Identify, Screen, and Treat Contaminants to Ensure Wastewater Security

WERF's security-related research addresses emergency response and contingency planning, chemical/biological/radioactive contamination events (accidental or purposeful), cyber security of process control systems, and risk communications.

This project is one of a number of tools and protocols focused on wastewater protection funded with a grant from the U.S. Environmental Protection Agency. This array of robust security products and tool kits includes emergency communication protocols, guidance documents, fact sheets, technical libraries and databases, expert software systems, and GIS-based simulation models for contaminant assessments in wastewater collection and treatment systems that provide for a greater culture of security. The projects funded by the grant covered the following broad thematic areas of security research:

- Emergency Response Plan (ERP) and Risk Communications
- Chemical/Biological/Radiological (CBR) Contamination Events and Operator Protocols
- CBR Sensors and Early Warning Systems
- Control System Cyber Security
- Physical Security Technologies

This study is the first of a series of four projects designed to develop operator protocols in response to chemical, biological, and radiological (CBR) contamination events. The development of the wastewater contaminant prioritization system from Phase I of this project and the prioritization of chemicals allow utilities and the U.S. EPA to be better prepared for a possible contamination event for all types of hazards. In addition, understanding the strengths and weakness of available analytical equipment and techniques for the detection of contaminants in wastewater (Phase II report) allows utilities to safely respond, remediate, and recover from a possible contamination incident. Together, this research can lead to better reliability, resiliency, and more sustainable wastewater collection and treatment systems for utilities.

This project emphasizes the risks and toxicity associated with specific agents, detection methods, treatment/inactivation mechanisms, fate and transport, and emergency operating procedures to protect public and employee health and safety, and prevent the spread of contaminants to other environmental media.

BENEFITS

- Provides utilities with information to help them determine the potential impact of the evaluated contaminants on human health, treatment plant integrity, and receiving waters.
- Provides utilities with a prioritization framework that can be used to develop contingency plans for safe operation of their facilities in the event of a terrorist threat or intentional attack.
- Phase II provides information to help utilities address concerns about the efficacy of treatment for a variety of agents.
- Phase II provides information to help develop or refine treatment that is more effective when little data exists and public health protection is paramount.

RELATED PRODUCTS

Feasibility Testing of Support Systems to Prevent Upsets (03CTS7S)

Integrated, GIS-Based Consequence Assessment Model for Sewer and Stormwater (04CTS10S)

Determining and Assessing Corrective Action Strategies for Treatment Plants Exposed to Chemical Toxins (04CTS11S)

These projects and others under other security thematic areas were published as separate reports or tools. Some of these products are not available for public distribution because of security concerns, but are available through WaterISAC at http://www.waterisac.org.

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The overall objective of this study was to assimilate and provide high-quality information to wastewater collection and treatment facility personnel and their communities so that they are better equipped to safely respond to (handle, treat, or inactivate), remediate (dispose of infectious, hazardous, or radioactive contaminants), and recover from (cleanup and restoration of service) direct or secondary intentional introduction of hazardous materials into wastewater collection and treatment systems.

Phase I of the project focused on the development of a prioritization framework for contaminants that may be intentionally or accidentally introduced into a wastewater collection and treatment system. A prioritization framework was developed by the research team and was used to prioritize contaminants for use by U.S. EPA and individual utilities. Contaminants were prioritized based upon the outcomes at four evaluation endpoints. For each endpoint, values were developed for eight criteria and the values for these criteria were then combined into a composite score. The contaminant prioritization allows substances with high overall scores at the different endpoints to be identified as high-priority contaminants with respect to that given endpoint. A number of contaminants were analyzed using the prioritization framework.

Phase II evaluated available analytical equipment and techniques for the detection of contaminants in raw wastewater; and wastewater following various stages of treatment. It provides information to help utilities address concerns about the efficacy of treatment for a variety of agents. Phase II also provides information to help develop and refine treatment that is more effective when little data exists and public health protection is paramount.

The research team recommended that new and emerging technologies and analytical techniques, developed since the completion of this research, be evaluated to determine the detection capability, matrix effects, and usefulness of these technologies and techniques for the contaminants of greatest concern. These technologies and techniques will be evaluated in raw wastewater and wastewater following various stages of treatment.

Other Available WERF Security Projects*

Security Research Areas	WERF Project Title
Security Agenda	**03CTS1S** Enhancing Security in the Wastewater Sector: A Prioritized Research Agenda Security Symposium Proceedings
Chemical, Biological, and Radiological (CBR) Sensors and Early Warning Systems (EWS)	**04CTS9SW** A Workshop on Research Needs for Sensor Development for Wastewater System Security Operations **04CTS9S/04CTS9Sa** Chemical, Biological, and Radiological Sensors for Early Warning Systems in Wastewater Utilities (Phase 1 and Phase 2)
CBR Contaminant Events and Operator Protocols	**03CTS2S** Identify, Screen, and Treat Contaminants to Ensure Wastewater Security **03CTS7S** Feasibility Testing of Support Systems to Prevent Upsets **04CTS10S** Integrated, GIS-Based Consequence Assessment Model for Sewer and Stormwater **04CTS11S** Determining and Assessing Corrective Action Strategies for Treatment Plants Exposed to Chemical Toxins: A Pilot Scale Study
Emergency Response Plan (ERP) and Risk Communications	**03CTS4S** Emergency Response Plan Guidance for Wastewater Systems **03CTS5SCO** Emergency Communications with Your Local Government and Community **04CTS12S** Strategies for Small Wastewater Systems for Risk Reduction and Safeguarding Assets

*All these projects are available through WaterISAC at www.waterisac.org

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