

## Field Services and Capabilities



**The foundation of every environmental project is valid and defensible monitoring data collected and analyzed by approved methods. The validity of scientific data is based on several factors, including an appropriate monitoring design plan, careful sample collection using appropriate equipment and methods, a quality assurance/quality control (QA/QC) program, analyses using an accredited environmental laboratory, and accurate reporting of analytical results. Before any samples are collected, many choices must be made relating to monitoring design, sample collection, sample analysis, data quality and worker safety. These decisions are specific to the needs of the project and the anticipated uses of the data collected.**



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LimnoTech has extensive experience in the design and implementation of field sampling programs to meet the most demanding data collection requirements for environmental investigations. It has been our experience that time spent at the beginning of a project to carefully design a safe and effective monitoring program avoids potential frustrations and conflicts later relating to the utility, validity, and defensibility of the data.

LimnoTech offers a wide range of field services in the support of technical projects. These include:

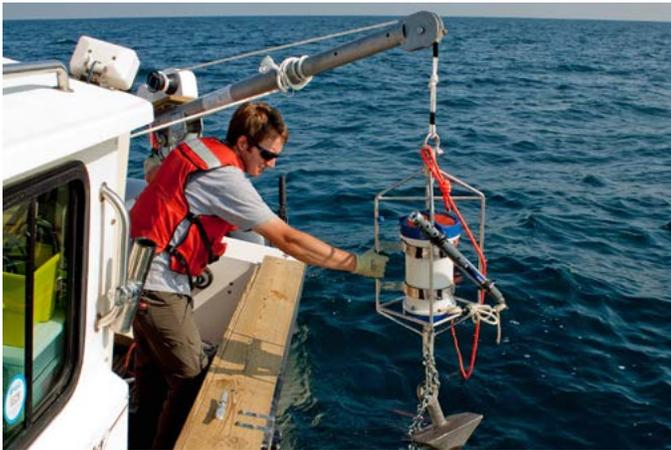
- Development and implementation of work plans for investigative sampling/monitoring, feasibility studies, quality assurance, and safety and health
- Assessment of project equipment and instrumentation—requirements, procurement, and training
- Deployment of field teams for short- and long-term sampling, monitoring and/or oversight
- Automated sampling station design and installation
- Contractor training, coordination, and oversight
- Environmental investigative sampling of large and small surface waters, shallow and deep sediments, surface and subsurface soils and bedrock formations, groundwater, and soil vapor
- Installation and operation of groundwater and soil remediation systems
- Analytical laboratory assessment, selection, and coordination



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The following project descriptions offer a brief sampling of the many field service capabilities that LimnoTech offers our clients.

**Upper Patuxent River Watershed Field Assessment and GIS Data Assembly.** LimnoTech assisted Anne Arundel County in performing an in-depth watershed assessment of the Upper Patuxent River watershed, which drains 22,555 acres and contains 171 miles of perennial streams. During six weeks in the field, LimnoTech staff used Maryland Habitat Physical Habitat Index (MPHI) protocols to collect reach-specific information on habitat and physical inventory features on over 130 miles of streams within the watershed; performed dry weather sampling on all 19 subwatersheds to provide an initial characterization of water quality, including nutrients, metals, field parameters, and bacteria; developed an inventory of all urban stormwater facilities and agricultural best management practices (BMPs) within the watershed and used this information to create a geodatabase for incorporation into the County's geographic information system; and provided information to develop broad Rosgen Level I classifications for all stream reaches, and Rosgen Level II classifications on two reaches to aid in specific restoration projects.



**Offshore Bathymetric, Seismic, and Deep Coring Investigation - Donald C. Cook Nuclear Plant.** The Donald C. Cook Nuclear Plant/AEP is located on the southeastern shore of Lake Michigan. AEP is evaluating the potential benefits of moving the plant cooling water intakes further offshore, targeting the cooler water located below the thermocline in critical summer months. Onshore and offshore geologic and geotechnical information was required to inform a feasibility assessment and to support preliminary design of an expanded intake tunnel for the plant. On AEP's behalf, LimnoTech planned, staffed and managed offshore and onshore seismic and coring investigations in the vicinity of the Cook Nuclear Plant to collect data on lakebed conditions and glacial and bedrock geology along a proposed tunnel corridor. LimnoTech

personnel developed the Health and Safety Plan and work plan for the field investigations, acquired permits from applicable regulatory agencies, assembled an expert project team, provided direct oversight of all field activities, and delivered a comprehensive Data Report within budget and on schedule.

**E. coli Sampling Program.** LimnoTech has been conducting an E. coli sampling program for the Michigan Department of Environmental Quality since 2003. The objective is to determine E. coli levels in waterbodies located in southeastern Michigan for development of E. coli Total Maximum Daily Loads (TMDLs). The E. coli sampling program consists of weekly sampling during the summer. The E. coli samples are delivered by LimnoTech personnel to laboratories for analysis within six hours of collection. At MDEQ's request, DNA samples were also collected at a subset of the sampling stations, after E. coli sampling had been conducted for several months, and had laboratory DNA fingerprinting performed on them. E. coli results are submitted to MDEQ on a weekly basis. Results are also placed on the DEQ Beach Monitoring website each week. The E. coli sampling being conducted by LimnoTech is being used to inform the public on bacteria concentrations in local waterbodies and to determine E. coli TMDLs for pathogen-impaired waterbodies in southeastern Michigan.



**Tittabawassee/Saginaw River System Sediment Transport and Contaminant Investigations.** Dioxins and furans have been identified at locations throughout the Tittabawassee and Saginaw Rivers and floodplains in Michigan. LimnoTech has been a consistent and critical member of the consultant teams, assisting the Dow Chemical Company in characterizing the river, planning and conducting remedial investigations, and designing remediation and restoration activities. A variety of investigations have been conducted to evaluate how water, sediments and hydrophobic contaminants move through the system. LimnoTech conducted innovative investigations of banks, floodplains, flow, and solids transport using

standard and state-of-the-science instruments (e.g., LISST, OBS-3+, ADCP, radar) and techniques (e.g., bedload transport, dendrogeochronology, turf mat, streambank habitat and GPS-tracked video assessments). The investigations generated data to characterize short and long-term transport phenomena that supported the development of very high resolution, multi-dimensional hydrodynamic and sediment transport models that are being used to thoroughly understand how the river functions, and which will allow Dow to develop an economical and effective remedy.



**Chicago Waterways Habitat Evaluation and Improvement Study.** The Chicago Area Waterway System (CAWS) is a network of 78 miles of rivers, deep-draft manmade canals, locks and dams in and around the City of Chicago. The system is used for navigation, flood control and wastewater conveyance. The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) maintains the system and has spent millions of dollars on water quality improvement over the last three decades. Responding to newly proposed dissolved oxygen standards, MWRDGC commissioned LimnoTech to determine if more restrictive standards would help the fish in the system given the apparent physical habitat limitations. An important component of LimnoTech's activities was implementation of a large, multi-month field investigation, navigating the CAWS for physical habitat inventory and representative sampling of fish and macroinvertebrates. The investigation generated data supporting our construction of a geo-database of habitat, biotic, and water quality data; development of a comprehensive geographic information system; development of a system-specific habitat index; and conceptual design of potential habitat improvement measures, focusing on the most limiting aspects of habitat in the system. LimnoTech found that physical habitat is more important to the resident fish than dissolved oxygen levels. We used our field data to develop a comprehensive habitat index for a major urban waterway, something that had not

been done on this scale before. This index allowed us to identify the most limiting habitat attributes, which informed conceptualization of habitat improvement measures. We also determined that if the system is to continue to serve its primary uses, improvements may not result in measurable improvements in the fish community.

**Airport Deicing Management Program Development and Implementation.** LimnoTech has provided field monitoring services to airports throughout the United States to support research efforts, NPDES compliance, and deicing runoff management program implementation activities. LimnoTech has planned and conducted deicing event outfall and monitoring investigations to provide data in support of NPDES permit negotiations, the development of deicing fluid management plans, the evaluation and modeling of existing storm water runoff controls and best management practices for deicing operations, and the field testing of aircraft deicing fluid with minimal, or greatly reduced environmental impact compared to conventional products. As an example, LimnoTech was part of a research team that conducted demonstration/validation testing of an aircraft deicing fluid with reduced environmental impact that was developed under the U.S. Dept. of Defense's Environmental Security Technology Certification Program (ESTCP). The demonstration was conducted at the Niagara Falls Air Reserve Station (NFARS). LimnoTech specified and executed a monitoring plan designed to provide high resolution water quality and flow data to support the quantification of water quality benefits of the new deicing fluid relative to conventional materials. Monitoring included the deployment and extended operation of automated sampling, flow measurement, in-situ chemistry, and metering instrumentation. The analyses involved the adaptation and application of LTI's proprietary Deicing Runoff Evaluation Model (DREM) to simulate the distribution, transport, and fate of the aircraft deicing fluid. Simulations were conducted to assess stormwater benefits under a range of conditions representative of typical airfields.



**Remedial Investigation/Feasibility Study (RI/FS) and Remedial Actions for Chlorinated Solvent Impacts in Northwestern Ohio.** LimnoTech helped the owner of a property in northwestern Ohio to address legacy industrial chemicals in soil and groundwater in a technically sound, cost-effective, and regulatory-compliant manner. Trichloroethylene, or TCE, was used to clean and degrease tubular metal parts at the industrial plant that once operated at the site. In spite of prevention measures, accidental releases of TCE to the environment occurred over the years. In the early 1990s, TCE, metals and other chlorinated solvents were discovered in soil and groundwater beneath the plant and, by the end of the decade, the impacts had migrated off-site. Working under the property owner's consent order with the state and in cooperation with the Ohio EPA, LimnoTech conducted and completed a multi-phase hydrogeological and contaminant transport remedial investigation of the multi-aquifer environment at the site. LimnoTech also conducted feasibility studies resulting in implementation of collection and treatment systems for impacted soils and groundwater

at the site, designing a number of cost-effective interim measures to address "hot spots" and prevent further migration of the impacts. When the groundwater impacts were believed to threaten the public water supply wells of the village, LimnoTech investigated alternative water supplies and discovered a previously unknown, deeper aquifer to provide water for the village. LimnoTech's proactive efforts to address priority issues, concurrently with the RI/FS process and collaboratively with the regulatory agency, resulted in a lower cost final remedy for the site. By the time the state drafted their preferred plan for the site, it largely consisted of ongoing monitoring and maintenance, compared to multi-million-dollar alternatives evaluated in the feasibility study. LimnoTech's discovery of the alternate water supply aquifer led the client to voluntarily construct new water supply wells for the village, so the public benefited as well.

