Proposal for Feasibility Study to Address PAHs in Thompson Lake

July 22, 2013
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Lower Mississippi River WMO
c/o Dakota County Soil and Water Conservation District
4100 220 th St. West Suite 102
Farmington, MN 55024

RE: Proposal for a Feasibility Study to Address PAHs in Thompson Lake

To whom it may concern:

LimnoTech appreciates the opportunity to submit the enclosed Proposal and receive consideration to serve the Lower Mississippi River WMO by performing a Feasibility Study to Address PAHs in Thompson Lake. PAH contamination of sediments in lakes and wetlands receiving urban storm water runoff is an issue of emerging concern.

While this Study is focused on Thompson Lake, it has relevance in establishing a foundation for considering this issue in lakes and wetlands throughout the Twin Cities metropolitan area. In order to effectively inform decision-making to address this issue, the Study should include the following principle components: determination of the extent and severity of contamination; assessment of the impact on beneficial uses; identification of sources; feasibility of source control measures; and feasibility of a range of remediation and restoration options for sediments. LimnoTech has extensive experience in all of these components, as our Proposal demonstrates. Our combination of urban storm water experience and contaminated sediment expertise provides the LMRWMO with the breadth and depth of resources to maximize the benefit of this Study.

Please contact me with any questions regarding this Proposal:
Hans Holmberg, PE, Associate Vice President
2217 Vine Street, Suite 205, Hudson, WI 54016 (through July 26, 2013)
Phone: 715-808-0182; Email: hholmberg@limno.com
New address and phone for LimnoTech’s Twin Cities office beginning July 29, 2013:
7300 Hudson Boulevard, Suite 295, Oakdale, MN 55128
Phone: 651-330-6038

We understand that no addenda have been issued for this Request for Proposals. LimnoTech’s Proposal is valid for a period of not less than 90 days from today, July 22, 2013. LimnoTech appreciates the time and effort being put forth to review our Proposal. We look forward to the potential opportunity to serve LMRWMO on this important and strategic project.

LimnoTech

Sincerely,
LimnoTech

Hans Holmberg, P.E.
Associate Vice President
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LIMNOTECH TEAM OVERVIEW AND ORGANIZATION

LimnoTech has the experience and qualifications to help the LMRWMO successfully complete the Feasibility Study to Address PAHs in Thompson Lake. LimnoTech has 30 years of experience investigating the health and function of aquatic freshwater systems throughout the nation and designing appropriate alternatives for their restoration. Founded in 1975, LimnoTech has the qualifications, capabilities, and capacity to meet all of the requirements of the proposed scope of work to inform the management and restoration of Thompson Lake.

Our staff has a national reputation for the scientific assessment of complex environmental issues and for finding innovative, effective solutions, especially as they relate to the selection and design of management alternatives for the water environment. Many LimnoTech senior staff members are internationally recognized experts in their fields, and more than 75% of our staff possess advanced degrees. LimnoTech’s reputation for excellence, innovation, and service is firmly rooted in our corporate philosophy of quality through planning and prevention. The success of our quality commitment is reflected in consistently high marks for our performance in our annual client surveys, and our greater than 90% rate of repeat clients and client referrals.

We have compiled a team for this project that combines local knowledge and capacity with national expertise, as represented in the organizational chart below.

LimnoTech Team Organizational Chart
The area of responsibility for each key member of our team is briefly described below. Resumes for key team members are included in Appendix A.

**Hans Holmberg** will serve as Project Manager. Hans will be the point-of-contact with the LMRWMO and will lead all phases of the project. He will ensure the required people and resources are made available to deliver the highest quality services and products. Hans brings a unique combination of contaminated sediment experience and urban storm water management experience. In his 18+ years of consulting he has supported both issues across the country, including contaminated sediments from the Lower Fox River and Green Bay, Wisconsin to the St. Louis River Estuary in Duluth; and urban stormwater management from Kansas City, Missouri to the Twin Cities. Hans is often called on by his clients to bring a national perspective to build understanding on local issues. He has lead stakeholder efforts and has demonstrated success in communicating complex technical issues to build understanding and common ground for moving forward with management decision-making.

**Greg Peterson** will serve as Technical Advisor. Greg brings 29 years of experience with extensive understanding of sediment investigations. He has in-depth knowledge of all phases of sediment remediation efforts, including field investigations, source identification, risk assessment, feasibility studies, remediation, and allocation of responsibility. Greg will provide general quality assurance/quality control throughout the project as well as strategic input.

**Jeremy Walgrave** will provide leadership on urban storm water management issues. Jeremy has 13+ years of experience working in the Twin Cities on storm water management and is also leading sediment remediation efforts in the St. Louis River Estuary in Duluth.

**Scott Bell** will provide leadership on remediation and restoration options for contaminated sediments. Scott has 21+ years of experience including assessing and developing costs for sediment remediation efforts including in-situ treatment, capping, dredging and disposal options.

**Doug Bradley** will provide leadership on assessment of biological impacts in Thompson Lake. Doug is a certified fisheries professional and recently conducted a screening level ecological risk assessment in the Presque Isle Bay Great Lakes Area of Concern which included PAHs as a primary contaminant of concern (http://www.pibpac.org/wp-content/uploads/2012/06/Final-Stage-3-RAP-Appendix-D-1.pdf). Doug has over 16 years of experience.

**Cathy Whiting** will provide leadership on developing plans for and carrying out collection and analysis of any further data needed. Cathy has led numerous data collection efforts related to both contaminated sediments and urban storm water in her 20+ years of experience.

**Subcontracting Laboratory Analytical Services**

LimnoTech is capable of conducting all phases of the work plan for the Study, with the exception of laboratory analysis of sediment or water samples. We have extensive experience subcontracting laboratory services but have not selected a specific laboratory for this project. If additional sampling and analysis is required, LimnoTech will recommend a laboratory to LMRWMO for utilization based on our past experience and cost. LimnoTech will then subcontract with the agreed upon laboratory.
LIMNOTECH QUALIFICATIONS AND EXPERIENCE

LimnoTech is one of the country’s leading water science and environmental consulting firms. We are headquartered in Ann Arbor, Michigan, with regional offices in Washington, D.C., and the Twin Cities (our office is currently located in Hudson, WI but is moving to Oakdale, MN beginning July 29, 2013). Satellite offices around the U.S. include Duluth, Minnesota; Austin, Texas; Los Angeles, California; and Greensboro, North Carolina. Throughout our history, we have been an independent and objective consultant to our clients across a broad range of sectors and project types. We also value our teaming relationships with private firms, public entities, research organizations, and universities. Our projects have covered 49 of the 50 United States and an increasing number of locations worldwide.

Since its inception in 1975, LimnoTech has been a leader in developing innovative approaches to understanding and solving environmental problems. In the area of sediment management LimnoTech has:

- Conducted innovative modeling and risk assessment studies to identify alternative in-place containment and treatment alternatives for contaminated harbor sediments.
- Conducted numerous sediment surveys for Great Lakes harbors and confined disposal facilities, documenting the extent of toxics including PCBs, heavy metals, and pesticides.
- Surveyed confined disposal facilities during dredging operations to quantify dredging and disposal impacts on receiving waters.
- At Superfund sites, evaluated remedial alternatives such as diversion, capping, removal and natural recovery.
- Developed lake management plans, including management practices such as dredging, sediment covers, lake drawdown and harvesting of macrophytes.
- Developed and implemented sampling plans to characterize sediments for dredge disposal.

LimnoTech has successfully applied watershed-scale approaches to pollution control in urbanized communities from Portland, OR to Washington, DC. These efforts have included:

- Watershed-wide assessments of control strategies, such as treatment facilities, detention ponds, wetlands, berms, zoning, borders, street-sweeping, and fertilization controls.
- Nonpoint source impact analyses for both large and small drainage basins.
- Development and implementation of innovative watershed stakeholder workshops.
- Conceptualization and development of local and national wet weather monitoring programs.
- Urban and rural nonpoint pollution source modeling, including the use and site-specific adaptations of SWMM, P8, WinSLAMM, NPS, ARM, AGNPS, HSPF, GWLF, BASINS, SWAT, WCS Sediment Tool, WARMF, MOUSE, SMPPTM, HEC-models, and ANSWERS models.
- Lake protection, restoration, and management.

Recent projects which demonstrate LimnoTech’s capabilities to carry out the Feasibility Study for Thompson Lake are included in this section. Also, the client contacts provided will further demonstrate LimnoTech’s focus on client service and delivery of the highest quality products and services.
Implementation Framework for St. Louis River Area of Concern (AOC)

Client: Minnesota Pollution Control Agency (MPCA)

Contact: Nelson French
525 Lake Ave. S. Suite 400
Duluth, MN 55802
Phone: 218.302.6625

Completion Date: July 2013

Key Team Member Responsibility:
- Hans Holmberg: Project Officer
- Greg Peterson: Technical Advisor
- Scott Bell: Concept Plan Leader
- Doug Bradley: Fisheries and Aquatic Biology

The lower St. Louis River estuary is one of the largest, most complex AOCs in the Great Lakes. Historical and current land uses contribute to an intermingled legacy of contaminated sediments, degraded habitat, and challenging nonpoint pollution issues. The system is being addressed by the St. Louis River System Remedial Action Plan (RAP). As part of the RAP process, the States of Minnesota and Wisconsin recognize the need to work together to plan and implement projects with a consistent approach to inform cross-jurisdictional decision-making. The St. Louis River AOC Implementation Framework will consolidate information and provide a roadmap for decision-makers to strategically prioritize projects that will accomplish removing beneficial use impairments (BUIs), and ultimately lead to delisting the AOC.

Major Project Elements include:
- Model of sources/stressors/BUIs
- Set of Measureable Indicators
- BUI Blueprints (historic and current conditions, path to delisting)
- Prioritized actions and Remediation to Restoration (R2R) plans
- Roadmap to recovery and ultimate delisting

LimnoTech is working closely with the MPCA, Minnesota DNR, Wisconsin DNR, Fond du Lac Tribe, and Minnesota Land Trust to develop conceptual Remediation to Restoration (R2R) design plans for selected, high-priority sites within the AOC. The R2R sites consist of varying degrees of remediation (legacy sediment contamination) and restoration (habitat in the project area).

The plans consist of a plan view and cross-section graphic of the R2R conceptual design with an accompanying description of the site, site-specific BUIs, design constraints, R2R objectives, planned project elements, planning-level cost estimates, uncertainties and additional work recommended, and permits and regulatory considerations. To date, plans have been developed for five different sites in the AOC. Each conceptual restoration design element was linked to restoration objectives (e.g., open water, emergent vegetation) to specifically address BUIs (e.g., loss of fish and wildlife habitat) applicable to each site. The overall goal of each plan is to contribute to delisting BUIs at a given site, and the ultimate delisting of BUIs within the St. Louis River AOC.
St. Louis River Benthic Community Reference Sites

Client: Minnesota Pollution Control Agency (MPCA)

Contact: Dan Breneman
525 Lake Ave. S. Suite 400
Duluth, MN 55802
Phone: 218-302-6624

Completion Date: June 2012

Key Team Member Responsibility:
- Hans Holmberg: Project Officer
- Greg Peterson: Technical Advisor
- Doug Bradley: Fisheries and Aquatic Biology
- Cathy Whiting: Sampling Coordinator

To support evaluation of progress towards removing the Degradation of Benthos BUI, information is needed on benthic macroinvertebrate communities within relatively unimpacted areas of the AOC. While information on macroinvertebrate communities does exist, concurrent information on conditions of the habitats associated with the community data are limited.

In June 2012, in a joint project with Wisconsin Department of Natural Resources and MPCA, LimnoTech conducted site characterization and benthic macroinvertebrate community sampling at four established reference areas in the AOC: Rask Bay, Red River West, Clough Island South, and Allouez Bay.

Habitat conditions were recorded at four microhabitats, defined by water depth and aquatic vegetation characteristics, within each reference site. Information on riparian vegetation, water depth (established using single-beam sonar), substrate structure (established using sidescan sonar), water quality (dissolved oxygen, pH, turbidity, specific conductance, and temperature), and aquatic vegetation was collected.

Sites were subsequently sampled for benthic macroinvertebrates and sediment chemistry/grain size distribution using petit ponar.

Results from the effort will be used to establish characteristics of benthic communities in AOC reference sites to allow for comparison against benthic communities at restoration sites in the estuary.
Grassy Point Habitat Restoration Project

Client: Minnesota Land Trust

Contact: Daryl Peterson
394 Lake Ave South, Suite 404A
Duluth, MN 55802
Phone: (218) 722-1416

Completion Date: Ongoing

Key Team Member Responsibility:
Jeremy Walgrave: Project Manager
Hans Holmberg: Senior Engineer
Scott Bell: Senior Engineer
Doug Bradley: Biologist
Cathy Whiting: Sampling Coordinator

Grassy Point is a 130-acre site located within the St. Louis River estuary, and is a priority restoration site within the St. Louis River Area of Concern (AOC). Wood waste materials from sawmill operations during the late 1800s through the early 1900s have limited the biologic productivity, habitat potential, and recreational use of this former sheltered embayment. LimnoTech has contracted with Minnesota Land Trust to complete an engineering design and environmental assessment worksheet (EAW) for site restoration.

The major restoration elements for the site include:

- An upstream wetland complex with a sediment trap;
- Improved open-water habitat;
- Estuary flats habitat;
- Enhanced littoral zones with emergent, floating, and submergent vegetation;
- Island construction and enhancement with trees and shrub-carr vegetation

As part of engineering design development, LimnoTech conducted field investigations to define the horizontal and vertical extent of wood waste and other sediment types present at the site.

Primary construction elements of the plan consist of wood waste removal and, where possible, reuse of the wood waste in the construction of the restoration design elements. The overall plan addresses applicable restoration objectives for Grassy Point.
Water Quality Modeling to Support a TMDL for Medicine Lake

Client: Minnesota Pollution Control Agency (MPCA)

Contact: Chris Zadak
520 Lafayette Road N
St. Paul, MN 55155-4194
Phone: 651-757-2837

Completion Date: December 2010

Key Team Member Responsibility:
Hans Holmberg: Project Manager

Medicine Lake is considered one of the most important recreational water bodies in the Minneapolis/St. Paul metropolitan area. In 2004, Medicine Lake was placed on MPCA’s impaired waters list, as the available data indicated that Medicine Lake exceeded the State’s criteria for nutrients. LimnoTech was contracted by the MPCA in the fall of 2008 to support the development of a Total Maximum Daily Load (TMDL) for Medicine Lake.

The Medicine Lake watershed is essentially fully developed and has a total area of 11,613 acres. Runoff from the watershed enters the lake from creeks, storm sewer outfalls, and culverts at various points along the lakeshore. Stormwater from approximately 90% of the Medicine Lake watershed drains through some form of wet detention before it enters Medicine Lake. The Cities of Plymouth, Medicine Lake, Golden Valley, New Hope, and Minnetonka constitute the watershed area. MnDOT and Hennepin County represent additional Municipal Separate Storm Sewer Systems (MS4s) that required wasteload allocations as part of the TMDL project.

LimnoTech refined and updated an existing watershed model using the P8 model framework. LimnoTech coordinated with five municipalities in the Medicine Lake watershed to review model representations of land uses and best management practices, and modify or add missing information. LimnoTech then calibrated the model to recent data. The P8 watershed model was used in conjunction with a BATHTUB model of Medicine Lake to assess what level of phosphorus loadings from the watershed is needed to achieve in-lake targets. LimnoTech also applied the P8 model to evaluate best management practices (BMPs) for reducing phosphorus loads, and to determine where in the watershed the BMPs should be located to be most cost-effective. BMPs assessed in the modeling effort included traditional stormwater detention ponds as well as source reduction practices such as turf amendments, rain gardens, and increased storage in impervious areas.

The modeling results were used to inform an extensive stakeholder group and assist them in making decisions on how to allocate the allowable phosphorus loads. LimnoTech conducted the watershed modeling and providing technical direction at the stakeholder meetings. LimnoTech developed a TMDL report and Implementation Plan with recommendations for BMPs to meet the acceptable TMDL endpoints.
Riverbank Restoration Studies and Support for the MWMO

Client: Mississippi WMO

Contact: Dan Kalmon
2522 Marshall Street NE
Minneapolis, MN 55418-3329
Phone: (612) 465-8780 ext. 203

Completion Date: April 2010

Key Team Member Responsibility:
Hans Holmberg: Project Manager

The MWMO contracted LimnoTech to develop a hydrodynamic model, conduct field surveys to document and classify the physical riverbank characteristics, and develop a software tool to support riverbank restoration planning efforts. The hydrodynamic model was developed to provide a basis for estimating near-bank shear stresses as an indicator of erosive forces experienced by the bank during typical and high-flow event conditions in the river. The ultimate goal of these efforts was to develop a software tool that could be used by MWMO and riparian landowners within the UMR corridor to evaluate appropriate shoreline erosion control measures for a given location, with an emphasis on bioengineering applications to better support restoration efforts and the riverine/shoreline ecosystem.

LimnoTech compiled many different types of information for the project area to support development of the hydrodynamic model including shoreline delineations; bathymetry data; and river flow, stage, and velocity data. LimnoTech also prepared a data gap analysis to identify priority needs for data collection that would benefit current or future modeling applications. The model was calibrated to available water surface elevation and instream velocity data, and then applied to simulate shear stress conditions throughout the UMR corridor for ten flow conditions, ranging from median (typical) flow to a 500-year flood event.

Field surveys were conducted for approximately 30 shoreline locations between I-694 and Ford Dam to compile representative reach information on bank profiles and slope, vegetative cover, soil type, and existing structures or protection measures. A complete GPS-referenced video survey of the shoreline was also conducted as part of the field effort. The information developed from field survey and the results of the modeling analysis was integrated into the “Riverbank Restoration Planning Software,” a user-friendly tool that allows a riparian landowner or other stakeholders to select a specific bank and reach and to determine which shoreline restoration measures are available to provide the necessary shoreline protection, given modeled shear stress and existing bank conditions. The software emphasizes the applicability of shoreline bioengineering practices (e.g., biologs, rootwads, crib walls) to promote local shoreline restoration where appropriate. The software provides map-based location tracking concurrent with video playback (“video tracking”), which allows users to visually assess and compare bank conditions at any location along the UMR shoreline with conditions documented for local bank survey points. Documentation is provided for individual bioengineering practices and to guide the user in applying the tool.
WORK PLAN, BUDGET AND SCHEDULE

The Request for Proposals includes a Scope of Services with six key components:

- Compilation, review and evaluation of all existing data related to Thompson Lake including water quality, sediment analyses, inputs from subwatershed, etc.
- Collection and analysis of any further data needed in order to fully understand the scope of the contamination.
- Convening of a stakeholder team to fully understand what has occurred to date (such as Dakota County, MPCA, adjacent landowners, LMRWMO, etc.
- Literature review and research regarding the impacts of varying levels of PAHs on aquatic ecology, human health, and how other entities are handling similar situations.
- A complete review and report on government activities, grants, regulations, etc. that may impact the resolution of the issue.
- A list of possible solutions to the contamination issue (options) including estimated costs per option, proposed responsible parties, as well as a recommended option.

These six components provide a solid basis for conducting the Feasibility Study. LimnoTech has prepared a Work Plan to address these components as well as assess additional items we believe will provide value in informing decisions related to management of Thompson Lake. The Work Plan presented in this section has been developed based on our experience on numerous contaminated sediment sites and considers the Decision Tree for Sediment Management that LimnoTech prepared in 1999 for the Sediment Management Workgroup (SWMG). SMWG is a national group of organizations and companies involved in addressing contaminated sediment sites. The Decision Tree for Sediment Management can be downloaded at: http://www.smwg.org/presentations/techpapers/paper4.pdf.

Working with LMRWMO and the stakeholders to clearly define management objectives and questions is of critical importance in guiding the Feasibility Study. Based on the Request for Proposals and LimnoTech’s experience, the primary management objectives can be stated as follows:

- Restore and protect Thompson Lake to attain full compliance with all regulatory requirements including attainment of all designated beneficial uses for aquatic life and human recreation.
- Restore and protect Thompson Lake by implementing sustainable and cost-effective source controls and sediment remediation.
- Ensure that responsibility for the contamination of the sediments and any required cleanup is appropriately identified and considered in funding management activities, and leverage available state and federal grant programs for funding.
The Work Plan is designed to answer the following key management questions:

- What is the spatial extent and severity of sediment contamination in Thompson Lake?
- Does the existing level of contamination pose an unacceptable risk to aquatic life or human health?
- What is the source of contamination?
- Is there a continuing source that must be addressed to prevent recontamination?
- What are the options for addressing unacceptable levels of existing contamination and how much each option cost?
- Based on the available data and information, what is the recommended path forward for restoring and protecting Thompson Lake?
- Is additional data required to answer these questions with an acceptable level of uncertainty?

LimnoTech’s proposed Work Plan is presented below as three primary tasks:

- Task 1 - Compile and Evaluate Existing Date and Information
- Task 2 – Alternatives Analysis and Cost Estimates
- Task 3 – Optional: Additional Data Collection

Stakeholder team involvement is embedded in Tasks 1 and 2. Task 3 includes additional data collection and is presented as an optional task. The scope presented includes one day of collecting information on sediments in Thompson Lake and a specified set of laboratory analyses. Task 3 can be adjusted to address more or less data collection, as needed.

If LimnoTech is selected to serve LMRWMO on this project, we suggest a meeting prior to beginning work to gather additional background information, verify management objectives and questions, and finalize the Work Plan. Adjustment to the proposed Work Plan, budget, and schedule can be made to accommodate project needs, available resources, and desired timeframes.
Task 1: Compile and Evaluate Existing Data and Information

Project Kickoff Meeting: LimnoTech will coordinate with LMRWMO to identify individuals for the stakeholder team. LimnoTech will facilitate an initial meeting with the stakeholder team to clarify the key management objectives and questions for the project and further inform the tasks to be carried out. An initial assessment of readily available information will be presented. Key pieces of data and information that stakeholders are aware of will be identified.

Deliverable: LimnoTech will summarize the outcome of the project kickoff meeting in a memorandum identifying the agreed upon management objectives and questions and specific considerations to be addressed in the course of the project.

Date Compilation: LimnoTech will compile readily available and relevant data and information to support the Feasibility Study. This will include:

- Chemical, physical and biological data:
  - Lake bathymetry
  - Sediment thickness, bulk density, grain size, organic carbon content, and contaminant concentrations
  - Water quality data in the lake and in contributing storm water runoff
  - Biologic data including aquatic plant surveys, benthic organisms and fish
  - Watershed area, land use, previously modeled/estimated runoff volumes and rates
- Literature review and research on PAH impacts.
- Compilation of applicable and relevant rules and regulations on federal, state and local levels.
- An assessment of funding mechanisms for remediation and restoration, including state and federal grants.

Deliverable: LimnoTech will prepare a project bibliography of the data and information compiled and will archive it in a project folder for distribution to the stakeholder team via CD-ROM or a project website for file sharing provided by LimnoTech.

Note that LimnoTech has previously compiled significant information related to PAH contamination of sediments and its ecological impact, regulatory requirements, and information on sediment remediation and restoration options for work done on other projects. LimnoTech has also received data collected on Thompson Lake from Dakota County and conducted a preliminary review. This will allow LimnoTech to hit the ground running at the beginning of the project and provide an efficient yet comprehensive review of site-specific and national data and information. An initial listing of some of the documents we have considered in preparation of this Proposal follows:
**Documents Considered in Preparation of Proposal**


Minnesota Pollution Control Agency. 2010. Contamination of stormwater pond sediments by polycyclic aromatic hydrocarbons (PAHs) in Minnesota. Document number: tdr-g1-07


Development of Initial Site Conceptual Model: LimnoTech will prepare a preliminary site conceptual model which represents the basic linkages between sources, existing contamination, and exposure and uptake by receptors, including benthic organisms, fish, and humans.

Initial Assessment of Risks Posed by PAH Contamination and Identification of Data Gaps: LimnoTech will conduct an assessment of the risks posed by PAH contamination, using one or a combination of the following sediment quality screening approaches:

- **Background approach**: PAH contamination in Thompson Lake is compared to the background concentration in a sediment believed to be unaffected but representative of regional sediment quality (e.g., no substantive anthropogenic inputs or biological effects). However, it is frequently difficult to determine appropriate background concentrations, and the approach has no basis in either bioavailability or biological effects.

- **Correlative approaches**: Correlative methods assume causal relationships between PAH concentrations and observed effects on biota. These methods include Apparent Effects Threshold (AET), Screening Level Concentration (SLC), Effects Range, and Threshold Effects Level (TEL) and Probable Effects Level (PEL) approaches.

- **Equilibrium Partitioning (EP) approach**: The EP approach accounts for bioavailability of the PAHs so that better predictions of biological effects can be made and relies on fundamental chemical theory.

The uncertainty associated with the results of the assessment will be evaluated. Data gaps will be identified and recommendations for additional data collection will be prepared.

*Deliverable:* LimnoTech will summarize the evaluation of the data and information collected in a memorandum. Separate sections of the memorandum will address: site conceptual model; assessments of risk in Thompson Lake; regulatory requirements, national approaches to the issue of PAH contamination of sediments in urban settings, data gaps and recommended data collection.

Stakeholder Team Meeting: LimnoTech will facilitate a meeting with the Stakeholder Team to review the results of the data compilation and assessment tasks and receive feedback. A decision on additional data collection will also be facilitated.

**Task 2: Alternatives Analysis and Cost Estimation**

LimnoTech will evaluate alternatives for remediation and restoration of Thompson Lake sediments including, but not limited to the following options: no action or monitored natural recovery; enhanced natural recovery or thin cap placement; sediment capping and armoring; mechanical and hydraulic dredging and disposal or beneficial reuse; in-situ biotreatment. Cost estimates will be prepared using standard engineering methods and LimnoTech’s experience. LimnoTech will recommend an option based on the available data and information. Funding strategies will also be evaluated.

*Deliverable:* LimnoTech will summarize the alternatives analysis in a memorandum.
Stakeholder Team Meeting: LimnoTech will facilitate a meeting with the Stakeholder Team to review the results of the alternatives analysis, recommended path forward, and receive feedback. To the extent possible, a decision on a recommended path forward will result. LimnoTech will finalize the Alternatives Analysis memorandum and submit.

Task 3: Optional – Additional Data Collection

LimnoTech will conduct additional data collection to address data gaps. For the purposes of this Proposal, we have included costs for one day of data collection on Thompson Lake. Based on our experience and a review of the information available on Thompson Lake, we believe one day of data collection will be sufficient to meet the needs of this project. We anticipate that 10-15 sediment cores can be collected in a day. Locations will be selected to fill gaps and provide the most beneficial coverage of the lake. Water depths and sediment thickness will be measured and recorded at each site. Sediment samples will be delivered Standard methods for sediment and water sampling and handling will be followed. A streamlined sampling and analysis plan (SAP) and quality assurance project plan (QAPP) will be prepared and followed. A laboratory will be selected in consultation with LMRWMO to provide reliable analysis of the samples. Samples will be analyzed for PAHs, bulk density, and total organic carbon.

**Deliverable:** LimnoTech will summarize the additional data collection in a memorandum and Excel files of the data.

Proposed Budget and Schedule

The proposed budget and schedule are on the following pages and represents LimnoTech’s commitment to complete the proposed scope of services for a total cost not to exceed this budget. Although the hours and dollars have been broken down into tasks, the fluid nature of this type of work makes it impossible to predict the breakdown of the level of effort by task with certainty. Therefore, these breakdowns by task, which have been created to the best of LimnoTech’s ability, are estimates only. In addition, LimnoTech reserves the right to use the personnel it deems most appropriate for specific tasks.

The proposed schedule can be expedited to meet LMRWMO needs. Field data can be collected during any season.
### Proposed Budget

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### Proposed Project Schedule

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CONFLICT OF INTEREST
To the best of LimnoTech’s knowledge, no conflict of interest would be created by our performance of work for the LMRWMO on this project. To the best of our knowledge, no relationship exists between LimnoTech and any potentially responsible persons involved with the work described in this Study.
ATTACHMENT A

RESUMES
Mr. Holmberg has 18 years of experience serving clients facing complex technical and regulatory challenges related to environmental issues. He works closely with his clients to develop innovative, efficient, and cost-effective solutions for a range of water resource-related problems. Mr. Holmberg focuses on client service, technical expertise, and a cooperative approach to stakeholder involvement and regulatory negotiations to successfully resolve complex water resources issues. Mr. Holmberg emphasizes the need to provide scientifically sound assessments that both the regulated community and regulatory agencies can use to inform decisions.

Mr. Holmberg’s experience includes more than 50 projects covering a range of environmental issues. Mr. Holmberg has managed state- and national-level projects, addressing contaminated sediments, development of appropriate water quality standards, Total Maximum Daily Loads (TMDLs), nutrient loadings, and urban wet weather impacts on water quality. Mr. Holmberg has also supported U.S. EPA and state agencies in developing policy and technical guidance, and implementing requirements of the Clean Water Act and state regulations.

Mr. Holmberg’s services include strategic planning for regulatory compliance, technical support and guidance, project management, presentation of findings, and negotiation with regulatory agencies. He has facilitated numerous stakeholder efforts and has led studies which rely on developing an understanding of approaches taken nationally and tailoring them to meet local project needs.

Key Project Experience

**St. Louis River Area of Concern Implementation Framework.** Mr. Holmberg directed the management and engineering associated with this multi-year project that resulted in development of an Implementation Framework for Delisting the St. Louis River Area of Concern (AOC). The Framework consists of blueprints of actions necessary to reach delisting for each of nine beneficial use impairments in the AOC. The Stage II Remedial Action Plan (RAP) will also be updated during this process. The St. Louis River AOC is located in the Lake Superior Basin and encompasses areas in both Minnesota and Wisconsin. A team of partners including AOC coordinators from Wisconsin DNR, Minnesota DNR, Minnesota Pollution Control Agency, and the Fond du Lac Band of Lake Superior Chippewa are working together to restore the river.

**Minnesota Watershed Restoration and Protection Report.** Mr. Holmberg directed the development of a Watershed Restoration and Protection (WRAP) report template for the Minnesota Pollution Control Agency. The WRAP report is intended to summarize the results of monitoring, modeling, and stressor identification work on an 8-digit HUC scale. The WRAP report is also intended to present an implementation strategy for addressing the restoration of impaired waters as well as protection strategies for other waters. The WRAP report template will be used as guidance for the development of WRAP reports for each 8-digit HUC in Minnesota.

**TMDL for Medicine Lake, Minnesota.** Mr. Holmberg was the project manager supporting the State of Minnesota Pollution Control Agency on the development of a TMDL for Medicine Lake. Medicine Lake is impaired for excess nutrients and algal growth. LimnoTech applied the P8 watershed model and BATHTUB model of the lake to assess effectiveness of BMPs in attaining goals for the lake. Mr. Holmberg wrote the TMDL report and Implementation Plan.
Development of Protocols for Lake Nutrient TMDLs. 2006. The State of Minnesota has hundreds of lakes listed as impaired because of nutrient enrichment and eutrophication issues. MPCA contracted LTI in 2006 to support the development of protocols for lake TMDLs. LTI assisted the MPCA in evaluating approaches for setting site-specific goals for lakes. Mr. Holmberg managed this effort and coordinated the research activities.

Lake St. Croix Implementation Plan. 2011-2012. Mr. Holmberg was the project manager supporting the States of Minnesota and Wisconsin in the development of an implementation plan for the St. Croix River watershed to address the Lake St. Croix Phosphorus TMDL. The project included extensive interactions with an implementation group consisting of state and federal agencies, as well as local-/county agents. Strategies to prioritize agricultural, urban and forestry BMPs are being developed, as well as civic engagement efforts to facilitate implementation. Water quality monitoring, project tracking, and adaptive management were also key components of this project.

Twin Cities Metro Chloride Project. Mr. Holmberg is the project officer and technical lead on this multiyear project for which LimnoTech is supporting the Minnesota Pollution Control Agency (MPCA) in the development of a chloride management plan that will lay out a strategy for addressing chloride impacts to surface waters for the 7-county St. Paul/Minneapolis metropolitan area. This chloride management plan will satisfy EPA requirements for impaired waters, address waters not yet listed, and develop a strategy to protect waters that are currently meeting the water quality standards. This management plan will also include implementation activities for reducing chloride to waters as well as identify high-priority areas to target implementation activities.

Lake Pepin Water Quality Modeling Project. The Lake Pepin TMDL for eutrophication and turbidity impairments impacts over half of the State of Minnesota. The development of this TMDL will be highly scrutinized by a wide range of stakeholders. The Minnesota Pollution Control Agency (MPCA) contracted LimnoTech to develop a water quality model of the Mississippi River and Lake Pepin to support the TMDL. Mr. Holmberg managed LimnoTech’s efforts. This work included an extensive review of previous studies, including compilation of various data sets into one common database. A comprehensive review of existing data identified data gaps and led to recommendations for additional data collection. Model development included an assessment of existing modeling frameworks and selection of the ECOMSED/RCA framework for the project. Model calibration was conducted and the model is being applied to inform TMDL development.

Water Environment Research Foundation (WERF) Research Projects on TMDLs and UAAs. Mr. Holmberg served as the project manager for a research project supported by WERF to assess and develop guidance for addressing narrative water quality criteria in the TMDL listing and development process. Publication of the findings of this project is available through WERF. Mr. Holmberg also served as project manager on a WERF project to compile, review, and evaluate the successes and failures of efforts across the country to conduct Use Attainability Analyses (UAAs).

TMDL Development for Lac Courte Oreilles. Mr. Holmberg is managing the development of a TMDL for Lac Courte Oreilles near Hayward, WI. Lac Courte Oreilles is a highly valued recreational lake that is impacted by excessive phosphorus loading. Adjacent cranberry bogs are a key source of phosphorus. LimnoTech’s work includes advising on monitoring requirements, compiling and assessing data, developing a BATHTUB model to support the TMDL, and preparation of the TMDL.

Contaminated Sediment Fate and Transport Modeling in the Fox River and Green Bay, Wisconsin. Mr. Holmberg was a technical coordinator and client representative for PCB fate and transport modeling in the Lower Fox River and Green Bay in Wisconsin. This project included conceptualization and development of alternative model frameworks and innovative modeling approaches for simulating sediment and PCB dynamics.

Development of a “Model” Sediment TMDL. Mr. Holmberg was the project manager for a study being conducted for the National Association of Home Builders. The intent of the study was to develop a “model” sediment TMDL that can be used by EPA and states as they consider stormwater permits for construction in 303(d)-listed watersheds. The project included a review of existing sediment TMDLs, a literature review of alternative approaches for developing sediment TMDLs, and development of a “model” approach for sediment TMDLs.

Development of Riverbank Restoration Guidance for the Mississippi Watershed Management Organization. Mr. Holmberg was the project manager for the development of an integrated user tool to support riverbank restoration guidance for the Mississippi River in the St. Paul/Minneapolis metropolitan area. LimnoTech supported the planning and completion of field surveys of the riverbanks, video tracking of the riverbanks, and database integration with GIS. LimnoTech developed a stand-alone user tool that allows users to select riverbank locations, to review survey information, pictures and video of the banks, and to review bioengineering applications that would apply to a location based on site characteristics.
Areas of Specialization:
Sediment Management  
Remedial Investigations  
Water Resources Management  
Regulatory Compliance  
Environmental Monitoring  
Feasibility Studies  
Hazardous Waste Management  
Environmental Modeling

Education:
BSE, Civil Engineering (Water Resources), University of Michigan, 1984  
BSE, Environmental Engineering (Water and Wastewater Engineering), University of Michigan, 1984

Career Highlights:
- Water Resource Engineering – Directed water resource quantity and quality evaluations, water footprint assessments, and water sustainability and stewardship projects.
- Sediment Investigations, Remediation, Restoration and Management - Directed and managed investigations, fate and transport modeling, remedial and restoration alternative design evaluations, remedy implementation at some of the largest sediment Mega Sites throughout the United States, including the Fox River, Kalamazoo River, Tittabawassee River, Saginaw River, Hackensack River, Berrys Creek, Passaic River, and Willamette River.
- RCRA and UST Corrective Action - Directed the investigation, corrective action and closure activities at numerous sites containing soils, groundwater and sediment impacted by releases.
- Superfund (CERCLA) Remediation - Directed RI/FS, PRP contribution evaluations, contaminant fate and transport modeling, remediation design

Mr. Peterson is a Vice President with responsibility for all phases of projects. His responsibilities in this capacity include contract management; division and project planning; resource allocation; conceptualization, development and review of technical approaches; task assignments, tracking and review; and maintenance of a clear definition of and adherence to the scope, schedule, and budget of each project.

Mr. Peterson has 29 years of experience in water resources and environmental engineering at more than 300 sites nationwide. He has managed environmental and water resource engineering projects for industrial, legal, and government clients in a variety of technical areas including sediment management; hazardous waste site assessments; remedial investigations and feasibility studies; RCRA facility investiga-tions and corrective actions; remedial action planning, design, and implementation; hydrogeologic investigations; underground storage tank remediation; regulatory compliance; permit development and review; contaminant fate and transport modeling; exposure and risk assessment; and nonpoint source assessment. Projects managed by Mr. Peterson have involved assessing, evaluating and remediating the full range of conventional and priority pollutants in groundwater, soils, waste disposal areas, sediments, lakes, streams, estuaries, and air.

Key Project Experience

Tittabawassee River Contami-nated Sediments and Floodplain Soils Evaluation, Midland, MI. Mr. Peterson is the project officer for LimnoTech’s efforts supporting the development of a remedial investigation of the Tittaba-wassee River dioxin site. This effort has included the design and execution of sediment characterization studies, flow and solids monitoring, monitoring of floodwaters, measurements of floodplain soil accretion rates, monitoring of bank and bed erosion rates, and sampling of floodplain soils. Mr. Peterson also provided an expert report on the site flood plain and area of likely contamina-tion as part of ongoing litigation. Mr. Peterson is also serving as a senior reviewer for the development of hydrodynamic models of the Tittabawassee River, the confluence with the Saginaw, and the floodplain areas adjacent to the river. These studies contribute to the development and refinement of conceptual models of transport and fate of dioxins and furans, and the evaluation of possible remedial alternatives as part of an overall remedial investigation.

Evaluation of PCB Impacts and Remedial Alternatives for a Paper Industry in Kalamazoo, Michigan. Since the mid-1980s, Mr. Peterson has been a technical advisor for legal counsel to an industry in Kalamazoo, MI, regarding the remediation of a 70 acre Superfund Site operable unit. The site contains sediment and soils with elevated levels of Polychlorinated Biphenyls (PCBs). A creek runs through the site, eroding the sediment and transporting PCBs. Mr. Peterson has directed remedial investigations and feasibility studies to evaluate and design possible remedial action alternatives. The studies conducted have included sediment and soil sampling to determine the extent and distribution of contamination, hydrogeologic investigations, aquifer performance analyses, pilot treatment feasibility studies, geotechnical investigations, and other studies necessary to support a remedial action design.

Mr. Peterson assisted legal counsel in the negotiation of a cash-out agreement for a removal action conducted in 1998, in which 150,000 cubic yards of impacted sediment was consolidated in an up-land disposal facility. Mr. Peterson has also provided technical review and oversight for the design of the disposal facility and perimeter groundwater collection system.
Fox River and Green Bay PCB Fate and Transport Model Evaluation. Mr. Peterson is Project Officer for this effort, undertaken by seven paper companies. In this capacity he has provided project oversight, technical review and technical direction for a large staff of specialists in watershed modeling, hydrodynamics, sediment transport, and contaminant transport. The project’s objective was to develop models of the Lower Fox River and Green Bay for the purpose of evaluating sediment management alternatives, which include dredging and natural recovery. More recently, the project team is providing technical support to the design team for the development of the remedial design of the selected alternative.

SERDP Evaluation of Uncertainty in In-Situ Sediment Remediation Strategies. Mr. Peterson developed the proposal for and oversaw the research efforts that included a comprehensive assessment of significant factors affecting in-place remedial strategies for contaminated sediments, and the related uncertainties affecting remedial actions. A major focus of the effort was to support the ongoing evaluation of capping performance on the Anacostia River in Washington, D.C., being performed by the South/Southwest Hazardous Substance Research Center.

Innovative Techniques for Bioremediation of Contaminated Sediments, Pearl Harbor, HI. Mr. Peterson was project officer for research performed for the Navy and USEPA for demonstration of an innovative hydrogen amendment technique for bioremediation of dioxin- and PCB-contaminated sediments. The method is currently being developed and applied to Pearl Harbor contaminated sediments in tandem with LimnoTech’s research partners at the University of Michigan.

Remedial Investigation, Feasibility Study and Site Remediation for a CERCLA Site in Kalamazoo, Michigan with Groundwater Contamination. Under Mr. Peterson’s direction, LimnoTech is managing and implementing remedial actions at a Superfund site located in western Michigan after having completed the Remedial Investigation and Feasibility Study (RI/FS) phases required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The current remedial activities are being conducted as a Non-Time-Critical Removal Action (NTCRA) under the Superfund Accelerated Cleanup Model (SACM) and prior to finalization of the Record of Decision (ROD) negotiations and Remedial Design (RD) phase of activities.

LimnoTech was initially contracted in 1989 by the corporation, which had acquired the site, to conduct the Remedial Investigation (RI). LimnoTech performed an evaluation of the extent, distribution, fate, and human health risks of the chlorinated solvent chemicals identified in groundwater.

LimnoTech used the results of the remedial investigations to conduct feasibility studies, which included fate and transport modeling and analysis of remedial alternatives. The selected final remedy was natural attenuation and institutional controls. The RI data and fate and transport model results indicated that natural attenuation would be protective, eventually restore the aquifer, and was millions of dollars less than other alternatives.

Hydrogeologic Investigations, RCRA Closures and Remedial Actions for a Solvent Interim Storage and Transfer Facilities in Michigan and Indiana. Under Mr. Peterson’s direction, LimnoTech has conducted closure activities, hydrogeologic activities, and corrective actions at RCRA solvent interim storage and transfer facilities in Michigan and Indiana. Seven RCRA units at the facilities have been closed successfully. The results of LimnoTech’s multi-phase hydrogeologic investigations documented the presence and extent and distribution of petroleum-based and chlorinated volatile organic chemical in soil and groundwater at five of the facilities. Beginning in 1992, soil vapor extraction pilot tests and groundwater pumping tests were conducted to determine vadose zone characteristics and subsurface hydrodynamics for corrective action planning. Mr. Peterson managed the design and implementation of corrective actions consisting of groundwater extraction/on-site treatment systems, air sparge and soil vapor extraction systems. Since 1995, the systems have been fully operational and are continuing to make progress toward restoration of the affected aquifers. Based upon recent results, remedial objectives appear to have been met at four of the five facilities.

Site Investigation and Remedial Action for Chlorinated Solvent Impacts at Fayette, Ohio. Since 1995, Mr. Peterson has directed site investigations and remedial actions in Fayette, Ohio, consistent with the requirements of the Ohio Voluntary Action Program and CERCLA. The site surrounds a plant where automotive air conditioning components are manufactured. Soils and groundwater on the site have been impacted by chlorinated solvents, and limited metals impacts to soils are also present. Protection of Village water supply wells is a high priority.

Mr. Peterson provided technical leadership in planning and conducting the site investigation, drafting Remedial Investigation and Feasibility Studies reports, and planning pilot tests of collection and treatment systems. Mr. Peterson has also worked with the Village Council and the Village’s engineer to provide a contingency air stripper for the Village water supply, for protection against volatiles impact.
Mr. Walgrave is experienced in hydraulic and hydrologic design of detention basins, stormwater conveyance systems, hydraulics for streams and rivers, and regulatory compliance. Jeremy’s project experience includes preparation of detailed plans and specifications, risk assessments, environmental assessments, hydraulic letters, project representation, environmental permitting, and project management. Computer software experience includes: AutoCAD, Eagle Point, GEOPAK, HEC-FFA, HEC-RAS, HY8, HydroCAD, MicroStation, P8, WATBUD and XP-SWMM.

Key Project Experience


Under previous association

Stormwater Feasibility Study, Minnesota West Community College – Worthington, MN. Lead engineer for planning and preliminary design of a campus-wide stormwater management plan. Developed planning-level cost estimates for implementation.

Griggs Hall Addition, University of Minnesota – Duluth, MN. Lead engineer for planning and final design of the stormwater treatment and conveyance system for the building and parking lot expansion. Designed stormwater storage and filtration system to reduce hydrology to pre-European settlement levels. Assembled documentation and calculations related to stormwater to obtain LEED Certification.

MAST Lab Parking Lot, University of Minnesota – Minneapolis, MN. QA/QC engineer for the stormwater treatment and conveyance system. Stormwater treatment system involved a stormwater storage and filtration basin to match pre-development hydrology.

Knoll District Stormwater Analysis, University of Minnesota – Minneapolis, MN. Evaluated methods to reduce runoff rates. Analyzed the existing drainage system for capacity deficiencies and potential improvements.

Mogren Pond and Wetland Treatment System – Maplewood, MN. Project engineer on this unique project that revolved around removal of 1,200 LF of 48-inch HDPE pipes that served as outlet for a large wetland complex and replacement of the pipes with an open channel/wetland basin. The project included complex hydraulics to coordinate the drainage plan for the entire site and anticipated future development and incorporation of a wetland planting plan. Construction plans were prepared in a short time frame to accommodate construction during the winter due to the extensive peat soils on the site. Also served as lead contact for compliance with requirements of SWPPP.

Hampshire Park Pond – Golden Valley, MN. Completed hydrologic and hydraulic analysis of the proposed water quality and rate control pond. Designed a diversion structure to divert low flows from the mainline storm sewer into the pond and bypass high flows. Assisted with the completion of final construction plans, cost estimates, and specifications. Project representative during construction - completed construction administration, including applications for payment. Verified computer modeling results during a post-construction rainfall event.

Phase 10 Streets Storm Sewer Analysis and Rain Gardens – Crystal, MN. QA/QC engineer for the XP-SWMM analysis of a large storm sewer system. Evaluated the XP-SWMM model completed on an existing system. The analysis was completed to determine if the system met State Aid standards for reconstruction of four State Aid routes within the City of Crystal.

1st Avenue Street Reconstruction – Grand Rapids, MN. Planning and QA/QC of rain gardens for water quality improvements for the street reconstructions. Provided construction details and recommendations for design and construction.

Duluth Stormwater Management Plan – Duluth, MN. Flow monitoring, hydrologic and hydraulic data collection for Chester and Oregon Creeks. Data were collected by the use of two different types of data collection devices. The data were compared between the two devices and checked against an XP-SWMM model that was developed for the creeks.

Superior BMP Pond – Superior, WI. Hydrologic and hydraulic modeling of a water quality pond that serves over 300 acres of South Superior. Water quality design based on WDNR guidelines. Additional rate control features to reduce the impact of erosive peak flows on the downstream channel. Application of bioengineering techniques to stabilize the site and create rapid wetland plant growth. Preparation of plans and specifications for the construction of the project. Completed P8 modeling to determine pollutant removal efficiencies.

Washburn County Maintenance Facility – Spooner, WI. Designed a stormwater pond and drainage system for water quality and rate control purposes. Followed WDNR guidelines for the design. Prepared WDNR stormwater permit.

5th Street NE Storm Sewer Analysis – Grand Rapids, MN. Hydrologic and hydraulic analysis of the existing storm sewer system using XP-SWMM. Preliminary design of a ponding and outlet system for localized flood relief. Recommendations for future improvements to the storm sewer system to further relieve drainage problems. Prepared hydrologic and hydraulic calculations report for Mn/DOT review.


USPFO Site – Camp Williams, WI. Design of a stormwater pond and drainage system for water quality and rate control purposes. WDNR guidelines were followed for the design. Preparation of WDNR stormwater permit.


ArcelorMittal, Minorca Mine – Virginia, MN. Project manager and lead designer for a stormwater sedimentation pond. Completed site surveying, hydrologic analysis, detention pond design, facility operations analysis, and mine road improvements. Completed detailed construction plans.

McNeilus Truck Stormwater Feasibility Study – Dodge Center, MN. Project manager for the development of a feasibility study. Study revolved around stormwater ponds for removal of TSS to meet the NPDES Industrial Stormwater Permit requirements. Developed estimated pond sizes and cost estimates for implementation.

U.S. Steel Keewatin Taconite – Keewatin, MN. Designed a sedimentation basin to remove turbidity. Completed site surveying, permitting, and design of the sedimentation basin. Worked with geotechnical engineers to address slope stability and seepage. Completed plans and specifications for construction.

ConAgra Foods Biofiltration Basin – Hastings, MN. Project manager for the completion of final design plans, specifications, and bidding assistance for a large scale biofiltration basin. The project included soils investigations, runoff modeling, and final design plans, details, and specifications.
**Areas of Specialization:**
- Environmental Remediation
- Eng. Feasibility Studies
- Environmental Eng. Design
- Contaminated Sediment Management
- Water Resources Engineering
- Hydrology and Hydraulics

**Education:**
- MS, Civil Engineering, University of Maine, 1992
- BS Env. Studies, State Univ. of New York, Magna Cum Laude, College of Env. Science and Forestry, 1988

**Professional Certifications:**
- Professional Engineer: Michigan, Illinois
- Board Certified Environmental Engineer (Diplomate), American Academy of Environmental Engineers

**Career Highlights:**
- Remedial investigation, assessment, and design experience at more than 75 sites of environmental contamination.
- Completed more than two dozen engineering feasibility studies at sites of contamination, including contaminated sediment sites.
- Designed and implemented a variety of remediation technologies and approaches for soil, groundwater and sediments including groundwater extraction, air sparging, soil vapor extraction, bioventing, enhanced bioremediation, removal, capping and natural attenuation.

Mr. Bell is a vice president and senior engineer with more than 21 years of environmental engineering experience. His primary area of expertise is environmental remediation, including site investigation, feasibility analysis, remedial technology selection, system design, and site management. He also provides expertise in the analysis of contaminant fate and transport.

Mr. Bell’s experience includes a variety of projects related to the investigation, assessment and remediation of contaminated sediments in rivers and large lakes. He is board-certified in hazardous waste engineering by the American Academy of Environmental Engineers and has served as an Adjunct Professor to the University of Michigan Department of Civil and Environmental Engineering, providing instruction in environmental engineering design.

**Key Project Experience**

**Consultation on Sediment Remediation, McIntosh, Alabama.** Senior technical consultant for remedial design of DDT-impacted floodplain sediments. Provided input and review related to cap design, construction methods, and remediation costs.

**Contaminated Sediment Investigation, Ottawa River, Toledo, Ohio.** Project manager and senior engineer for investigation of contaminated sediments in the Stickney Avenue Depositional Zone. Project involves sediment quality investigation and hydrodynamic modeling for remedial alternative analysis.

**Contaminated Sediment Investigation and Pre-Design Testing, White Lake, Michigan.** Planned and conducted sediment sampling in support of remedial design for contaminated sediment removal in Tannery Bay, White Lake, Michigan. Provided planning and oversight of bench-scale treatability tests for dredged sediments to provide data for design of sediment dewatering and stabilization systems.

**Consultation on Sources of Sediment Contamination, Portland Harbor, Oregon.** Provided site review, data analysis, fate and transport evaluation, and related consulting services to evaluate and define the role of upland soil and groundwater contamination as a potential source of offshore sediment contamination at two separate sites on the Portland Harbor.

**Remediation of Contaminated Sediments, Black River, Michigan.** Project Manager and Senior Project Engineer for remediation of 25,000 cubic yards of river sediments impacted with chromium and PCBs. Led evaluation of remedial investigation data review. Currently preparing focused feasibility study and providing engineering design for site remediation and restoration.

**Investigation of Contaminated Sediments, Storm Water Pond, Detroit Metropolitan Airport.** Designed and implemented a sediment sampling program to support closure of a 5-acre storm water detention pond at Detroit Metropolitan Airport.

**Contaminated Sediments Feasibility Study, Pine River, Michigan.** Prepared conceptual design for removal action and engineering cost estimates for a range of sediment removal scenarios, on behalf of a petroleum refiner. Work was conducted in support of negotiations between client and USEPA/USDOJ for a Supplemental Environmental Project.-

**Consultation on Soil and Groundwater Contamination, Industrial Site, Montreal, Quebec.** Providing review of site investigation and remedial activities related to soil and groundwater contamination at an industrial facility in Montreal, on behalf of a confidential industrial client.

**Industrial Site Remediation, Fayette, Ohio.** Project manager and engineer for remedial investigation, feasibility study, and
remediation design at a former industrial site in Fayette, Ohio. Contaminants of concern include TCE and related compounds. Remediation includes groundwater collection and in situ chemical oxidation.

**Industrial Site Remediation, Kentwood, Michigan.** Project manager and engineer for site investigation and remediation design to address separate plumes of hexavalent chromium and chlorinated solvent compounds in groundwater.

**RCRA Facility Closure and Remediation, Portage, Indiana.** Project manager and engineer for RCRA closure activities and remediation design to address chlorinated solvent compounds in groundwater. Designed and oversaw construction of a soil vapor extraction/air sparge system.

**RCRA TSD Closure and Remediation, Chicago, Illinois.** Project engineer for closure activities at a RCRA TSD in Chicago. Conducted site investigation activities and designed remedial actions to address soil and groundwater contamination.

**Abandoned Mine Lands Investigation, Owyhee Mountains, Idaho.** Provided technical consultation for site investigations at abandoned hard rock mining sites in southwestern Idaho for the U.S. Corps of Engineers. Investigations included preliminary soil, rock, sediment and surface water sampling to evaluate acid mine drainage impacts to nearby streams.

**RCRA Facility Closure and Remediation, South Bend, Indiana.** Project manager and engineer for RCRA closure activities and remediation design to address chlorinated solvent compounds in groundwater. Designed and oversaw construction of a soil vapor extraction/air sparge system.

**Expedited Site Remediation for Property Transfer, Warren, Michigan.** Project manager for a fast-track site investigation and removal action to address soil contamination from historical industrial activities. Completed all work and achieved closure within two months.

**Roto-Finish Superfund Site, Kalamazoo, Michigan.** Project manager and engineer during RI/FS phase of project. Oversaw site investigations, designed removal action, conducted feasibility study (FS).

**RCRA Facility Closure and Remediation, Pontiac, Michigan.** Project manager and engineer for RCRA closure activities and remediation design to address chlorinated solvent compounds in soil. Designed and oversaw construction of a soil vapor extraction system.

**Spill Response and Remediation at a RCRA Solvent Transfer Facility in Romulus, Michigan.** Coordinated and supervised spill response and soil remediation. Prepared spill response report.

**Remedial Action for Hazardous Soils Impacted with PCP at a Wood Treating Site in Hatfield, Arkansas.** Prepared and implemented site management plan, which included on-site screening and remediation of hazardous soils contaminated with pentachlorophenol from wood-treating operations.

**Petroleum Remediation at a Commercial Property in Detroit, Michigan.** Oversaw removal of the petroleum-impacted soils, and conducted soil sampling to ascertain removal extent and to confirm completion of remediation. Prepared engineering specifications for clay fill and anti-seep collars for utility entries. Drafted UST closure report.

Environmental Due Diligence:

**Meade Automotive Properties, Detroit, Utica, and Southfield, Michigan.** Automotive dealerships. Phase I ESAs.

**FKI Logistex, Arlington, Tennessee.** Former industrial property. Focused phase II ESA.

**Truth Hardware, West Hazleton, Pennsylvania.** Industrial site—Metal plating and fabricating. Phase I ESA.

**Distribution Madico, Pintendre, Quebec.** Light manufacturing and industrial distribution. Phase I ESA.

**Weber-Knapp, Jamestown, New York.** Industrial site—Metal plating and fabricating. Phase I ESA.

**Faultless Caster, Hopkinsville, Kentucky.** Industrial site—manufacturer of furniture casters. Phase I ESA.

**Keeler Brass Company, Grand Rapids, Michigan.** Industrial site—hardware manufacturing and plating. Phase I ESA and Phase II investigation.

**Wright Products, Rice Lake, Wisconsin.** Industrial site—door hardware manufacturing. Phase I ESA.

**Acco Chain and Lifting Products, York, Pennsylvania.** Industrial site—chain and hoist manufacturing. Phase I ESA and Phase II investigation.

**Cardinal Health Systems, Cleveland, Ohio.** Industrial site—Manufacturer of radiation sensing equipment. Phase I ESA.

**Sybron Dental Specialties, Romulus, Michigan.** Industrial site—Manufacturer of dental amalgam products. Phase I ESA.

**FKI Logistex, Danville, Kentucky.** Office building. Phase I ESA.

**Thomson Ball Screw Company, Saginaw, Michigan.** Industrial site—Manufacturer of steel ball screw assemblies. Phase I ESA and Phase II investigation.
Mr. Bradley has over 16 years of experience as a biologist and aquatic resource specialist. He is a certified fishery professional with experience leading and supporting a wide range of aquatic system evaluations. His interests include urban system impacts and the application of automated and remote monitoring technologies to assess and monitor conditions. He is experienced at conducting analyses at varying scales, from site-specific to watershed- and basin-level. His experience includes most phases of fish, macroinvertebrate, and aquatic habitat planning and sampling. He has also led and provided specialist support on aquatic and wetland habitat restoration projects from project development to construction, post-construction monitoring and public outreach. His experience offers a full range of aquatic support for river and coastal restoration planning and implementation.

**Key Project Experience**

**Acoustic Telemetry Evaluation of Wet Weather Responses.** Water Environment Research Federation-funded project. Project scientist. Designed and received funding for a wet-weather research project that examined the response of fish to dissolved oxygen reductions in an urban system. Implemented an acoustic telemetry project with a research team within the Chicago Area Waterway System. Completed project and published findings with WERF. Project U3R09.

**Development of a Habitat Evaluation and Improvement Approach for Nonwadeable Waterways.** Metropolitan Water Resource District of Greater Chicago. Project Scientist. Lead project scientist in supporting the development of a habitat index unique to the Chicago Area Waterway System (CAWS). This complex project involved the building of biotic and habitat geodatabases for the District as well as the review, compilation and analysis of long-term District data. A comprehensive field collection was designed and implemented to support the evaluation and habitat improvement concepts for this modified urban system. A final report was submitted and peer-reviewed.

**Cook Nuclear Power Plant Permitting/Compliance support. Project Scientist.** Continuing to provide on-call permitting-related support and analysis on facility operations, specifically tied to fish and organism protection compliance. Have reviewed historic entrainment-/impingement datasets and completed and delivered comprehensive planning and assessment documents focused on the pending 316(b) rulemaking, and continue to update client on rule status. Continuing to support 316(a) as well.

**Discharge Impact Assessment, Washington DC Water and Sewer Authority. Project Scientist.** Planned and implemented a biotic and habitat survey of a coastal tributary impacted by a sewer line failure. Developed a quick response plan, sampled impacted and reference reaches of the affected area, and reported on findings. Primary responsibility included planning, biota and habitat sampling, and impact analysis and reporting. The collected data will be used to design and implement in-channel improvements to this modified stream.

**Thermal Discharge Adaptations of Fishes – Research Review and Study Design. Electric Power Research Institute. Lead Scientist.** Conducted a review of the research examining the uncertainties associated with evaluating the effects of thermal discharges on fishes. Conducted a summary of the methods used to evaluate the effects with a focus on advances in telemetry techniques. Developed a detailed conceptual study plan to evaluate thermal effects in receiving waters of power facilities. Final report was published as A Field Research Design to Study the Response of Fishes to Thermal Plumes, EPRI 1017944, November 2009.
Northern Kentucky Sanitation District 1 Stream Condition and Prioritization Assessments. Lead Field Biologist. Conducted training of field staff and coordinated and completed a condition assessment of several hundred miles of lotic and lentic waters in coastal regions of Maryland. Field work resulted in the characterization and measurement of habitat and infrastructure features across the County’s management area to support restoration and enhancement projects.

Northern Kentucky Sanitation District 1 Stream Condition Index. Lead Project Biologist. Developed a stream condition index for monitoring and ranking site conditions within the District-managed areas in Northern KY. The project included the evaluation of habitat, flow, water quality, fish and macroinvertebrate data against watershed-related stressors as a means to track long-term chronic effects and restoration actions within the management area.

Tittabawassee and Saginaw River Bank Classification. Project Scientist. Collaborated in the design of a bank classification protocol and survey for over 40 miles of the Saginaw and Tittabawassee Rivers in Michigan. The study results were used to evaluate and rank bank stability and will support the design and implementation of technologies that will improve and promote riverbank stability and to support the restoration approaches that protect the regionally prized walleye fishery.

NPDES Program Permitting, Biological Evaluation of Municipal Discharges, Idaho. Project Scientist. Provided scientific support for regulatory consultation on a range of NPDES permits for several municipalities in Idaho (City of Lewiston, City of Coeur d’Alene, City of Post Falls, City of Twin Falls, and ID DOT). The permit support provided Region 10 EPA with resource documents to consult with NOAA Fisheries and Fish and Wildlife Service on the effects of municipal discharges permit renewals on federally listed biota within anadromous systems of Idaho.

Porcupine Ridge Pipeline Project, Holly Energy Partners, Salt Lake City, Utah. Resource Permitting Lead. Developed and submitted planning and permitting documents for a 65-mile oil pipeline in eastern Utah. Conducted listed and sensitive species assessments/evaluations and wetland delineations and assessments of the impacts of the proposed project on over thirty aquatic and terrestrial species across the project area. Completed environmental permitting necessary for construction designs and impact minimization to sensitive areas across the project area.

Mores Creek Stream Fish Passage and Restoration, Idaho City, ID. Fisheries Biologist. Provided fish passage and in-stream structure restoration design guidance on the reconstruction of a segment of a placer mine impacted headwater stream. Provided flow-passage, channel configuration and relocation recommendations to support the native and federally listed trout species. Directed pool, in-stream cover and riparian vegetation designs for thermal reductions and included floodplain wetland plans in the concept and final designs.

Concepcion Wetland Mitigation Plan, Caldwell, Idaho. Project Manager and Scientist. Contracted and conducted the wetland delineation, impact assessment and mitigation site design and permitting for a gravel extraction operation located adjacent to the Boise River, ID. Surveyed and delineated wetlands across the 120-acre site and completed and submitted the delineation report to the ACOE and received approval on the determinations. Following ACOE determination approval, completed an approved mitigation and monitoring report for the impacts associated with the land development and mitigation applications.

Mica Creek and Mica Bay Impact Assessment and Fish Passage Planning, ID. Aquatic Biologist. Conducted a comprehensive evaluation on the adverse impacts of a failed sediment storage pond on resident and adfluvial coldwater fishes. Developed and implemented a channel restoration plan that provided seasonal fish passage and recovered spawning areas along the impacted segment of stream.

Silver Creek Aquatic Habitat Restoration Project, Boise National Forest, Idaho. Lead Biologist and Equipment Supervisor. Designed and implemented a channel reconstruction and stream habitat improvement project within a destination recreation area in southern Idaho. The project included extensive public and private collaboration and education. The channel work involved floodplain reconstruction, in-channel habitat development, and riparian planting on 5 miles of stream on Forest Service lands. In addition, stream crossings, interpretive signs, educational tours were included in the project for this heavy use recreational area.

Emmett Ranger District Fisheries Program Manager, Boise National Forest, ID. District Aquatic Program Biologist. Responsibilities included aquatic resource planning, program development and implementation within and among Districts. Identified, designed and implemented several habitat restoration projects that required collaboration (private, municipal and federal). Led project development and secured grant funding for activities that ranged in scale from small passage restoration projects to watershed-scale riparian and channel enhancement projects. Planned and implemented aquatic monitoring across the District that included fish, macroinvertebrate and habitat sampling using a range of techniques. Hired, managed and trained field personnel in numerous biota and habitat sampling techniques. Supported interagency sampling and training efforts and conducted extensive education support to local communities on aquatic, wetland and recreation opportunities associated with fisheries and riparian resources.
Ms. Whiting is a senior project engineer and project manager with more than 20 years of environmental engineering and consulting experience. Her recent area of focus is the design and implementation of field sampling plans. She also has experience in environmental remediation, including site investigation, feasibility analysis, remedial technology selection, system design, and site management. She is a trained wetland delineator.

Ms. Whiting has managed many surface water investigations. These projects have involved oversight and coordination of project activities including data review and display, model selection, data evaluation and analysis, and sampling plan preparation.

Ms. Whiting has also conducted site investigations for soil and groundwater contamination, and has managed environmental remediation projects under various regulatory frameworks including state leaking underground storage tank (LUST) programs, state hazardous waste programs, RCRA facility closures and corrective actions, CERCLA (Superfund) sites, and voluntary actions.

Ms. Whiting also has over six years of experience in the utility industry at Detroit Edison. She was involved with environmental compliance programs for power plants required by legislation such as the Clean Water Act, Clean Air Act, TSCA and RCRA.

Key Project Experience

Michigan Department of Environmental Quality Water Studies Research Services. Ms. Whiting served as project manager, which included coordinating and supervising water quality investigations in southern lower Michigan for the MDEQ Surface Water Quality Division. Sampling was conducted for bacteria, nutrients, metals and low-level mercury analysis using ultra-clean sampling techniques. LimnoTech also assisted MDEQ with fish shocking and collection.

Kalamazoo River Sampling for Fate and Transport Modeling. Ms. Whiting served as Project Manager for the additional surface water data collection portion of the project. This involved conducting biweekly base flow water quality sampling and flow monitoring of the river at ten stations over one year. Tributary sampling was also conducted, which included the installation, maintenance and monitoring of automatic samplers. Wet weather water quality sampling and two timed transect studies were also completed as part of the study. Ms. Whiting also managed the preparation of the modeling report.

Wetland Evaluations / Delineations in Southeastern Michigan. Ms. Whiting served as Project Manager. Wetland evaluations and/or delineations were conducted at several undeveloped properties as part of property transfers. Site investigations were performed and reports were prepared documenting the results.

Tittabawassee River Contaminated Sediments and Floodplain Soils Evaluation, Midland, MI. Ms. Whiting served as Project Manager of the field investigation that included wet and dry weather sampling, flow measurements, and sediment sampling and probing. Ms. Whiting also assisted with work plan development, data evaluation and reporting.

Toledo Combined Sewer Overflow Receiving Water Quality Monitoring. Ms. Whiting served as Project Manager of the field investigation that included wet weather and dry weather sampling on three water bodies, flow measurements, and an investigation of photosynthesis and respiration which included continuous dissolved oxygen monitoring and sampling for chlorophyll a.
Lynchburg, VA CSO Long Term Control Plan 2010 Update. Ms. Whiting served as Project manager and senior engineer for development of water quality models of the James River and its tributaries, to evaluate receiving water impacts from combined sewer overflows, as part of long-term control planning. She developed the water quality sampling plan and quality assurance project plan for field activities to collect the data required for the modeling effort. She also prepared standard operating procedures and trained the field staff.

Lake Erie Dead Zone Water Treatment Study. Ms. Whiting served as Project manager and senior engineer for the collection and evaluation of anoxic water from the dead zone in the Lake Erie Central Basin near Cleveland, Ohio. Sample collection and preservation methods were developed, as well as a series of jar tests performed to evaluate potential treatment options for the Cleveland Division of Water.

Buffalo River Sediment Remediation Study, Buffalo, NY. Ms. Whiting was responsible for the field investigation associated with LimnoTech’s contributions to a sediment remedial investigation and feasibility study being performed under the Great Lakes Legacy Act. As a Legacy Act project, the project is jointly funded by a contributing PRP and the Great Lakes National Program Office (GLNPO) of the EPA. LimnoTech is working with other consultant team members Honeywell, GLNPO, the Army Corps of Engineers, and state agencies to plan and execute a rapid field study and sediment investigation, and a feasibility screening of remedy alternatives. LimnoTech installed continuous turbidity and velocity monitoring systems in the lower six miles of the river.

High Rock Lake TMDL Monitoring Project for the Yadkin Pee Dee River Basin Association. Ms. Whiting served as the Project Manager for successful preparation of a 319 grant application for lake and watershed monitoring conducted to support development of the High Rock Lake TMDL models. The water quality model of High Rock Lake will address turbidity, dissolved oxygen, and eutrophication problems. Ms. Whiting developed the Sampling and Analysis Plan for the monitoring program as well as the Quality Assurance Project Plan. She also oversaw the high flow sampling and development of the project database.

Don River Restoration Design, Toronto, ON. Ms. Whiting served as the project manager for field investigations conducted on three rivers in Toronto, Ontario. Surface sediment samples and sediment cores were collected from the Don River and two reference reaches. A bank characterization survey was also conducted. Bank soil samples were collected and characterized, and bathymetry measurements were collected as well.

Remedial Investigation, Feasibility Study, and Site Management for a CERCLA Site in Kalamazoo, Michigan. Ms. Whiting has served as Project Engineer in the remedial investigation-feasibility stage (RI/FS) of the project, during which she has primarily been responsible for site management activities and evaluations. She has been involved in water management plans and oversight of the water treatment process. She has also developed an erosion control plan for a landfill, and was involved with implementation of the plan. Ms. Whiting has also conducted evaluations related to the remedial investigation and future remediation of the site.

Implementation of a Phase II RCRA Facility Investigation at Solvent Recycling Center in Chicago, IL. Ms. Whiting has served as Project Manager for implementation of a Phase II RCRA facility investigation. This has involved conducting sampling, data evaluation, and negotiations with regulatory personnel. A Tiered Approach to Corrective Action Objectives (TACO) evaluation was conducted under Illinois regulations related to risk-based corrective actions. A Corrective Measures Study is being performed to determine the remedial objectives for the site.

Water Quality Evaluation for Phase II CSO Facilities Plan. Ms. Whiting served as Project Manager for Phase II CSO Facilities Planning Evaluation. She was responsible for the water quality evaluation activities associated with the planning process. This included developing a receiving water sampling plan, data evaluation, and water quality model selection.

Sediment Investigation at Former Mill Pond in Bangor, Michigan. Ms. Whiting served as Project Manager for the site investigation at the former mill pond. The work included preparing the work plan, as well as coordinating and supervising the investigation of the former mill pond which was impacted with PCB and metals. The results were presented at a public forum and a remedial investigation report was prepared.

East Branch Coon Creek Dissolved Oxygen Study, Macomb County, MI. 2005. Ms. Whiting served as project manager for a dissolved oxygen study of East Branch Coon Creek. Data gathered during the study was used to support DO total maximum daily load (TMDL) development for a segment of the creek that was historically in non-attainment of the 5 mg/L minimum DO standard. Continuous dissolved oxygen data was collected along with instantaneous measurements. A reaeration study was also conducted.

Total Maximum Daily Load (TMDL) Development for Illinois Watersheds. Project Engineer. Participated in monitoring conducted to support development of TMDLs in multiple watersheds in Illinois, under contract to Illinois EPA.

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