EPA
United States
Environmental Protection
Agency

# Wastewater Response Protocol Toolbox:

## Planning For and Responding To Wastewater Contamination Threats and Incidents

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### Module 6:
### Remediation and Recovery Guide

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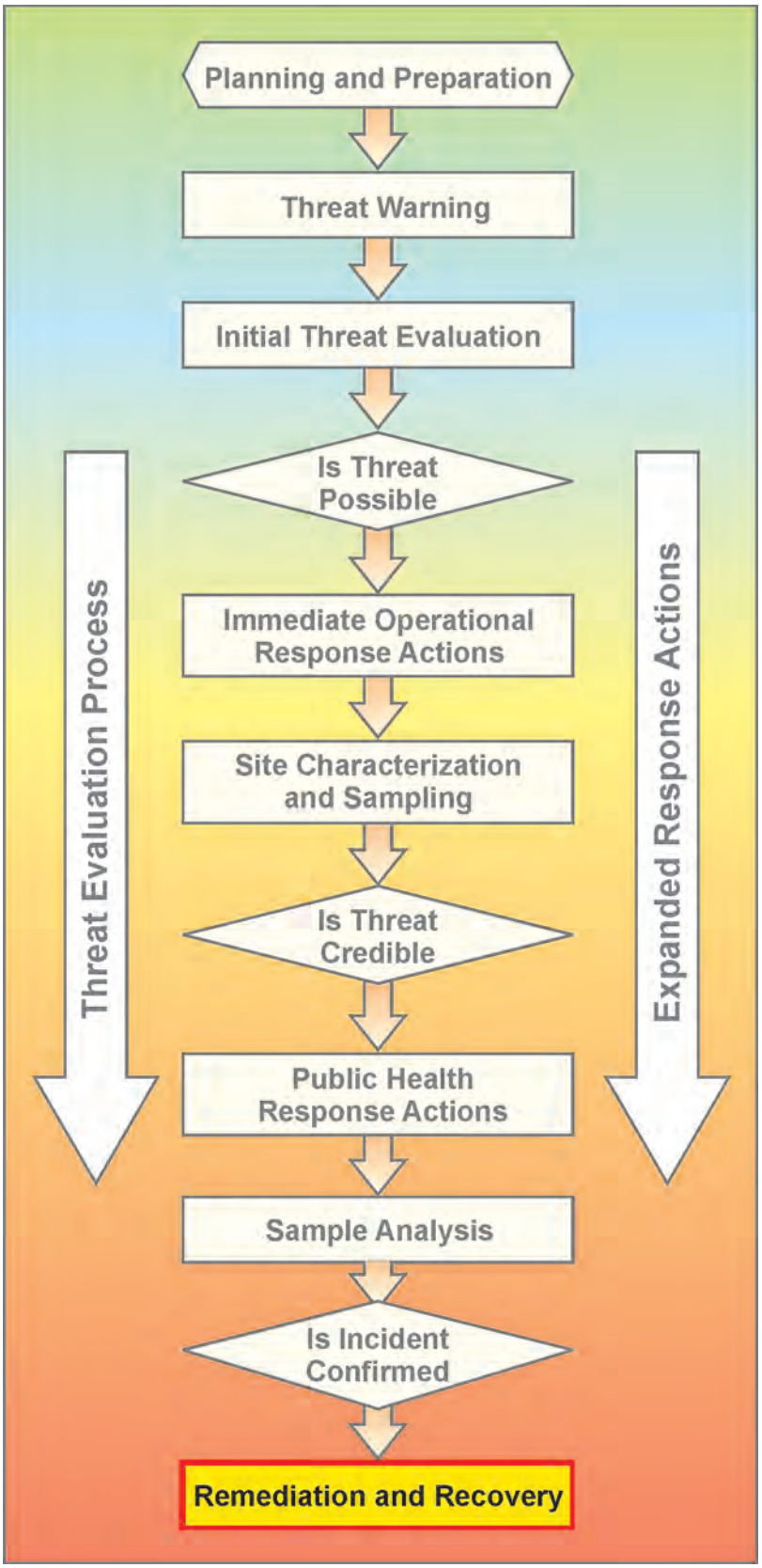
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## 1 Introduction

This module presents guidance on the remediation and recovery process that should be applied when a wastewater contamination incident has been confirmed. The target audience for this module includes:

- Individuals who will be involved in characterization, risk assessment, and remedial response activities following a confirmed contamination incident.

- Lead agency personnel and decision makers who will determine the need for long-term alternate sanitary services, select remedial technologies, determine when to return to normal operations, and communicate with the public.

These individuals will probably include utility personnel, regulators, public health officials, and technical assistance providers.

The purpose of the remediation and recovery process is to address extensive contamination at levels that pose immediate and/or long-term risks to human health and the environment. The overall objective is to reduce or eliminate the contaminant and return the wastewater system to service as quickly as possible while protecting public health and the environment and minimizing disruption to normal life. The remediation and recovery process is applicable for decontamination of the contaminated wastewater prior to safe disposal, as well as to remediation of the wastewater collection system, the treatment plant, and associated facilities such as lift stations. While rapid recovery of the system may be critical, it is important to follow a systematic process that is consistent with any applicable laws and regulations, and establishes remedial goals acceptable to all stakeholders, implements the remedial process in an effective and responsible manner, and demonstrates that the remedial action was successful. This module describes some elements of such a systematic process.

If it is determined that chemical, biological, or radiochemical contaminants have entered the public wastewater system it may be necessary to protect utility employees from exposure until the scope of the problem is defined and remediation has been completed. These actions may even need to take place prior to the completion of the characterization process. Some specific steps that might be taken to protect employees in the interim include:

- Prevent personnel from entering manholes
- Prevent personnel from entering wet wells of pump stations
- Suspend manual cleaning of bar screens and removal of grit
- Restrict access to trickling filters, aeration basins, and other treatment plant sites where aerosols might be generated
- Suspend manual handling of biosolids

## 2 Roles and Responsibilities During Remediation and Recovery

The remediation and recovery process should be implemented when a contamination incident has been confirmed. For a 'Confirmed' incident, an agency external to the utility may assume the responsibility for coordinating the response under the Incident Command System (ICS). Whether a local, state, or federal government exercises primary authority may depend on the nature and size of the incident and the resources needed for remediation and recovery. State and local governments have primary responsibility for consequence management, including remediation and recovery efforts. If the magnitude of the remediation and recovery efforts exceeds the capabilities and resources of state and local government, and if federal interests are involved, then the federal government may be required to provide assistance.

## 3 Steps in Remediation and Recovery Process

It should be noted that the remediation and recovery approach outlined in this module is modeled, in part, on the EPA Superfund remedial response program. There are nine steps in the remediation and recovery program. Each is described below.

### 3.1 Long-Term Alternate Sanitary Services

During the remedial process, long-term alternate sanitary services may need to be secured. The specific services required will depend on the extent of contamination but could include long-term alternate wastewater collection, treatment, and disposal. Long-term alternate services may be different from the short-term services described in Module 5. The need for long-term alternative services will depend on the nature and severity of the contamination event and the length of time required to return the system to normal operation. If utility and local authorities do not have the resources to provide long-term alternate sanitation, assistance may be required from mutual aid and assistance agreements with other wastewater utilities (such as WARNs), the state, or the federal government. Alternative services may include:

- Portable toilets
- Collection points for removal and disposal of 'gray water' (i.e., wash water that does not contain sanitary waste)
- Contracts with hauling companies to assist in transferring unaffected wastewater

### 3.2 System Characterization/Feasibility Study

After a contamination incident has been confirmed, additional information will be required to support remediation/recovery actions. This information and data can be obtained via a System Characterization/ Feasibility Study. The study will provide a detailed assessment of the nature and extent of contamination and preliminarily screen candidate treatment options. Several planning documents may be helpful for the system characterization.

### System Characterization/Feasibility Study Work Plan

The System Characterization/Feasibility Study Work Plan documents information collected and decisions made during the systematic planning process, and describes anticipated future tasks. It also serves as a tool for assigning responsibilities and setting the project's schedule and cost. Appendix 15 provides a suggested outline for the System Characterization/Feasibility Study Work Plan.

### Quality Assurance Project Plan

This is a critical planning document for data collection for system characterization because it documents all project activities including Quality Assurance (QA) and Quality Control (QC) procedures. See Appendix 16 for a listing of the elements of a Quality Assurance Project Plan.

### Health and Safety Plan (HASP)

The HASP includes information regarding personnel roles, lines of authority and communication, site security and control, and medical and emergency alert procedures. The HASP should be developed for the specifics of the incident so that staff is aware of the common routes of exposure at a site and is trained in the proper use of safety equipment and protective clothing and equipment. Safe areas should be designated for washing, drinking, and eating. A suggested format for a HASP is given in Appendix 17.

## 3.3 Risk Assessment

Upon confirmation of a contamination incident, the lead agency for consequence management will quickly assess the risk posed

to on-site workers and the public. This rapid risk assessment will help guide response actions.

During the remedial response phase, additional risk assessments may be required to:

- Evaluate risk reduction achieved by the operational response actions being conducted at that time
- Aid in establishing preliminary remediation goals
- Assess potential risk reduction from implementation of long-term remedial actions

## 3.4 Detailed Analysis of Alternatives for Remediation

This step involves the evaluation of various remediation approaches available on the basis of their effectiveness and technical feasibility. In situations in which human health and environmental risks are reduced to acceptable levels through natural attenuation or degradation of the contaminant, no remedial actions may be required.

If remedial actions are required, they may include any of the following steps, or combination of steps:

- Containment of contaminated wastewater
- Treatment of contaminated wastewater
- Disposal of contaminated wastewater
- Rehabilitation of contaminated wastewater system components
- Restoration of the biological treatment process

Restoration of biological treatment may require importing and introducing organisms from other processes within the plant (if unaffected) or from other nearby treatment plants. Full recovery of the biological community could take weeks or months.

Possible technologies for cleanup of contaminated wastewater include, but are not limited to, the following, which can be used alone or in combination:

- Chlorination
- Air stripping
- Granular activated carbon filtration
- Ultraviolet irradiation
- Ozonation

For the management of radioactive materials entering POTWs that may impact wastewater/stormwater management, guidance is provided by the Interagency Steering Committee on Radiation Standards in the document *ISCORS Assessment of Radioactivity in Sewage Sludge: Recommendations on Management of Radioactive Materials in Sewage Sludge and Ash at Publicly Owned Treatment Works* (February 2005 - ISCORS Technical Report 2004-04; EPA 832-R-03-002B; DOE/EH-668) that is available on the ISCORS website under LIBRARY at http://www.iscors.org/pdf/FinalRecommendations.pdf.

Additionally, various contaminated components of the wastewater system may need to be rehabilitated. These include the infrastructure, such as system mains and pumps, as well as the equipment used to treat the wastewater at the plant. Possible technologies and alternatives that can be considered for the rehabilitation of contaminated system components include:

- Disinfection
- System flushing
- Pigging and swabbing of system piping
- Air scouring
- Sand blasting
- Relining pipes
- Condemning portions of the collection and/or treatment system (e.g., in response to gross contamination such as from a radiological agent)
- Utilization of the current treatment plant with a new collection system
- Utilization of the current wastewater collection system with a new treatment plant

Remediation can be performed in stages with emergency short-term remediation being conducted to reduce dangerous levels of a contaminant to a safer level. This can then be followed by long-term, more comprehensive cleanup steps to remove any remaining low levels of the contaminant(s). When assessing remediation alternatives, the utility will need to take into consideration any applicable laws and regulations.

To learn more about available federal funding for remediation/recovery from disasters see http://water.epa.gov/infrastructure/watersecurity.

### 3.5 Remediation Technology Selection

To select the remediation technology, a comparative analysis may be performed to identify the advantages and disadvantages of each technology. The criteria for technology selection include, among others:

- Protection of human health
- Protection of the environment
- Compliance with applicable laws and regulations (e.g., the Clean Water Act)
- Feasibility of implementation
- Cost

### 3.6 Remedial Design

After a final remedy is selected, remedial design is the next step. This is an engineering phase involving preparation of a series of documents, specifications, and drawings that detail the specific steps to be taken during the remedial action. The lead agency will be responsible for remedial design, assisted by the wastewater utility (if not already the lead agency) and other technical support staff. Remediation should be designed to prevent impacts on the remaining unaffected portions of the wastewater system.

### 3.7 Remedial Action

This is the actual implementation of the chosen remediation approach and includes both treatment of contaminated wastewater and rehabilitation of system components.

### 3.8 Post-Remediation Monitoring

After site actions are complete, monitoring of the system must be conducted to ensure that the remediation was effective.

### 3.9 Communication to Restore Public Confidence

During remediation activities, and prior to return of the system to normal operations, the utility and other agencies should conduct outreach to the community to restore public confidence in the wastewater system.

The degree to which remediation and recovery follows the nine step model presented above will depend on the nature and extent of the contamination. A small-scale incident might not involve all of the steps. For example, extensive system characterization may not be required if the contamination is contained through early operational responses and is confined to a well-defined area. Each remediation and recovery effort will be unique and will be dictated by details of the intentional or accidental contamination event.

## 4 Summary

Following confirmation of either an accidental or intentional contamination event in a wastewater system, steps must be taken to remove the contamination and bring the system back into full service. Depending on the nature and extent of contamination, the wastewater may have to be decontaminated prior to disposal. The wastewater infrastructure (e.g., collection mains, pumps, and treatment plant) may also have to be decontaminated. Module 6 of the Toolbox outlines a systematic approach, based on EPA's Superfund experience, for remediation and recovery of affected wastewater systems.

Efforts are ongoing within the federal government and research community to develop specific technical solutions to wastewater system decontamination needs. When developed, this information may be distributed through vehicles such as WCIT.

## 5 Appendices

The following are examples of forms that may be used to facilitate the remediation and recovery process:

- Suggested Outline for System Characterization/Feasibility Study Work Plan
- Elements for a Quality Assurance Project Plan
- Elements of a Health and Safety Plan

These forms can be found in the Appendices located at the end of the Toolbox.