AECOM
1555 N. River Center Drive
Suite 214
Milwaukee, WI 53212

T: +1-414-944-6080
aecom.com

September 25, 2023

Mr. Joe Graham
Wisconsin Department of Natural Resources
Spooner Service Center
810 W. Maple Street
Spooner, WI 54801

Project Name:
WDNR Superior Slips (RFP-SLR22), Feasibility Studies & Preliminary Design

WDNR PO:
37000-0000021216

AECOM Project No.
60685299

Subject: Superior Slips Quality Assurance Project Plan (QAPP) Addendum - 2023 AECOM Investigation

Dear Mr. Graham,

AECOM Technical Services, Inc. (AECOM) has prepared this addendum to the *Quality Assurance Project Plan for Superior Slips* (AECOM 2022a) in accordance with "EPA Requirements for Quality Assurance Project Plans (QA/R-5)" (EPA/240/B- 01/003, March 2001) and "Guidance for Quality Assurance Project Plans (QA/G-5)" (EPA/240R- 02/009, December 2002). and guidelines provided in the Wisconsin Department of Natural Resources' request for proposal (RFP) and Scope of Work (SOW) Revision 1, dated April 20, 2022 (WDNR, 2022). This Quality Assurance Project Plan (QAPP) Addendum provides details of QA/QC procedures and specifications for additional field activities to be completed as part of the data gap field investigation for Tower Avenue, General Mills, and C Street Slips.

1. Introduction and Project Objectives

Field activities are anticipated to take place in late summer/early fall of 2023. Sampling proposed as part of this 2023 investigation includes sediment cores and surficial sediment grab samples following the methods described in the *Field Sampling Plan for Superior Slips* (AECOM 2022b) and this 2023 addendum. The purpose of the 2023 Supplemental Site Investigation (2023 SSI) is to confirm concentrations of select constituents of concern (COCs), further delineate applicable COCs related to Beneficial Use Impairment (BUI) data gaps and collect additional toxicity data to further support remedial alternative(s) decisions.

1.1 Addendum Outline

The QAPP Addendum outline is based on the outline of the original *Quality Assurance Project Plan for Superior Slips* (AECOM, 2022a). In accordance with the guidance cited above, the 2022 QAPP is organized into four major sections:

- Group A – Project Management;
- Group B – Data Generation and Acquisition;
- Group C – Assessment and Oversight; and
- Group D – Data Validation and Usability.
- This addendum provides updates to the original sections only as necessary to address additional analytical parameters. Group B details approaches and procedures that apply to all sampling and analytical methods proposed in both the original and data gap investigations. No changes are made

to that section other than the general observation that specific references to the C Street Slip apply to all locations addressed in this data gap investigation.

- The 2023 Field Sampling Plan (FSP) Addendum
- This QAPP Addendum is organized as follows, with original QAPP sections noted in parentheses:
- Introduction and Project Objectives;
- Approval Page (**Section A-1**);
- Distribution List (**Section A-3**);
- Project/Task Organization (**Section A-4**)
  - Analytical Laboratories (**Section A-4.4**);
  - Project Organization Chart (**Section A-4.5, Figure 1**)
- Overview/Problem Definition (**Section A-5.1**);
- Project Task Description (**Section A-6**)
  - Schedule (**Section A-6.1.5**)
- Data Quality Objectives Process (**Section A-7.1**);
- Analytical Methodologies (**Section A-7.3**);
- Laboratory Methodologies (**Section A-9.1.4**);
- Reports to Management (**Section C-2**);
- Data Review, Validation, and Verification Methods (**Section D-1**)
- Figures (**Figure 1**)
- Tables (**Tables 1, 2, 3, 4A, 4B, 5A** and **5B**); and
- Attachments – Laboratory SOPs.

2. Approval Page (Section A-1)

WDNR

Joe Graham/Project Manager

Printed Name/Title

Joseph Graham Digitally signed by Joseph Graham Date: 2023.10.13 14:05:48 -05'00'

Signature/Date

USEPA

Meaghan Kern/SLR Sediment Lead

Printed Name/Title

MEAGHAN KERN Digitally signed by MEAGHAN KERN ~~Date: 2023.09.28 14:35:49 -05'00'~~

Signature/Date

GLLA

Mark Loomis/QA Manager

Printed Name/Title

CHRISTIAN BAKO 2023.10.02 15:31:43 -05'00'

Christian Bako, GLLA QA Team representative on behalf of Mark Loomis

Signature/Date

AECOM

Kim Elias/Project Manager

Printed Name/Title

9/25/2023

Signature/Date

AECOM

Dean Fenske/QC Manager & CQC Systems Manager

Printed Name/Title

9/25/2023

Signature/Date

AECOM

Waverly Braunstein/Chemistry QA Manager

Printed Name/Title

9/25/2023

Signature/Date

Pace – Green Bay (WI)

Christopher Hyska/Lab Project Manager

Printed Name/Title

9/26/2023

Signature/Date

ALS - Kelso (WA)

Luke Rahn/Lab Project Manager

Printed Name/Title

9/27/2023

Signature/Date

Aquatec – Williston (VT)

John Williams/Lab Project Manager

Printed Name/Title

John Williams 9/27/2023

Signature/Date

Revision History

Revision	Revision date	Details	Authorized	Name	Position
0	07/24/2023	Draft	Yes	Kim Elias	Project Manager
1	09/11/2023	RTC	Yes	Kim Elias	Project Manager
2	09/22/2023	RTC	Yes	Kim Elias	Project Manager
3	09/25/2023	Final	Yes	Kim Elias	Project Manager

3. Distribution List (Section A-3)

AECOM Technical Services Inc. (AECOM) will maintain this Quality Assurance Project Plan (QAPP) and subsequent updates, and its distribution. The individuals named in the following table will receive a copy of this QAPP addendum and any subsequent revisions. **Table 1** also provides a summary of the project team for the data gap field investigations.

Mr. Joe Graham, Project Manager Wisconsin Department of Natural Resources Spooner Service Center 810 W. Maple Street Spooner, WI 54801 715.292.4925 joseph.graham@wisconsin.gov	Scott Cieniawsk, SLR Sediment Lead U.S. Environmental Protection Agency Great Lakes National Program Office 77 W. Jackson Blvd G-17J Chicago, IL 60604 312.353.9184 cieniawski.scott@epa.gov
Mark Loomis, GLLA QA Manager U.S. Environmental Protection Agency Great Lakes National Program Office 77 W. Jackson Blvd G-17J Chicago, IL 60604 312.886.0406 Loomis.Mark@epa.gov	Meaghan Kern, Project Manager U.S. Environmental Protection Agency Great Lakes National Program Office 77 W. Jackson Blvd G-17J Chicago, IL 60604 312.353.5784 Kern.Meaghan@epa.gov
Waverly Braunstein, Chemistry QA Manager AECOM 250 Apollo Drive Chelmsford, MA 01824 978.905.2133 waverly.braunstein@aecom.com	Kim Elias, Project Manager AECOM 1555 N Rivercenter Drive Milwaukee, WI 53212 920.377.1371 Kim.Elias@aecom.com
John Williams, Director Aquatec Environmental, Inc. 273 Commerce Street Williston, Vermont 05495 802.860.2960 jwilliams@aquatecenv.com	Walter Bolt, Vice President Mannik Smith Group/Driller 865 Aulerich Road East Tawas, Michigan 48730 989.305.6808 https://manniksmithgroup.com/
Chris Hyska, Laboratory QA Project Manager Pace Analytical Laboratory 1241 Bellevue St, STE 9, Green Bay, WI 54302 920.321.9405 Christopher.Hyska@pacelabs.com	Luke Rahn, Project Chemist ALS Environmental 1317 South 13th Avenue Kelso, WA 98626 360.577.7222 Luke.rahn@alsglobal.com

4. Project/Task Organization – (Section A.4)

Analytical Laboratories (Section A-4.4)

PACE Analytical Laboratory (Pace), Green Bay, Wisconsin has been selected to support this project performing chemical analyses for sediments for metals (including mercury), polycyclic aromatic hydrocarbons (PAHs), SVOCs (dibenzofuran only), Acid Volatile Sulfide/Simultaneously Extracted Metals (AVS/SEM), and analyses of Investigation Derived Waste (IDW). Multiple Pace network laboratories will be used to support this project including Pace Gulf Coast (Baton Rouge, LA), Pace (Mt. Joliet, TN), Pace (Long Island, NY), Pace Analytical (New Orleans, LA), and Pace-Alpha (Mansfield, MA).

ALS, Kelso, Washington (ALS) has been selected to support this project performing chemical analyses for tributyltin in sediments.

Aquatec, Williston, Vermont, has been selected to provide toxicity testing. Acute toxicity testing will be performed by evaluating the 10-day survival and growth of the midge, *Chironomus dilutus*. Chronic toxicity testing will be performed by evaluating the 28-day survival, growth, and fecundity (percentage of females with eggs) of the amphipod, *Hyalella azteca*. The FSP describes the selection of the 10 investigative and one reference locations. The laboratory will prepare 10 replicates from each location for each test.

Each laboratory has provided AECOM with its Quality Manual which provides a summary of the laboratories' analytical and toxicity methods, laboratory QC, instrument/equipment testing, maintenance and inspection, instrument/equipment calibration and frequency, laboratory data management, and laboratory data reporting procedures.

A summary of the environmental and quality control samples to be collected for the data gap investigations are presented in **Table 3**.

Collection, preservation, and holding times are presented in **Table 4A**. Laboratory SOPs for preparation and analysis are itemized in **Table 4B** and provided in Attachment A (Pace), Attachment B (ALS), and Attachment C (Aquatec).

Table 5A and **Table 5B** provide a complete list of analytes as well as the laboratories' method references, Method Detection Limits (MDLs) and Reporting Limits (RLs). The analyte list and laboratory limits for IDW are unchanged from the original QAPP.

Project Organization Chart (Section A-4.5, Figure 1)

A summary of the project team for the data gap field investigations are presented in the organization chart in **Figure 1.**

5. Overview/Problem Definition (Section A-5.1)

The purpose of the 2023 SSI is to confirm concentrations of select COCs, further delineate applicable COCs related to BUI data gaps, and collect additional toxicity data to further support remedial alternative decisions. Field activities will include the following tasks:

1. Collection of sediment cores for chemical analysis to confirm or delineate tributyltin (TBT) impacts in sediments deposited in and adjacent to Tower Avenue and General Mills Slips.
2. Collection of surface sediment grab samples for toxicity evaluation at General Mills and Tower Avenue Slips.
3. Collection of surface sediment grab samples in the western region of the General Mills and Tower Avenue Slips for additional delineation of BUI #4 exceedances.

4. Collection of sediment cores for chemical analysis to confirm or delineate mercury concentrations in sediments deposited along the eastern shore of C Street Slip.
5. Waste characterization and disposal of IDW generated during the 2023 SSI.

The results of the investigation will be used to evaluate the feasibility of viable sediment management alternatives and to refine the preliminary remedial designs for each Slip.

6. Project/Task Description (Section A-6)

Schedule (Section A-6.1.5)

The field event is scheduled from September 25 – October 1, 2023. The tentative field schedule broken down by task is as follows:

1. Collection of sediment cores for chemical analysis to improve data quality, confirm spatial extent (horizontal and vertical) and/or delineate TBT impacts in sediments deposited beyond predicted dredge prisms in and adjacent to Tower Avenue and General Mills Slips. (Sept 25-29, 2023).
2. Collection of surface sediment grab samples at General Mills and Tower Avenue Slips adjacent to tentative dredge prisms as well as a reference location for aquatic toxicity evaluation that includes analysis of historically reported COCs and AVS/SEM. (Sept 25-29, 2023).
3. Collection of surface sediment grab samples in the western region of the General Mills and Tower Avenue Slips for additional delineation of locations with COC exceedances between the Midpoint Effect Concentration (MEC) and Probable Effect Concentration (PEC) to evaluate the Degradation of Benthos BUI No. 4 and potential inclusion in the dredge prism. (Sept 30-Oct 1, 2023).
4. Collection of sediment cores for chemical analysis to confirm or delineate mercury impacts in sediments deposited along the eastern shore of C Street Slip. (Sept 30-Oct 1, 2023).
5. Waste characterization and disposal of IDW generated during the 2023 SSI. (Oct 1, 2023)

7. Data Quality Objectives Process (Section A-7.1)

The DQO process is a systematic planning tool based on the Scientific Method for establishing criteria for data quality and for developing data collection designs. It was developed by the USEPA to accurately describe the type, quantity, and quality of data to be used in decision-making for an investigation or corrective action implementation. DQOs are developed to verify that data of sufficient quantity and quality are collected to satisfy the project objectives. The DQOs for the Supplemental Investigation at General Mills, Tower Avenue, and C Street Slips have been developed to be consistent with the DQO guidance set out in the USEPA guidance document: “United States Environmental Protection Agency, Guidance for the Data Quality Objectives Process (EPA QA/G-4. EPA/240/B-06/001) from the Office of Environmental Information in Washington, D.C. (February 2006).”

The objectives of this program will be achieved by controlling sample collection, sample custody, sample analysis, data reporting, analytical data review, and the final data evaluation. Refer to the 2022 QAPP for:

- Sample monitoring and collection practices (**Section A-6);**
- Custody procedures **(Section B-3.2);**
- Sample analysis **(Section B-4)**;
- Data reporting **(Section A-9)**; and
- Analytical data review process **(Section D)**.

7.1 Problem Statement

A Preliminary Remedial Design for the Superior Slips requires an investigation at each slip to delineate the nature and extent of mercury (C Street Slip), tributyltin (General Mills and Tower Avenue Slips), and other COCs related to BUI exceedances (General Mills and Tower Avenue Slips). A toxicity evaluation is also required for General Mills and Tower Avenue Slips. The rationale for the selection of each location, including reference locations, is provided in **Table 2** of this addendum. Historically, multiple transport pathways have impacted the sediments in the previously mentioned slips and include:

- Groundwater: Dissolved phase plumes of contaminants in upland groundwater may have migrated into the lake either directly or via preferential flow paths and impacted sediment contaminant concentrations within the boat slip.
- Stormwater: Contaminants in stormwater (falling onto nearby industrial and commercial properties) may have impacted surface sediment contaminant concentrations within the slip via the City's storm sewer conveyance system.
- CSTP#2 Pond: Adjacent to the boat slip is the City of Superior's main sewage treatment plant and CSTP#2 wastewater pond. Potential contamination from the pond to the boat slip may have occurred via lateral seepage of wastewater (through the pond berm) or via direct discharge of wastewater through the discharge pipe.
- Overwater Activities: Spills or releases associated with commercial vessel loading and offloading and fueling may have impacted sediments within the boat slip.
- Shoreline Erosion / Resuspension and Redistribution of Bedded Sediments: wind, wave erosion, propeller wash, or mass wasting of the slope and natural events, or anthropogenic processes (scour from marine vessel propeller wash) may contribute to redeposits of contamination.

7.2 Decision Identification

- What are the concentrations of the COCs in the sediments at the slips and do those concentrations exceed human health or ecological criteria defined in **Tables 5A** and **5B**?
- What are the geophysical characteristics of the sediments at the three slips? How do these geotechnical properties of the sediment affect the concentrations of the COCs, future dredging rate, and the transport, processing, and disposal of dredged sediments?
- What are the concentrations of TBT in sediments throughout the General Mills and Tower Avenue Slips and can the laboratory achieve detection limits lower than the Wisconsin Consensus-Based Sediment Quality Guidelines (SQG) Midpoint Effect Concentration (MEC) of 1.73 micrograms per kilogram (ug/Kg)?
- Can the concentrations of mercury along the southeastern wall of the C Street Slip be better delineated vertically and horizontally to improve EVS modeling of the mercury plume and refine the dredge prism edge?
- At what concentration are COCs toxic to benthic organisms within the sediments deposited in the General Mills and Tower Avenue Slips and what is the current overall health of the benthic community compared to a reference location outside of the Slips? Do sediments with COC concentrations greater than MEC exhibit aquatic toxicity that contributes to the Degradation of Benthos BUI (BUI No. 4) within the Saint Louis River Area of Concern (SLRAOC)?
- What are the concentrations of contaminants in the waste generated and do concentration levels allow for the disposal in a Subtitle D landfill as non-hazardous waste as shown in Table 6 of the 2022 QAPP (AECOM, 2022a).

7.3 Decision Input

Decision inputs will include:

- Sediment descriptions including the level and type of visual impact (i.e., bleb, stringer, staining, sheen, saturated), debris (i.e., paint chips, organic material) and odors.
- Sediment sampling for chemical analysis to delineate extent of COCs horizontally and vertically.
- Collection of surface sediment grab samples at General Mills and Tower Avenue Slips as well as a reference location for aquatic toxicity evaluation that includes analysis of historically reported COCs and AVS/SEM.
- Sediment results that have been validated and are defensible with sufficiently low detection limits to correspond with project-specific action levels. The selected laboratory's MDL is below all ecological screening levels presented in **Table 5B**. However, MDLs increase based on the moisture content of samples and dilutions performed. To minimize the impact of moisture on the MDLs, the field team will decant overlying water from the samples prior to containment. For TBT analysis the laboratory will employ the following drying technique prior to analysis:
  - Transfer sample from jar into an aluminum pan that has been pre-rinsed three times with dichloromethane and spread the sample into a uniform layer.
  - Air dry for two to four days with occasional stirring.
  - Transfer the dried material into a new, clean container.
- Review of historical/background information, data, and reports.
- Waste parameter collection, and analysis to verify meeting landfill requirements for IDW.

7.4 Investigation Boundaries

The sampling program will be limited to sediment, surface water (water quality only) and IDW. Sediment samples to be analyzed for COCs will be collected from cores and surface grabs extracted at designated locations. Toxicity evaluations only require surficial sediment samples (0.0'-0.5'). Water quality parameters using field testing equipment only, will be measured from approximately one foot below the water surface and one foot above the sediment bottom prior to sediment disturbance to capture water quality throughout the slip at the time of sample collection. For the waste sample, a grab sample will be collected in accordance with the SOP in Appendix B of the FSP.

Practical constraints that may impede sampling will be considered (e.g., weather, boring locations, underwater obstructions, etc.) For this project, historical information will be used to assess locations for sediment borings. The designated sample areas in the slips were defined by DNR in the bid process and discussed in the FSP. Cores will be advanced to refusal or target depth below the sediment surface (feet below sediment surface (bss), whichever is attained first. The target sampling depth is 14 ft bss, 4 feet deeper than the 10-foot target depth of historical samples. Surficial sediment samples are anticipated to be collected from 0.0-ft to 0.5-ft below the sediment surface.

For purposes of clarity the following locations are provided:

- General Mills Slip (Figure 1 of the FSP) – 15 sediment cores will be collected to delineate TBT concentrations and three surface sediment grab samples for additional delineation of BUI No. 4.
- Tower Avenue Slip (Figure 2 of the FSP) – 22 sediment cores will be collected to delineate TBT concentrations and three surface sediment grab samples for additional delineation of BUI No. 4.
- Toxicity Evaluation Locations (Figure 3 of the FSP) – Surficial sediment grab samples will be collected from five locations in the Tower Avenue Slip, five locations in the General Mills Slip, and one reference location. In addition to the toxicity tests, these samples will be analyzed for TBT, BUI COCs, total organic carbon (TOC), and AVS/SEM.

- C Slip (Figure 4 of the FSP) – Three sediment cores will be advanced in the C Street Slip to confirm the presence/absence of mercury in areas of the slip not previously analyzed.

7.5 Decision Rules

The sediment sample results will be evaluated to determine whether results exceed Wisconsin regulatory criteria for direct soil contact (non-industrial and industrial), the soil to groundwater pathway, and Consensus-Based Sediment Quality Guidelines (CBSQG) for benthic invertebrate toxicity (WDNR 2003) as defined in **Tables 5A** and **5B** of this addendum.

The IDW sample results will be evaluated to determine whether the sediment displays a Resource Conservation and Recovery Act (RCRA) hazardous waste characteristic and would require management pursuant to RCRA. The regulatory levels are defined in Table 6 of the 2022 QAPP (AECOM, 2022a).

7.6 Limits on Decision Error

The possibility of decision error may occur as sampling design error and/or measurement error. Although the possibility of decision error can never be eliminated, it can be minimized and controlled. For this project, sampling and measurement decision errors are to be controlled. The sampling program (location, time, or individual sample collection) is discussed in the FSP addendum. Measurement errors are controlled using analytical methods that achieve reporting limits that are less than the established action levels. The following describes the possible decision errors and potential consequence of each error:

- Precision: ≤ 40% among field replicates for COCs
- Precision: ≤ 40% among field duplicates for COCs

No field blanks or equipment blanks are required for this investigation.

- *Decision error based on a false positive.*

This error is being generally minimized by use of standardized test methods for sample analysis at an analytical laboratory that has a fully implemented and integrated QA program.

Decision error based on a false negative.

The likelihood of a decision error based on a false negative is minimal for the following reasons:

- The use of standardized test methods and the validation of the results minimize the likelihood of false negatives.

The analytical program is designed to generate data sensitive enough to produce chemical concentrations below the project-specific action levels for sediment and waste.

There is also the possibility of decision error associated with TBT results due to the variation in the distribution of source materials and heterogeneity of concentrations in sediment. The distribution of source material cannot be controlled, but spatial variation can be assessed by comparing adjacent sample results, noting the possible presence of paint chips during field logging procedures (detailed in FSP Addendum), and by using field replicates and duplicates. The replicate and duplicate precision of 40% mentioned above will be used to assess data variability but will not be used to invalidate results for use in dredge prism or plume modeling. All forms of data collected, both current and historically, will be used to assess how the dredge prisms and TBT plumes will be adjusted after this investigation. Three additional steps will be taken to give more options during the assessment of data:

1. Enough sediment will be provided to the laboratory to allow for the reanalysis of a specific sample if deemed necessary.

2. Samples being analyzed will remain at the laboratory in cold storage (frozen) past the sample hold time of 14 days and past the standard 30-day sample hold to allow for time to assess all data post analysis and reanalyze if deemed necessary.
3. Samples that exceed the 40% precision matrix will be flagged with specific reason codes in the EQuIS database so the results can be easily queried during the assessment of data and modeling of the TBT plume and dredge prisms.

7.7 Decision Optimization

The most cost-effective sampling approach to achieve the objectives of the sampling program is to select locations based on historic knowledge of the operational activities near and at the slips. The project FSP has been designed to maximize the project objectives and usability of the data. Conditions encountered in the field (e.g., inability to access a sampling location) or during validation (e.g., rejection of data due to matrix issues) potentially could result in limitations to the data. Identification, communication, and response to significant problems that would prevent achievement of the project objectives will be handled as described in **Section A-9** of the 2022 QAPP (AECOM, 2022a).

- The sediment core sampling strategy has been adjusted for the 2023 SSI and is detailed in Section 4.6.1 of the FSP Addendum. The strategy was developed to maximize data usage and minimize costs. Sediment samples will be collected from each core in one-foot intervals. The bottom one foot of every two-foot interval (up to 7 composite analytical samples) will be submitted for chemical analysis. The remaining 7 samples will be held in cold storage (4°C) until further notice for future use.
- Sampling will exclude dense, native red clay. If red clay is encountered, it will not be included in a sample interval. Sampling will also exclude sediments containing greater than 50% dense sand. Dense sands have been historically encountered in the Superior Slips and have caused vibracores to refuse advancement. If dense sand is captured in a core, it will be considered for chemical analysis only when more than 50% of soft sediments are present. Dense sand captured within the core beneath the last internal with greater than 50% soft sediment will be segmented into 1-foot intervals but only the first dense sand interval will be sent to the laboratory for analysis. The remaining intervals will be archived pending results from intervals above it.

8. Analytical Methodologies (Section A-7.3)

Analytical methods, container requirements, preservation, holding times, and laboratory SOP references are presented in **Tables 4A** and **4B**.

9. Laboratory Methodologies (Section A-9.1.4)

<u>Tributyltin – Laboratory SOP SOC-BUTYL</u>

Documentation from the laboratory must specifically address the following:

- Extraction procedures completed within method holding time.
- Drying procedure used
- GC Calibration - Concentrations/source and date prepared for standards used for initial calibration and applicability.
- Chromatograms and data system printouts for initial and continuing calibration.
- Calculation of continuing calibration response and deviation from expected response, limits used to define acceptable calibration.
- Retention time window criteria used.
- Chromatograms and data system printouts for all samples, lab blanks, QC check samples and lab QC (duplicates, spikes).

- Surrogate spike recovery and limits used for assessment.
- QC check standard chromatogram, data system printout and recovery calculations, limits used for assessment.
- MS/MSD and/or lab duplicate chromatograms, data system printouts and calculations of recovery and RPD limits used for assessment.
- Laboratory blank chromatograms, data system printouts and limits used for assessment.

Toxicity (*Chironomus dilutus*, 10-Day Survival and Growth, *Hyalella azteca*, 42-day Survival, Growth, and Reproduction) – EPA Methods 100.2 and 100.4

Documentation in the laboratory must specifically address the following:

- Preparation of test organisms.
- Initial test conditions.
- Frequency and results of water quality testing.
- All logbook entries as required by the specific SOP.
- Results for positive and negative controls and limits used for assessment.
- Statistical results to support the final toxicity statement.

10. Reports to Management (Section C-2)

AECOM will evaluate the analytical results of the sediment investigation and prepare a Supplemental Site Investigation Report (SSIR) per Wisconsin Administrative Code NR 716.15 for the General Mills and Tower Avenue Slips. The SSIR will include results from the investigation activities described in Section 4.6 of the FSP? for both slips. This SSIR will be furnished to the WDNR and EPA for review within 30 days of receipt of all validated laboratory data, including validated data for any frozen samples chosen for analysis (Phase 2 Analysis).

11. Data Review, Validation and Verification Methods (Section D-1)

Data validation for all investigative analyses with the exception of the toxicity analyses (*C. dilutus*, 10-Day Survival and Growth, and the *H. azteca*, Modified 28-day Survival and Growth) will be performed as described in the 2022 QAPP.

The toxicity test data packages will be reviewed for completeness, and the results from positive and negative controls will be evaluated against the quality control limits provided in the laboratory SOPs. No formal validation will be conducted, but any nonconformances will be discussed in the data usability assessment.

Total PAHs as referenced in the 2022 QAPP, and included in Table 5B for comparison to ecological screening criteria consist of the following 18 PAHs: 2-methylnaphthalene, acenaphthene, acenaphthylene, anthracene, benz(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(e)pyrene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, naphthalene, phenanthrene, and pyrene.

Total PAHs will be calculated by summing all detected concentrations and using a value of zero (0) for non-detected analytes. Results of the calculation will be rounded to two significant figures.

12. References

AECOM, 2022a.Quality Assurance Project Plan for Superior Slips. Prepared by AECOM Technical Services, Inc. for Wisconsin Department of Natural Resources. Revision 2. August 15, 2022.

AECOM, 2022b. Field Sampling Plan for Superior Slips. Prepared by AECOM Technical Services, Inc. for Wisconsin Department of Natural Resources. Revision 3. August 12, 2022.

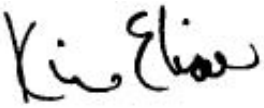
WDNR, 2003. *Consensus Based Sediment Quality Guidelines Recommendations for Use Interim Guidance*. Publication No. WT-732 2003. Wisconsin Department of Natural Resources. December 2003.

WDNR. 2022. Wisconsin Department of Natural Resources. 2022. Professional Services Request for Proposals (RFP) and Scope of Work (SOW) for Feasibility Studies & Preliminary Designs for Contaminated Sediment Remediation in the Superior Slips Revision 1. April 20, 2022.

13. Closing Remarks

Please feel free to contact me at (920) 377-1371 or by email at kim.elias@aecom.com if you have any questions.

Sincerely,

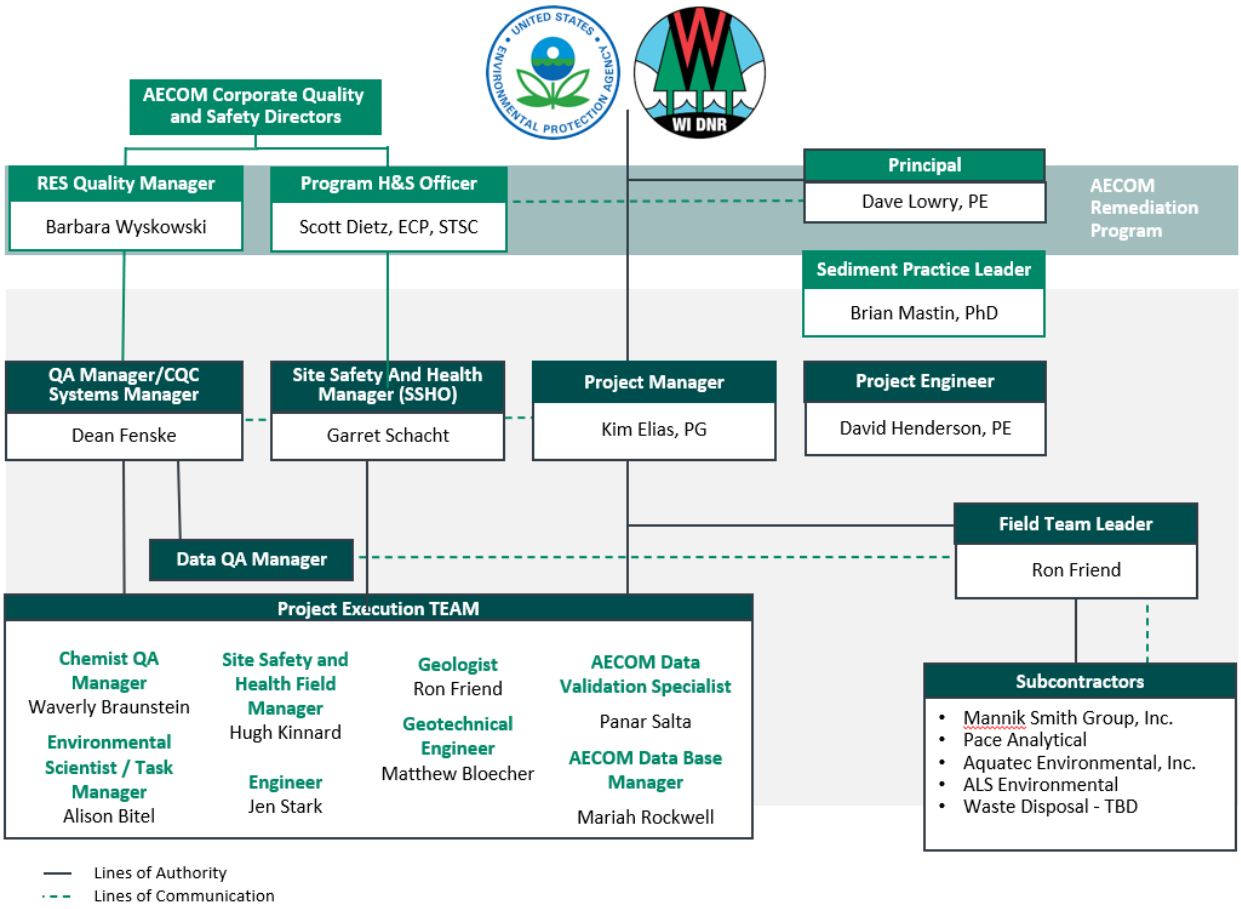


Kim Elias, PG (WI)
AVP, Sr. Project Manager
AECOM

Figures

Figure 1 Project Organization Chart for the 2023 AECOM Investigation

Figure 1
Project Organization Chart for the 2023 AECOM Investigation



Tables

Table 1 Project Team Summary for the Data Gap Field Investigation

Table 2 Sample Locations (Cores, Depth, IDs), Parameter Group and Rationale

Table 3 Environmental and Quality Control Samples

Table 4A Matrices, Parameter Groups, Sample Containers, Preservation, Handling Procedures, and Hold Times

Table 4B Matrices, Parameters, Analytical Methods, and Laboratory SOP References

Table 5A Regulatory Limits (Human Health) and Laboratory Quality Control Criteria for Sediments

Table 5B Regulatory Limits (Ecological) and Laboratory Quality Control Criteria for Sediments

Table 1: Project Team Summary for the Data Gap Field Investigation

Name	Affiliation	Title	Telephone	Email
Joe Graham	Wisconsin Department of Natural Resources	Project Manager	715.292.4925	joseph.graham@wisconsin.gov
Scott Cieniawski	USEPA	SLR Sediment Lead	312.353.9184	cieniawski.scott@epa.gov
Mark Loomis	GLLA	QA Manager	312.886.0406	Loomis.Mark@epa.gov
Donalea Dinsmore	WDNR Great Lakes	Quality Assurance Coordinator	608-228-2672,	donalea.dinsmore@wisconsin.gov
Dean Fenske	AECOM	QA Manager & CQC Quality Systems Manager	715.342.3043	Dean.Fenske@aecom.com
Kim Elias	AECOM	Project Manager	920.377.1371	Kim.Elias@aecom.com
Dave Henderson	AECOM	Project Engineer	414.429.8304	Dave.Henderson@aecom.com
Ron Friend	AECOM	H&S Manager Field Team Leader	248.204.4148	Ronald.friend@aecom.com
Alison Bitel	AECOM	Geologist	248.204.4149	Alison.bitel@aecom.com
Waverly Braunstein	AECOM	Data QA Manager	978.905.2133	Waverly.Braunstein@aecom.com
Shellee McGrath	QATS/APTIM	Data Validation Specialist	702.895.8719	Shellee.mcgrath@aptim.com
Walter Bolt	Mannik Smith Group	Sediment Surveyors	517.263.4515	https://manniksmithgroup.com/
John Williams	Aquatec Environmental, Inc.	Laboratory Director	802.860.2960	jwilliams@aquatecenv.com
Luke Rahn	ALS Environmental	Project Chemist	360.577.7222	luke.rahn@alsglobal.com
Christopher Hyska	Pace Analytical Laboratory	Laboratory Project Manager	920.321.9405	Christopher.Hyska@pacelabs.com

Table 2: Sample Locations (Cores, Depth, IDs), Parameter Group and Rationale

Matrix & Location	No. of Samples	Depth Range	Location IDs	Para-meter Group[a, b]	Rationale
Sediment Core C-Street Slip	15	0.0-1.0, 1.0-2.0, 2.0-3.0, 3.0-4.0, 4.0-5.0, 5.0-6.0, 6.0-7.0, 7.0-8.0, 8.0-9.0, 9.0-10, 10-11, 11-12, 12-13, 13-14, 14-15	2023-SED-CS01	Mercury	Confirm the presence or absence of mercury between mercury plumes at a similar elevation to contaminated areas detected in 2022-SED-8 and 2022-SED-11.
Sediment Core C-Street Slip	15	0.0-1.0, 1.0-2.0, 2.0-3.0, 3.0-4.0, 4.0-5.0, 5.0-6.0, 6.0-7.0, 7.0-8.0, 8.0-9.0, 9.0-10, 10-11, 11-12, 12-13, 13-14, 14-15	2023-SED-CS02	Mercury	Confirm the presence or absence of mercury at a similar elevation to contaminated area detected in 2022-SED-8 and the southeastern shore.
Sediment Core C-Street Slip	15	0.0-1.0, 1.0-2.0, 2.0-3.0, 3.0-4.0, 4.0-5.0, 5.0-6.0, 6.0-7.0, 7.0-8.0, 8.0-9.0, 9.0-10, 10-11, 11-12, 12-13, 13-14, 14-15	2023-SED-CS03	Mercury	Confirm the presence or absence of mercury at a similar elevation to contaminated area detected in 2022-SED-8 and the southeastern shore.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM01	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM02	TBT	No detections in ND20-GM14 but it has elevated reporting limits above the MEC. Location proposed to assess presence of TBT.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM03	TBT	Location proposed to confirm PEC exceedance at surface at ND20-GM13 and to vertically delineate TBT in area.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM04	TBT	No historical data collected in this area. Location proposed to fill that gap.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM05	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM06	TBT	Location proposed to delineate TBT exceedances vertically and horizontally between locations ND20-GM09 and ND20-GM11.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM07	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM08	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM09	TBT	Location proposed to delineate TBT exceedances vertically and horizontally between locations SW15-SLB05 and ND20-GM09.

Matrix & Location	No. of Samples	Depth Range	Location IDs	Para-meter Group[a, b]	Rationale
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM10	TBT	To delineate MEC exceedance at ND20-GM07 and to assess elevated reporting limits reported at ND20-GM05.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM13	TBT	Location proposed to delineate TBT exceedances to the west.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM14	TBT	No historical data collected in this area. Location proposed to fill data gap.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM15	TBT	No historical data collected in this area except a single surface grab that had an elevated reporting limit above the PEC. Location proposed to fill data gap.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM16	TBT	No historical data collected in this area. Location proposed to fill data gap.
Sediment Core General Mills	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-GM17	TBT	No detections in ND20-GM01 and ND20-GM02, but both have elevated reporting limits above the MEC and PEC. Need sample to confirm presence of TBT above criteria.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA01	TBT	2020 sample in this area had elevated reporting limits over MEC criteria. Need to confirm TBT is not present by achieving lower detection limits.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA02	TBT	2020 sample in this area had elevated reporting limits over MEC criteria. Need to confirm TBT is not present by achieving lower detection limits.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA03	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA04	TBT	2020 sample in this area had elevated reporting limits over MEC and PEC criteria. Need to confirm TBT is not present by achieving lower detection limits.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA05	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA06	TBT	Location proposed to vertically delineate detections of TBT above PEC in boring SW15-SLB13. The 2020 boring (ND20-TB07) did not get low enough detection limits to show delineation below MEC.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA07	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.

Matrix & Location	No. of Samples	Depth Range	Location IDs	Para-meter Group[a, b]	Rationale
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA08	TBT	Location needed to confirm presence of TBT in the area. ND20-TB09 had elevated detection limits above 5xPEC criteria.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA09	TBT	2020 sample in this area had elevated reporting limits over MEC and PEC criteria. Need to confirm TBT is not present by achieving lower detection limits.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA10	TBT	Location needed to vertically delineate TBT criteria exceedances at SW15-SLB14.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA11	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA12	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the east.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA13	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate to the west.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA14	TBT	Location proposed to vertically delineate TBT hot spot. 2020 location ND20-TB16 had detections of TBT above 5xPEC to 2 feet. Also using this to potentially delineate to the west.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA15	TBT	No historical data collected in this area. Location proposed to fill that gap and to delineate eastern side of the slip.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA16	TBT	Location proposed to vertically delineate detection in 2020 location ND20-TB18 that exceeds MEC. Also, will be used to delineate to the west of the investigation area.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA17	TBT	Location proposed to delineate the northern boundary of the work area and to vertically delineate elevated reporting limits at the bottom of boring ND20-TB19.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA18	TBT	Location proposed to delineate the 5xPEC exceedances in boring ND20-TB22 vertically and to the east/southeast.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA19	TBT	Location proposed to confirm vertical delineation of TBT and northern delineation of TBT within the work area.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA20	TBT	Location proposed to confirm vertical delineation of TBT and northern delineation of TBT.

Matrix & Location	No. of Samples	Depth Range	Location IDs	Para-meter Group[a, b]	Rationale
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA21	TBT	Location proposed to confirm vertical delineation of TBT and northern delineation of TBT.
Sediment Core Tower Avenue	7	1.0-2.0, 3.0-4.0, 5.0-6.0, 7.0-8.0, 9.0-10, 11-12, 13-14	2023-SED-TA22	TBT	Location proposed to confirm vertical delineation of TBT and northern delineation of TBT.
Sediment General Mills	1	0.0-0.5	2023-SED-GM04	Toxicity	Collect at 2023-SED-GM04. Location near SW15-SLB07. Good location to show what is being left in place post dredge.
Sediment General Mills	1	0.0-0.5	2023-SED-GM03	Toxicity	Collect at 2023-SED-GM03. Located next to ND20-GM13 that had TBT detection that exceeded PEC value.
Sediment General Mills	1	0.0-0.5	2023-SED-GM05	Toxicity	Collect at 2023-SED-GM05. Location near ND20-GM11. Good location to show what will be left in place post dredge.
Sediment General Mills	1	0.0-0.5	2023-SED-GM09	Toxicity	Collect at 2023-SED-GM09. Location near ND20-GM08. Good location to show what will be left in place post dredge.
Sediment General Mills	1	0.0-0.5	2023-SED-GM10	Toxicity	Collect at 2023-SED-GM10. Location near ND20-GM07 and ND20-GM05. Good location to show what will be left in place post dredge.
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA09	Toxicity	Collect at 2023-SED-TA09. ND20-TB10 was collected here and has elevated PAHs, SVOCs, Metals, TBT, and PCBs above background/TEC.
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA10	Toxicity	Collect at 2023-SED-TA10. Not within a dredge prism and has SVOC, TBT, and metal impacts.
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA13	Toxicity	Collect at 2023-SED-TA13. ND20-TB15 has minor metal, PAH and SVOC impacts but has high Pentachlorophenol (SVOC-8270D). Good mid-range location. ND20-TB14 has little to no detections at surface but more detections deeper. Good low to mid-range impacts. The proposed sample location is slightly in the middle of the two 2020 samples.

Matrix & Location	No. of Samples	Depth Range	Location IDs	Para-meter Group[a, b]	Rationale
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA16	Toxicity	ND20-TB19 and 20 are both good locations. They have TBT exceedances, SVOC and metal exceedances, but are in the Nav channel or there are no proposed 2023 locations nearby. Changed this to be collected at 2023-SED-TA16. Would be a good area but ND20-TB18 had very little detected. Did have TBT detected and is relatively close to SW15-SLB15 which had many exceedances.
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA11	Toxicity	Collect at 2023-SED-TA11. Have some historical data on opposite side of slip but nothing close by.
Reference Location	1	0.0-0.5	2023-TOX-REF01	Toxicity	Same reference location was used during the 2020 EA investigation, ND20-SLBREF1.
Sediment General Mills	1	0.0-0.5	2023-SED-GM11	Western Slip Delineation	Selected to fill data gaps in the western portion of the Slip.
Sediment General Mills	1	0.0-0.5	2023-SED-GM12	Western Slip Delineation	Selected to fill data gaps in the western portion of the Slip.
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA23	Western Slip Delineation	Selected to fill data gaps in the western portion of the Slip.
Sediment Tower Avenue	1	0.0-0.5	2023-SED-TA24	Western Slip Delineation	Selected to fill data gaps in the western portion of the Slip.
IDW	1	Composite/Grab	Drummed Material	Disposal	Analysis for landfill required parameters

EA =
MEC = Midpoint Effect Concentration
PEC =
TBT = tributyltin
TEC =
[a] Samples for Toxicity testing will be analyzed for Tributyltin, PAH, SVOC (Dibenzofuran), TOC, AVS/SEM, Metals, Chironomus dilutus, Hyalella azteca, and moisture content.
[b] Samples for Western Slip Delineation will be analyzed for Tributyltin, PAH, SVOC (Dibenzofuran), Metals, and moisture content.

Table 3: Environmental and Quality Control Samples

Matrix	No. of Samples	Parameter Group	Field DUPs[a]	Field REPs[a]	MS/ MSD Pairs	PES	Total*
Sediment Core	259	Tributyltin	13	13	14	0	299
Sediment Core	45	Mercury	3	3	3	1	55
Sediment Grab	15	Tributyltin	1	1	0	0	17
Sediment Grab	15	Metals[b]	1	1	0	1	18
Sediment Grab	15	PAHs	1	1	0	1	18
Sediment Grab	15	SVOCs (Dibenzofuran)	1	1	0	1	18
Sediment Grab	11	Acute Testing Midge larvae, *Chironomus dilutus*, 10-day survival and growth	0	0	0	0	11
Sediment Grab	11	Chronic Testing Amphipod, *Hyalella azteca*, 28-day survival, growth, and fecundity	0	0	0	0	11
Sediment Grab	11	AVS/SEM	0	0	0	0	11
Sediment Grab	11	Total Organic Carbon	0	0	0	0	11
IDW	2	TCLP Suite (VOCs, SVOCs, Pesticides, Herbicides, RCRA Metals), Total PCBs, Ignitability, Reactive Cyanide, Reactive Sulfide, Paint Filter Test, pH	0	0	0	0	2

[a] The sample collection procedures for field duplicate and field replicates are provided in **Section A.6** and **B-5.1 of the 2022 QAPP**.
[b] Complete metals list is provided on Table 5A and Table 5B
AVS/SEM-Acid volatile sulfide/simultaneously extracted metals
DUPs-field duplicates.
IDW – Investigation derived waste
MS/MSD-matrix spike/matrix spike duplicate
PAHs-Polycyclic aromatic hydrocarbons
PCBs-Polychlorinated biphenyls
PES-Performance Evaluation Samples (obtained from GLLA QATS)
REPs-field replicates
SVOCs-semi-volatile organic compounds
VOCs-volatile organic compounds

Table 4A: Matrices, Parameter Groups, Sample Containers, Preservation, Handling Procedures, and Hold Times

Matrix	Parameter Group	Container [a,b]	Preservation	Storage, Shipping and Handling	Hold Time
Sediment	PAHs/SVOCs	4oz amber glass jar. (Fill jar full.)	No chemical preservation	Cool to 0-6°C.	Extraction within 14 days. Analysis within 40 days
Sediment	Metals	4oz plastic jar, unpreserved (Fill jar full.)	No chemical preservation	Cool to 0-6°C.	Analysis within 180 days
Sediment	Mercury	4oz plastic jar, unpreserved (Fill jar full.)	No chemical preservation	Cool to 0-6°C.	Analysis within 28 days
Sediment	Percent Moisture	4oz amber glass jar.	No chemical preservation	Cool to 0-6°C.	Analysis within 7 days.
Sediment	TOC	4oz amber glass jar.	No chemical preservation	Cool to 0-6°C.	Analysis within 28 days
Sediment	Tributyltin (TBT)	4oz amber glass jar w/ Teflon lined lid	No chemical preservation	Cool to 0-6°C.	Extraction within 14 days. Analysis within 40 days
Sediment	AVS/SEM	4 oz glass jar with Teflon septa cap and no headspace (fill jar full)	No chemical preservation	Cool to 0-6°C.	Analysis within 14 days.
Sediment	Sediment Toxicity (Amphipod, *Hyalella azteca* and Midge larvae, *Chironomus dilutus*)	one-gallon HDPE buckets with minimal to no headspace	No chemical preservation	Cool to 0-6°C.	Analysis within 14 days.
IDW (solid)	TCLP VOCs	3, 9 oz amber glass jars	No chemical preservation	Cool to 0-6°C.	Extraction within 14 days. Analysis within 14 days.
IDW (solid)	TCLP SVOCs	3, 9 oz amber glass jars	No chemical preservation	Cool to 0-6°C.	Extraction within 14 days. Prep within 7 days. Analysis within 40 days.
	TCLP Pesticides				Extraction within 14 days. Prep within 7 days. Analysis within 40 days. Hg: Extraction & prep within 28 days. Analysis within 28 days. Metals: Extraction within 180 days. Analysis within 180 days.
	TCLP Herbicides				
	TCLP RCRA Metals				

Matrix	Parameter Group	Container [a,b]	Preservation	Storage, Shipping and Handling	Hold Time
	Total PCBs				Extraction within 14 days. Analysis within 14 days.
	Ignitability				ASAP
	Reactive Cyanide				ASAP
	Reactive Sulfide				ASAP
	Paint Filter				NA
	pH				ASAP

[a] For field duplicates samples, double the sample volume is required to be shipped to the laboratory. Similarly, for field replicates, double the sample volume is required. Due to volume restrictions for the cores, field duplicate and field replicates will not be collected at the same location.

[b] For MS/MSD samples, triple the sample volume is required to be shipped to the laboratory. Due to volume restrictions for the cores, MS/MSD samples will not be collected at the same locations as the other field QC samples.

AVS/SEM-Acid volatile sulfide/simultaneously extracted metals
SW-USEPA SW846 Methods
TCLP-Toxicity Characteristic Leaching Procedure
TOC- Total Organic Carbon
VOC-volatile organic compounds
SVOC-semi volatile organic compounds

Table 4B: Matrices, Parameters, Analytical Methods, and Laboratory SOP References

Matrix	Parameter Group	Analytical Methods	Laboratory SOP Reference
Sediment	PAHs	SW3546 (prep) SW8270E-SIM	ENV-SOP-GBAY-0077 v03_Microwave Extraction in Solids by Method 3546 ENV-SOP-GBAY-0157 v01_Determination of Semi-Volatile Organics by GC_MS SW846 8270E SIM
Sediment	SVOCs	SW3546 (prep) SW8270E	ENV-SOP-GBAY-0077 v03_Microwave Extraction in Solids by Method 3546 ENV-SOP-GBAY-0155 v02_Semi-Volatile Organics by GC/MS_8270E
Sediment	Metals	SW3050B (prep) SW6020B	ENV-SOP-GBAY-0016 v04_Solids Digestion by SW846 3050B ENV-SOP-GBAY-0010 v03_Determination of Trace Metals in Waters and Wastes by Inductively Coupled Plasma Mass Spectroscopy - 6020/A/B 200.8
Sediment	Mercury	SW7471A (prep and definitive)	ENV-SOP-GBAY-0013 v03 Mercury by CVAA-CETAC M-7500(7470A_7471B)
Sediment	TOC	Lloyd Kahn	ENV-SOP-GBAY-0051 v02_TOC Using EA4000 Instrument Lloyd Kahn
Sediment	Percent Moisture	ASTM 2216	ENV-SOP-GBAY-0004 v04_Measurement of Percent Moisture in Soils and Solids
Sediment	Tri-Butyl Tin (TBT)	Lab SOP	EXT-OSWT, REV 12.0_ Extraction Method for Organotins in Sediment, Water and Tissue Soc-Butyl, Rev, 17.0_ Butyltins
Sediment	AVS/SEM	EPA-821-R-91-100	SOP 2140, Rev. 5, Acid Volatile Sulfides and Simultaneously Extracted Metals in Sediments
Sediment	Toxicity	EPA Method 100.2 EPA Method 100.4	SOP SED-A-002 Rev. 2_ Midge, *Chironomus dilutus*, 10-Day Survival and Growth Toxicity Test for Sediments SOP SED-A-003 Rev. 4_ Amphipod, *Hyalella azteca*, 42-day Survival, Growth, and Reproduction Toxicity Test for Sediments (And Modified 28-day Survival and Growth)
IDW (solid)	TCLP VOCs	SW1311 (ext) SW5030 (prep) SW8260D	ENV-SOP-GBAY-0043 v02_TCLP, SPLP and ASTM D3987-85 ENV-SOP-GBAY-0057 v02_Preparation of Aqueous Samples by SW846 5030B ENV-SOP-GBAY-0156 v01_Volatile Organics by GC_MS SW846 8260D
	TCLP SVOCs	SW1311 (ext) SW3510C (prep) SW8270E	ENV-SOP-GBAY-0043 v02_TCLP, SPLP and ASTM D3987-85 ENV-SOP-GBAY-0083 v05_Separatory Funnel Extraction by SW846 3510C ENV-SOP-GBAY-0155 v02_Semi-Volatile Organics by GC_MS SW846 8270E
	TCLP Pesticides	SW1311 (ext) SW3510C (prep) SW8081A	ENV-SOP-GBAY-0043 v02_TCLP, SPLP and ASTM D3987-85 ENV-SOP-GBAY-0083 v05_Separatory Funnel Extraction by SW846 3510C ENV-SOP-MTJL-0079 REV4 Pesticides by Gas Chromatography (EPA Methods 608, 8081A, 8081B, SM 6630C)
	TCLP Herbicides	SW1311 (ext) SW3510C (prep) SW8151	ENV-SOP-GBAY-0043 v02_TCLP, SPLP and ASTM D3987-85 ENV-SOP-GBAY-0083 v05_Separatory Funnel Extraction by SW846 3510C ENV-SOP-MTJL-0073 REV 4 Chlorinated Herbicides by Gas Chromatography (Methods 8151A, 615 & 1658)
	TCLP Metals	SW1311 (ext) SW3015A (prep) SW6010D or SW7470A (Hg)	ENV-SOP-GBAY-0043 v02_TCLP, SPLP and ASTM D3987-85 ENV-SOP-GBAY-0009 v03_Determination of Metals by ICP Spectroscopy by SW846 6010D & EPA 200.7
	Total PCBs	SW3541 (prep), cleanup,	ENV-SOP-GBAY-0075 v02_Extraction of PCBs Using the Automated Soxhlet ENV-SOP-GBAY-0069 v02_Sulfuric Acid Clean-Up-38124-1

Matrix	Parameter Group	Analytical Methods	Laboratory SOP Reference
		SW8082A	ENV-SOP-GBAY-0078 v01_Analysis of PCBs by GC SW846 8082A
	Ignitability	SW1030	ENV-SOP-BTRO-0076 v01_Ignitability by SW846 1030-51955-1 (1030)
	Reactive Cyanide	SW Chapter 7.3.3.2	ENV-SOP-SROS-0034 v01_Reactive Cyanide Sulfide-46122-1-1
	Reactive Sulfide	SW Chapter 7.3.4.2	ENV-SOP-SROS-0034 v01_Reactive Cyanide Sulfide-46122-1-1
	Paint Filter for Free Liquids	SW9095	ENV-SOP-GBAY-0026 v02_Free Liquid SW846 9095B
	pH	SW9045D	ENV-SOP-GBAY-0047 v02 pH in Water, Soil and Waste_SM 4500H+_9040C_9045D

ext = extraction

Table 5A: Regulatory Limits (Human Health) and Laboratory Quality Control Criteria for Sediments

Parameter	CAS No.	WDNR RCLs (DC) [1] Non-Industrial		WDNR RCLs (DC) [1] Industrial		GW Pathway		Prep Method (SW846)	Analytic. Method (SW846)	MDL*	RL*	LCS (%)	LCS RPD	MS/ MSD (%)	MS/ MSD RPD
Metals (mg/kg) [Pace Analytical – Green Bay, WI]															
Mercury	7439-97-6	3.13		3.13		0.208		7471B	7471B	0.010	0.035	85-115	20	85-115	20
Aluminum (Al)	7429-90-5	77500		100000		600		3050B	6020B	78.8	263	80-120	20	75-125	20
Antimony (Sb)	7440-36-0	31.3		467		0.542		3050B	6020B	0.16	0.67	80-120	20	75-125	20
Arsenic (As)	7440-38-2	0.677		3		0.584		3050B	6020B	0.26	0.88	80-120	20	75-125	20
Barium (Ba)	7440-39-3	15300		100000		164.8		3050B	6020B	0.26	0.87	80-120	20	75-125	20
Beryllium (Be)	7440-41-7	156		2300		6.32		3050B	6020B	0.14	0.67	80-120	20	75-125	20
Cadmium (Cd)	7440-43-9	71.1		985		0.752		3050B	6020B	0.10	0.67	80-120	20	75-125	20
Calcium (Ca)	7440-70-2	--		--		--		3050B	6020B	186	620	80-120	20	75-125	20
Chromium (Cr)	7440-47-3	--		--		360000		3050B	6020B	0.61	2.03	80-120	20	75-125	20
Cobalt (Co)	7440-48-4	23.4		347		3.607		3050B	6020B	0.18	0.67	80-120	20	75-125	20
Copper (Cu)	7440-50-8	3130		46700		91.6		3050B	6020B	0.54	1.78	80-120	20	75-125	20
Iron (Fe)	7439-89-6	54800		100000		--		3050B	6020B	48.7	167	80-120	20	75-125	20
Lead (Pb)	7439-92-1	400		800		27		3050B	6020B	0.18	0.67	80-120	20	75-125	20
Magnesium (Mg)	7439-95-4	--		--		--		3050B	6020B	46.0	167	80-120	20	75-125	20
Manganese (Mn)	7439-96-5	1830		25900		39.124		3050B	6020B	0.55	1.84	80-120	20	75-125	20
Nickel (Ni)	7440-02-0	1550		22500		13.06145		3050B	6020B	0.26	0.88	80-120	20	75-125	20
Potassium (K)	7440-09-7	--		--		--		3050B	6020B	310	1033	80-120	20	75-125	20
Selenium (Se)	7782-49-2	391		5840		0.52		3050B	6020B	0.18	0.67	80-120	20	75-125	20
Silver (Ag)	7440-22-4	391		5840		0.849		3050B	6020B	0.10	0.33	80-120	20	75-125	20
Sodium (Na)	7440-23-5	--		--		--		3050B	6020B	42.0	167	80-120	20	75-125	20
Thallium (Tl)	7440-28-0	0.782		11.7		0.284		3050B	6020B	0.11	0.67	80-120	20	75-125	20
Vanadium (V)	7440-62-2	393		5840		60		3050B	6020B	0.26	0.85	80-120	20	75-125	20
Zinc (Zn)	7440-66-6	23500		100000		--		3050B	6020B	6.97	23.3	80-120	20	75-125	20
PAHs/SVOCs (ug/kg – dry wt.) [Pace Analytical – Green Bay, WI]															
Acenaphthene	83-32-9	3,590,000		45,200,000		--		3546	8270E-S	2.2	16.7	69-120	20	52-120	26
Acenaphthylene	208-96-8	--		--		--		3546	8270E-S	2.1	16.7	63-120	20	46-120	22

Parameter	CAS No.	WDNR RCLs (DC) [1] Non-Industrial		WDNR RCLs (DC) [1] Industrial		GW Pathway		Prep Method (SW846)	Analytic. Method (SW846)	MDL*	RL*	LCS (%)	LCS RPD	MS/ MSD (%)	MS/ MSD RPD
Anthracene	120-12-7	17,900,000		100,000,000		196,949.2		3546	8270E-S	2.1	16.7	71-112	20	50-112	25
Benzo(a)anthracene	56-55-3	1140		20,800		--		3546	8270E-S	2.2	16.7	62-120	20	41-120	37
Benzo(a)pyrene	50-32-8	115		2110		470		3546	8270E-S	1.9	16.7	71-111	20	44-114	33
Benzo(b)fluoranthene	205-99-2	1150		21,100		478.1		3546	8270E-S	2.3	16.7	59-112	20	41-112	43
Benzo(e)pyrene	192-97-2	--		--		--		3546	8270E-S	1.9	16.7	72-109	20	45-109	44
Benzo(ghi)perylene	191-24-2	--		--		--		3546	8270E-S	2.9	16.7	64-115	20	40-115	36
Benzo(k)fluoranthene	207-08-9	11,500		211,000		--		3546	8270E-S	2.3	16.7	72-117	20	56-117	30
Chrysene	218-01-9	115,000		2,110,000		144.2		3546	8270E-S	3.1	16.7	75-120	20	45-120	28
Dibenzo(a,h,)anthracene	53-70-3	115		2110		--		3546	8270E-S	2.3	16.7	67-114	20	44-114	33
Fluoranthene	206-44-0	2,390,000		30,100,000		88,877.8		3546	8270E-S	2.0	16.7	70-110	20	55-110	43
Fluorene	86-73-7	2,390,000		30,100,000		14,829.9		3546	8270E-S	2.0	16.7	64-104	20	47-104	27
Indeno(1,2,3-cd) pyrene	193-39-5	1150		21,100		--		3546	8270E-S	3.5	16.7	71-114	20	45-114	33
1-Methylnaphthalene	90-12-0	17,600		72,700		--		3546	8270E-S	2.4	16.7	64-110	20	51-110	34
2-Methylnaphthalene	91-57-6	239,000		3,010,000		--		3546	8270E-S	2.4	16.7	60-110	20	45-110	29
Naphthalene	91-20-3	5,520		24,100		658.2		3546	8270E-S	1.6	16.7	62-120	20	47-120	26
Phenanthrene	85-01-8	--		--		--		3546	8270E-S	1.9	16.7	59-106	20	38-106	24
Pyrene	129-00-0	1,790,000		22,600,000		54,545.5		3546	8270E-S	2.5	16.7	69-120	20	51-120	41
2-Fluorobiphenyl (S)	321-60-8	--		--		--		3546	8270E-S			41-98			
Terphenyl-d14 (S)	1718-51-0	--		--		--		3546	8270E-S			37-106			
Dibenzofuran	132-64-9	73000		1040000		--		3546	8270E	20.2	167	70-130	20	47-130	23
2-Fluorobiphenyl (S)	321-60-8							3546	8270E			12-118			
Nitrobenzene-d5 (S)	4165-60-0							3546	8270E			10-125			
Terphenyl-d14 (S)	1718-51-0							3546	8270E			10-124			
2-Fluorobiphenyl (S)	321-60-8							3546	8270E			12-118			
Tributyl Tin (ug/kg – dry wt.) [ALS Environmental – Kelso, WA]															
Tri-n-butyltin	36643-28-4							Lab SOP	Lab SOP	0.42	4.0	10-122	40		
Tripropyltin (S)	761-44-4							Lab SOP	Lab SOP			10-120			
Acid Volatile Sulfide (AVS)/Simultaneously Extracted Metals (umoles/g – dry wt.) [Pace Alpha– Mansfield, MA]															
AVS	None	--		--		--		EPA-821-R-100		0.624	0.624	85-115	20	75-125	20
SEM Cadmium	7440-43-9	--		--		--		EPA-821-R-100		0.00089	0.00089	85-115	20	75-125	20
SEM Copper	7440-50-8	--		--		--		EPA-821-R-100		0.0157	0.0157	85-115	20	75-125	20
SEM Lead	7439-92-1	--		--		--		EPA-821-R-100		0.00966	0.00966	85-115	20	75-125	20
SEM Nickel	7440-02-0	--		--		--		EPA-821-R-100		0.0342	0.0342	85-115	20	75-125	20

Parameter	CAS No.	WDNR RCLs (DC) [1] Non-Industrial		WDNR RCLs (DC) [1] Industrial		GW Pathway		Prep Method (SW846)	Analytic. Method (SW846)	MDL*	RL*	LCS (%)	LCS RPD	MS/ MSD (%)	MS/ MSD RPD
SEM Zinc	7440-66-6	--		--		--		EPA-821-R-100		0.0612	0.0612	85-115	20	75-125	20

Footnotes:
-- Standard not established.
DC = Direct Contact [pathway]
LCS/LCSD = laboratory control sample/laboratory control sample duplicate
MCL/MCLG = Maximum Contaminant Level/Maximum Contaminant Level Go–l - National Primary Drinking Water Standards-Federal
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
RL = reporting limit
RPD = Relative Percent Difference
8270E-S = Single Ion Monitoring
(S) = Surrogate compound – recovery limits are presented in the LCS column
-- No Generic RCL or objective established.
[1] Generic Regional Screening Levels (RCLs) per WDNR PUB-RR-890, December 2018.
*Actual sample reporting limits for soils are on a dry weight basis and will be higher than the values listed due to moisture content and the volume of soil sample. Also, MDLs, RLs and laboratory accuracy and precision criteria are updated on an annual basis.

Table 5B: Regulatory Limits (Ecological) and Laboratory Quality Control Criteria for Sediments

Parameter	CAS No.	TEC		MEC		PEC		Prep Method SW846	Analytic. Method SW846	MDL	RL	LCS (%)	LCS RPD	MS/ MSD (%)	MS/ MSD RPD
Metals (mg/kg-dry wt.) [Pace Analytical - Green Bay, WI]															
Mercury	7439-97-6	0.18		0.64		1.1		7471B	7471B	0.010	0.035	85-115	20	85-115	20
Aluminum (Al)	7429-90-5	--		--		--		3050B	6020B	78.8	263	80-120	20	75-125	20
Antimony (Sb)	7440-36-0	2		13.5		25		3050B	6020B	0.16	0.67	80-120	20	75-125	20
Arsenic (As)	7440-38-2	9.8		21.4		33		3050B	6020B	0.26	0.88	80-120	20	75-125	20
Barium (Ba)	7440-39-3	--		--		--		3050B	6020B	0.26	0.87	80-120	20	75-125	20
Beryllium (Be)	7440-41-7	--		--		--		3050B	6020B	0.14	0.67	80-120	20	75-125	20
Cadmium (Cd)	7440-43-9	0.99		3		5		3050B	6020B	0.10	0.67	80-120	20	75-125	20
Calcium (Ca)	7440-70-2	--		--		--		3050B	6020B	186	620	80-120	20	75-125	20
Chromium (Cr)	7440-47-3	43		76.5		110		3050B	6020B	0.61	2.03	80-120	20	75-125	20
Cobalt (Co)	7440-48-4	--		--		--		3050B	6020B	0.18	0.67	80-120	20	75-125	20
Copper (Cu)	7440-50-8	32		91		150		3050B	6020B	0.54	1.78	80-120	20	75-125	20
Iron (Fe)	7439-89-6	20000		30000		40000		3050B	6020B	48.7	167	80-120	20	75-125	20
Lead (Pb)	7439-92-1	36		83		130		3050B	6020B	0.18	0.67	80-120	20	75-125	20
Magnesium (Mg)	7439-95-4	--		--		--		3050B	6020B	46.0	167	80-120	20	75-125	20
Manganese (Mn)	7439-96-5	460		780		1100		3050B	6020B	0.55	1.84	80-120	20	75-125	20
Nickel (Ni)	7440-02-0	23		36		49		3050B	6020B	0.26	0.88	80-120	20	75-125	20
Potassium (K)	7440-09-7	--		--		--		3050B	6020B	310	1033	80-120	20	75-125	20
Selenium (Se)	7782-49-2	--		--		--		3050B	6020B	0.18	0.67	80-120	20	75-125	20
Silver (Ag)	7440-22-4	1.6		1.9		2.2		3050B	6020B	0.10	0.33	80-120	20	75-125	20
Sodium (Na)	7440-23-5	--		--		--		3050B	6020B	42.0	167	80-120	20	75-125	20
Thallium (Tl)	7440-28-0	--		--		--		3050B	6020B	0.11	0.67	80-120	20	75-125	20
Vanadium (V)	7440-62-2	--		--		--		3050B	6020B	0.26	0.85	80-120	20	75-125	20
Zinc (Zn)	7440-66-6	120		290		460		3050B	6020B	6.97	23.3	80-120	20	75-125	20
PAHs/SVOCs (ug/kg – dry wt.) [Pace Analytical - Green Bay, WI]															
Acenaphthene	83-32-9	6.7		48.0		89.0		3546	8270E-S	2.2	16.7	69-120	20	52-120	26
Acenaphthylene	208-96-8	5.9		67.0		128		3546	8270E-S	2.1	16.7	63-120	20	46-120	22
Anthracene	120-12-7	57.2		451		845		3546	8270E-S	2.1	16.7	71-112	20	50-112	25
Benzo(a)anthracene	56-55-3	108		579		1050		3546	8270E-S	2.2	16.7	62-120	20	41-120	37
Benzo(a)pyrene	50-32-8	150		800		1450		3546	8270E-S	1.9	16.7	71-111	20	44-114	33
Benzo(b)fluoranthene	205-99-2	240		6820		13400		3546	8270E-S	2.3	16.7	59-112	20	41-112	43
Benzo(e)pyrene	192-97-2	150		800		1450		3546	8270E-S	1.9	16.7	72-109	20	45-109	44

Parameter	CAS No.	TEC		MEC		PEC		Prep Method SW846	Analytic. Method SW846	MDL	RL	LCS (%)	LCS RPD	MS/ MSD (%)	MS/ MSD RPD
Benzo(ghi)perylene	191-24-2	170		1685		3200		3546	8270E-S	2.9	16.7	64-115	20	40-115	36
Benzo(k)fluoranthene	207-08-9	240		6820		13400		3546	8270E-S	2.3	16.7	72-117	20	56-117	30
Chrysene	218-01-9	166		728		1290		3546	8270E-S	3.1	16.7	75-120	20	45-120	28
Dibenzo(a,h,)anthracene	53-70-3	33.0		84.0		135		3546	8270E-S	2.3	16.7	67-114	20	44-114	33
Fluoranthene	206-44-0	423		1327		2230		3546	8270E-S	2.0	16.7	70-110	20	55-110	43
Fluorene	86-73-7	77.4		307		536		3546	8270E-S	2.0	16.7	64-104	20	47-104	27
Indeno(1,2,3-cd) pyrene	193-39-5	200		1700		3200		3546	8270E-S	3.5	16.7	71-114	20	45-114	33
2-Methylnaphthalene	91-57-6	20.2		111		201		3546	8270E-S	2.4	16.7	60-110	20	45-110	29
Naphthalene	91-20-3	176		369		561		3546	8270E-S	1.6	16.7	62-120	20	47-120	26
Phenanthrene	85-01-8	204		687		1170		3546	8270E-S	1.9	16.7	59-106	20	38-106	24
Pyrene	129-00-0	195		858		1520		3546	8270E-S	2.5	16.7	69-120	20	51-120	41
Total PAHs	NA	1610		12205		22800		NA	NA	NA	NA	NA	NA	NA	NA
2-Fluorobiphenyl (S)	321-60-8	--		--		--		3546	8270E-S			41-98			
Terphenyl-d14 (S)	1718-51-0	--		--		--		3546	8270E-S			37-106			
Dibenzofuran	132-64-9	150		365		580		3546	8270E	20.2	167	70-130	20	47-130	23
2-Fluorobiphenyl (S)	321-60-8							3546	8270E			12-118			
Nitrobenzene-d5 (S)	4165-60-0							3546	8270E			10-125			
Terphenyl-d14 (S)	1718-51-0							3546	8270E			10-124			
2-Fluorobiphenyl (S)	321-60-8							3546	8270E			12-118			
Tributyl Tin (ug/kg – dry wt.) [ALS Environmental – Kelso, WA]															
Tri-n-butyltin	36643-28-4	0.52		1.73		2.94		Lab SOP	Lab SOP	0.42	4.0	10-122	40		
Tripropyltin (S)	761-44-4							Lab SOP	Lab SOP			10-120			
Acid Volatile Sulfide (AVS)/Simultaneously Extracted Metals (umoles/g – dry wt.) [Pace Alpha– Mansfield, MA]															
AVS	None	--		--		--		EPA-821-R-100		0.624	0.624	85-115	20	75-125	20
SEM Cadmium	7440-43-9	--		--		--		EPA-821-R-100		0.00089	0.00089	85-115	20	75-125	20
SEM Copper	7440-50-8	--		--		--		EPA-821-R-100		0.0157	0.0157	85-115	20	75-125	20
SEM Lead	7439-92-1	--		--		--		EPA-821-R-100		0.00966	0.00966	85-115	20	75-125	20
SEM Nickel	7440-02-0	--		--		--		EPA-821-R-100		0.0342	0.0342	85-115	20	75-125	20
SEM Zinc	7440-66-6	--		--		--		EPA-821-R-100		0.0612	0.0612	85-115	20	75-125	20

-- Standard not established.
WDNR -Consensus-Based Sediment Quality Guidelines. Interim Guidance. December 2003. (TEC-threshold effect concentration; MEC-midpoint effect concentration; PEC-probable effect concentration).
LCS/LCSD-laboratory control sample/laboratory control sample duplicate
MDL = method detection limit
MS/MSD = matrix spike/matrix spike duplicate
NA-not applicable

RL = reporting limit
RPD = Relative Percent Difference8270E-S = SW846 Method 8270E with Selective Ion Monitoring (SIM)
(S) = Surrogate compound – recovery limits are presented in the LCS column
* Actual sample reporting limits for soils are on a dry weight basis and will be higher than the values listed due to moisture content and the volume of soil sample. Also, MDLs, RLs and laboratory accuracy and precision criteria are updated on an annual basis.

Attachments

Attachment A Pace SOPs

Attachment B ALS SOPs

Attachment C Aquatec SOPs