be sampled or confirm that the data is not available and that is why adjacent well information is being used.
11. **Page 5, Laboratory Deployment Time Study:**
This section states that three different contact durations (2, 5, and up to 7 days) will be tested. Guidance document recommendations (U.S. Environmental Protection Agency. 2017. *Laboratory, Field, and Analytical Procedures for Using Passive Sampling in the Evaluation of*

Contaminated Sediments: User's Manual) are for deployment of 1 day. The Toeroek team suggests adding a fourth contact duration of 1 day to the deployment time study.

12. **Page 6, Field Pilot Testing, First Paragraph:**

This section states that full-scale testing will entail the use of SCUBA divers for deployment, but that the DGTs deployed during the pilot test will be near the top of the water column from the shore or by boat. Although the work plan acknowledges the challenges associated with SCUBA diver deployment, the Toeroek team suggests that the pilot test also include a small percentage of such deployments to minimize troubleshooting and potential delays during the full-scale test.

13. **Page 7, Field Pilot Testing, Table 3:**

Method A and B are referenced in the table but not in the description on pages 6-7. Clarify which method is A and which is B.

14. **Figure 1, Proposed Decision Chart for VBW Testing:**

EPA is unclear why Tyco would calculate an average concentration for each representative area (seam), rather than simply comparing the time-weighted average (TWA) arsenic concentration from each DGT directly to acute and chronic surface water criteria, since surface water criteria need to be met at the point of discharge. Additionally, the subsurface conditions against the VBW are heterogeneous and suggest that averaging would not be appropriate; the wall covers fill and alluvium with a higher conductivity than underlying lacustrine sand and silt; arsenic concentration gradients exist vertically across the different deposits; interlocking joints/seams may separate at any point in the joint/seam due to varying structural loads on the wall from the different deposits and increasing hydraulic pressure with depth, which can create significant local bending moments. Vertical differences in geology, arsenic concentrations, and structural loadings on the wall suggest that it is not appropriate to average TWA arsenic concentrations along the entire seam/joint. Once a measurement of arsenic leaking through the wall at concentrations above background is confirmed, Tyco should proceed to compare the result to surface water criteria and update the SedCAM model.

15. **Figure 2:** This figure only addresses decisions based on TWA surface water concentrations. The decision tree should include TWA pore water concentrations and subsequent actions.

16. **In Attachment 1, Evaluation of Alternatives to the Dye Test,** Tyco states:

“7. Pore Water and Surface Water Sampling with Passive Arsenic Sampler

Passive samplers, such as DGTs, could be used to measure pore water arsenic concentrations and surface water concentrations immediately above the river bottom. Because pore water concentrations measured by passive samplers reflect an equilibrium with the surrounding sediments, they will not directly provide information on whether that pore water represents upwelling groundwater. However, collection of surface water data immediately above the sediments would assess potential impacts on surface water from sediments and upwelling. In discussion with the agencies, it was decided that passive arsenic samples from the river bottom would be collected to provide additional data on river bottom conditions.”

The DNR proposes the following language instead:

“7. Pore Water and Surface Water Sampling with Passive Arsenic Sampler

Passive samplers, such as DGTs, could be used to measure pore water arsenic concentrations and surface water concentrations immediately above the river bottom. ~~Because~~ Pore water concentrations measured by passive samplers reflect an equilibrium with the surrounding sediments, ~~they will not directly~~ and this data may provide an indication of areas where upwelling of groundwater containing significant arsenic is occurring. ~~provide information on whether that pore water represents upwelling groundwater. However, collection of surface water data immediately above the sediments would assess potential impacts on surface water from sediments and upwelling.~~ In discussion with the agencies, it was decided that passive arsenic samples from the river bottom would be collected to provide additional data on river bottom conditions.”

References:

2015. CH2M HILL. Response to April 16, 2015, EPA Comments “Tyco Updated Dye Injection Information and Estimates Proposal CH2M HILL Technical Memorandum, dated March 13, 2015.” Prepared for Tyco Fire Products, LP. June 29, 2015.