

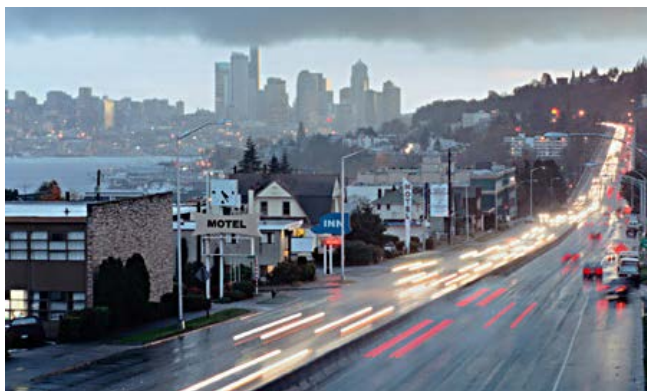
Wet Weather Water Quality



Regulatory requirements for municipal wet weather flows have grown continually over the last 20-30 years, while new funding for capital system improvements have not. These wet weather discharges can cause or contribute to water quality impairments, beach closures, contamination of drinking water supplies, and other environmental and human health problems. To make the most of limited resources to invest in controls that best achieve water quality goals, cities need a way to develop comprehensive, integrated compliance strategies.

LimnoTech is at the forefront of advancing science and public policy for solving water-related issues. In addition to our long history of service to municipalities, industries, and state and federal agencies, we are collaborating with the U.S. EPA, the Water Environment Federation (WEF), the Water Environment Research Foundation (WERF), the National Association of Clean Water Agencies (NACWA), and other organizations to develop effective solutions. Specifically, we have:

- Helped numerous municipalities develop cost-effective plans to comply with state and federal requirements associated with combined sewer overflows (CSOs) and municipal stormwater discharges.
- Developed hydrologic and hydraulic models to assess capacity and peak wet weather flow issues.
- Conducted watershed and river water quality assessment and modeling to evaluate the water quality benefits of control alternatives.
- Developed or reviewed total maximum daily loads (TMDLs) and use attainability analyses (UAAs).
- Developed NPDES permit conditions that are protective of the environment but not overly stringent.
- Helped pioneer the use of adaptive watershed management and water quality standards revisions to meet Clean Water Act goals with less cost.



A coordinated wet weather management assessment considers all contributing factors, including combined sewer overflow (CSO), sanitary sewer overflow (SSO), stormwater (MS4), wastewater treatment plant effluents, and “nonpoint” flows.

LimnoTech’s scientific and engineering expertise, high-end modeling skills and regulatory experience form a basis for planning, implementing, and evaluating wet weather source control strategies. For over 40 years, LimnoTech has helped communities resolve complex water quality issues with nationally recognized technical expertise and negotiation support.

LimnoTech Services

CSOs, SSOs, and Peak Flows

- Collection system characterization and modeling
- Control measure conceptual design
- Operations and management innovations to reduce costs of overflow control
- Policy and regulation review
- Long-Term Control Plan development and review

NPDES Permits

- NPDES permit application development and representation
- Mixing zone and effluent impact monitoring and modeling
- Toxicity Reduction Evaluations (TRES)

Urban and Industrial Stormwater

- Phase I and II MS4 permitting
- Water quality and quantity modeling
- Nonpoint source runoff modeling
- Illicit connection surveying
- BMP development and effectiveness evaluation

Integrated Receiving Water Impact Assessment and Planning

- Receiving water monitoring and modeling
- Water quality, sediment and biological assessment
- Forecasting/hindcasting waterbody response to pollutant load changes
- Economic benefits analysis of source controls
- Total Maximum Daily Loads
- Setting appropriate water quality targets for CSO LTCPs, TMDLs, and watershed plans

The following projects provide a brief example of our experience and expertise in wet weather management.

Willamette CSO Tunnel Modeling for City of Portland, OR.

The City of Portland, OR, recently completed construction of the Willamette Combined Sewer Overflow (CSO) tunnel system to contain combined sewage during storm events and prevent unauthorized release of sewage to the Willamette River. The Willamette CSO Tunnel system includes a network of consolidation conduits designed to intercept combined

flows upstream of CSO outfalls and convey the combined flows to drop shafts which discharge to deep CSO tunnels. As the CSO Tunnel system was brought on line, the challenges of consolidating and redirecting flows for the most extreme events became apparent as the effect of hydraulic transients, including displaced manhole covers, were observed at various locations along the conduits and interceptor sewers. LimnoTech was engaged by the City to conduct an analysis of hydraulic transients in the consolidation conduits to better understand the causes of observed effects at three locations and to support design of mitigation measures. LimnoTech applied the proprietary SHAFT (Surge and Hydraulic Analysis for Tunnels) model in the analysis. Preliminary modeling results showed pressurization of the air space underneath the affected manhole covers and a routine was added to SHAFT to dynamically simulate pressurization of the air space in chambers above surcharged sewers and associated venting. LimnoTech's analysis revealed that rapid air pressurization could have created sufficient pressure forces to result in the observed events. Based on these findings it was concluded that additional venting would suffice to safely relieve pneumatic pressures, thereby providing an acceptable level of service. The subsequent design effort focused on providing pneumatic relief to the systems, through various measures.



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Integrated Watershed Services for Northern Kentucky in Support of Consent Decree Requirements. Sanitation District No. 1 (SD1) signed the nation's first wet weather Consent Decree based on the principles of adaptive watershed management—an approach that LimnoTech helped found. This decree provides SD1 with the flexibility to prioritize controls in five-year increments to improve water quality. To help SD1 submit the first Watershed Plans, LimnoTech helped design and implement monitoring programs for the 16 watersheds. LimnoTech also conducted a comprehensive watershed characterization using historical data on in-stream water quality and pollutant sources, watershed characteristics using GIS, attainment of designated uses, and an assessment of pollutant loads from different sources. LimnoTech also developed and applied watershed and water quality models to link pollutant sources with impacts on the region's recreational use of streams. LimnoTech applied these models to inform the cost-benefit analysis of CSO and SSO controls, green infrastructure, and watershed controls (including stormwater management). LimnoTech also used these tools to identify watershed controls, and then provided conceptual designs for several control features.

RiverSmart DC – Low Impact Development Demonstration Project, Washington, DC. Low Impact Development (LID), or green infrastructure, is an attractive, cost-effective solution to urban wet weather challenges. LimnoTech is working with a coalition of District government agencies and nonprofit organizations to assess the stormwater management benefits of green infrastructure practices in three demonstration neighborhoods in Washington, D.C. LimnoTech first worked evaluate potential demonstration locations where LID retrofits could be installed and monitored. Based on these

analyses, LimnoTech recommended three sewersheds to serve as project demonstration sites. LimnoTech also developed and implemented a monitoring program to collect flow data to evaluate the performance of the LID retrofits. Evaluation of data will allow the team to identify appropriate placement of LID features and to develop conceptual designs for each practice. This will include characterization of study areas and field verification and ground-truthing of sewershed boundaries and impervious features.

Comprehensive Wet Weather, Water Quality, and Regulatory Compliance Services in Kansas City, MO. The City of Kansas City, MO, is faced with multiple water and wastewater management challenges, including CSO control, sanitary sewer overflow control, NPDES permitting, MS4 permit requirements, street flooding, and water-in-basement issues. The City is taking an integrated approach to these issues, to achieve improvements across the range of issues with limited resources. LimnoTech was contracted to lead water quality and regulatory support issues. LimnoTech was also retained by the City to provide services related to POTW and MS4 permit negotiations and compliance, and to take a lead role in negotiations with the Missouri DNR on multiple issues including 303(d) listing methodologies and draft 303(d) lists, use attainability

analysis (UAA) protocols, effluent regulation and water quality standards revisions, and development of rules specifically addressing CSOs. To help the City resolve its challenges, LimnoTech designed and provided oversight for a monitoring program to fill data gaps, then led assessment of the data and prepared a water quality model to address streams and rivers impacted by wet weather discharges.

Watershed-Based Permitting and Integrated Planning for Richmond, VA, Department of Public Utilities. The City of Richmond DPU manages three utilities that address water: drinking water, stormwater, and wastewater (including combined sewer overflows discharging to the James River). Each of these programs includes regulatory compliance and management requirements, and has historically been addressed separately. This approach forced the City to make decisions related to compliance for each utility without being able to consider the interrelated impacts. LimnoTech and the City are using EPA's Integrated Planning Framework to develop an integrated approach that protects water quality and meets programmatic and regulatory requirements.

LimnoTech's approach uses three separate planning tools: a Watershed Management Plan, an Integrated Plan, and a watershed-based permitting process. The Integrated Plan and the watershed-based permitting process will rely on the Watershed Management Plan to provide the information necessary for their development, and over time the Integrated Plan and watershed-based permitting process will feed information back into the Watershed Management Plan. This "feedback loop" will facilitate an adaptive management process whereby information will be assessed over time and changes made based upon the new information and assessment of the existing controls and activities.