EPA

United States
Environmental Protection
Agency

Consequence Management Primer

For Water Quality Surveillance and Response Systems

Introduction

A Water Quality Surveillance and Response System (SRS) provides a systematic framework for enhancing distribution system monitoring activities to detect emerging water quality issues and respond before they become problems. An SRS consists of six components grouped into two operational phases, surveillance and response. The surveillance components are designed to provide timely detection of water quality incidents in drinking water distribution systems and include: Online Water Quality Monitoring, Enhanced Security Monitoring, Customer Complaint Surveillance and Public Health Surveillance. The response components include Consequence Management and Sampling & Analysis, which support timely response actions that minimize the consequences of a contamination incident. The *Water Quality Surveillance and Response System Primer* provides a brief overview of the entire system (USEPA, 2015a).

This document provides an overview of Consequence Management (CM), a response component of an SRS. It presents basic information about the goals and objectives of CM in the context of an SRS. This primer covers the following four topics:

- **Topic 1**: What is CM?
- **Topic 2**: What are the major design elements of CM?
- **Topic 3**: What are common design goals and performance objectives for CM?
- **Topic 4**: What are cost-effective approaches for CM?

Topic 1: What is CM?

In the context of an SRS, CM consists of actions taken to plan for, investigate, respond to, and recover from drinking water contamination incidents. These actions, outlined in **Figure 1**, are meant to minimize response and recovery timelines through a planned, coordinated effort. CM actions are initiated upon identification of a possible contamination incident to: (1) establish the credibility of the possible contamination incident, (2) minimize public health and economic consequences, and (3) guide the remediation and recovery effort.
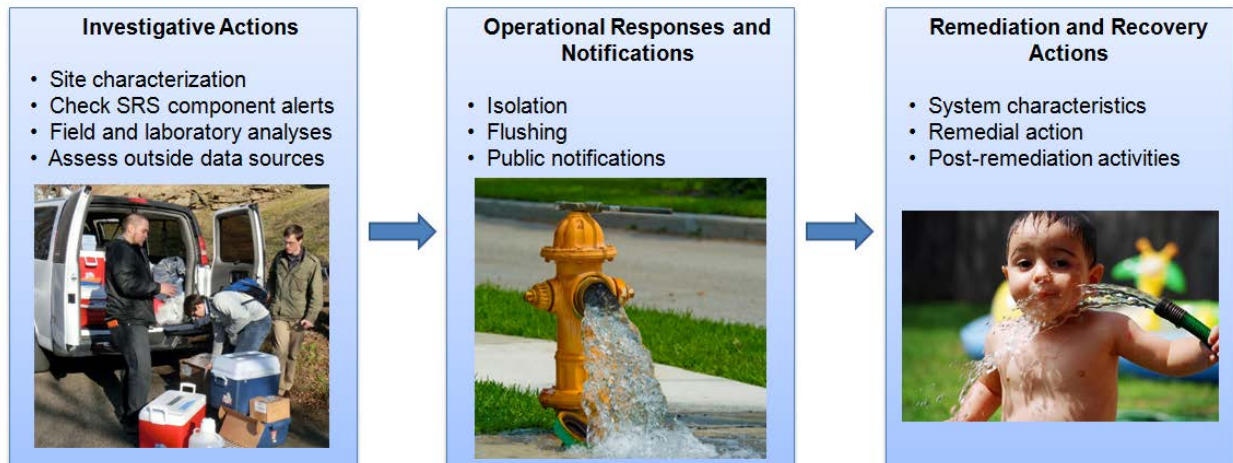

Figure 1. CM Actions Implemented in Response to a Contamination Incident

While surveillance components can provide timely detection of possible water contamination, CM describes the actions that can be implemented to minimize consequences. Additionally, CM seeks to integrate common elements of existing utility plans and those developed by response partners into a unified foundation for decision-making during water contamination incidents. Thus, the CM component is critical to an SRS because it serves as the framework for coordinating and planning with response partners, thereby optimizing the effectiveness of the overall response.

Topic 2: What are the major design elements of CM?

As illustrated in **Figure 2**, CM is organized into three design elements that build upon a utility's existing resources, such as emergency response plans, established relationships with local response partners and in-house communication equipment.

Incident Response Procedures	Response Partner Networks	Communication Equipment and Methods
Step-wise framework for investigation and response decision-making during an incident, and for communication during an incident	Network to better integrate roles and responsibilities during incident response	Methods for communication and coordination during incident response

Figure 2. CM Design Elements

Incident Response Procedures

CM incident response procedures include both a Consequence Management Plan (CMP) and a Risk Communication Plan (RCP) (USEPA, 2013). The CMP and RCP are focused on incident-specific procedures for response to and recovery from a drinking water contamination incident and should be incorporated into a utility's overall Emergency Response Plan (ERP). **Figure 3** outlines the general relationship among a utility's ERP, CMP and RCP.
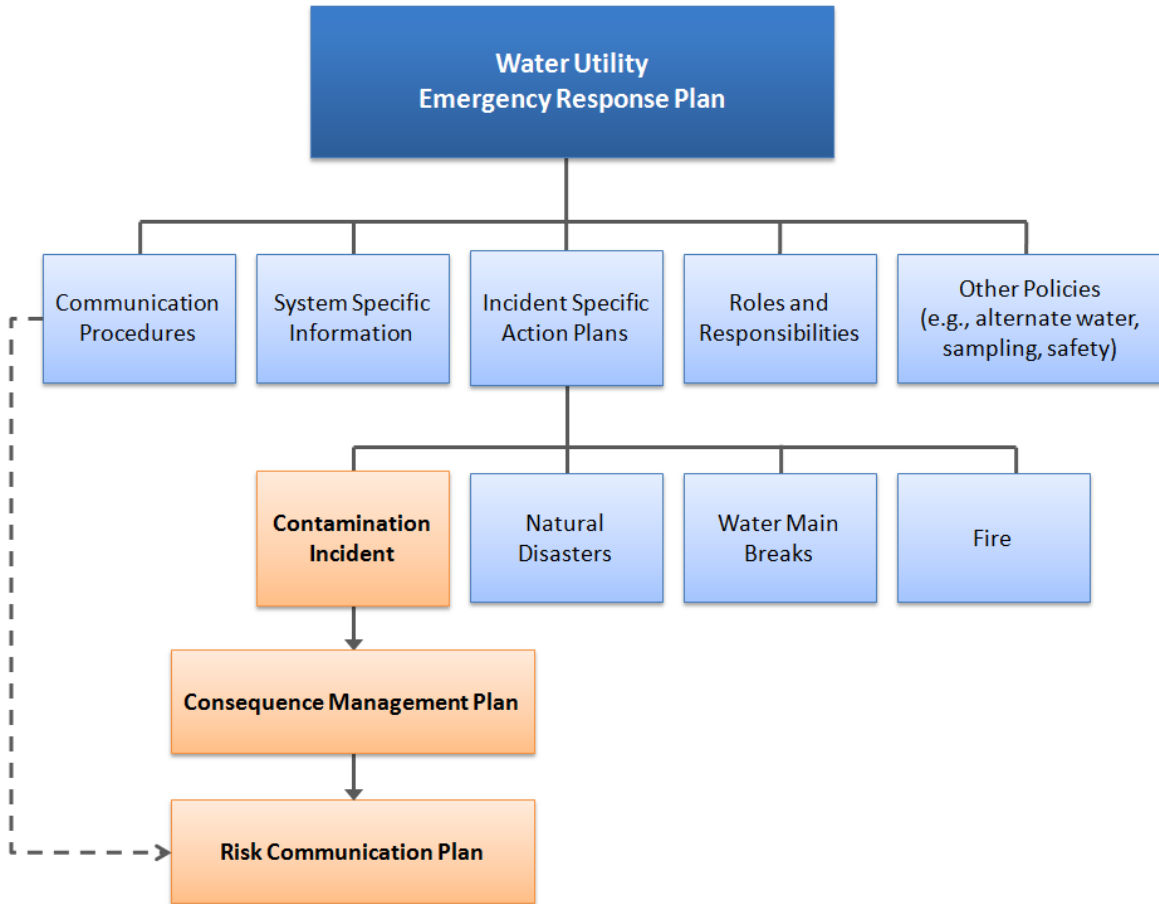
Figure 3. Relationship among a Water Utility's ERP, CMP and RCP

Consequence Management Plan: The CMP documents roles and responsibilities, notification protocols and response procedures. As **Figure 4** illustrates, a CMP guides a utility through actions that should be taken following detection of a possible water contamination incident. In general, the scope and significance of these actions increases as the credibility of the incident increases. Thus, a utility-specific CMP should include sections to address the following three phases of the credibility determination process:

- **Possible Contamination Phase** is the investigation of a possible contamination incident to determine whether additional information corroborates the information from the validated alert. Information considered during this phase includes the status of other SRS surveillance components and the results from site characterization, as described in the *Sampling and Analysis Primer* (USEPA, 2015b). If the results of the investigation corroborate the initial alert, contamination is considered credible. Operational response actions may be implemented in an effort to limit the spread of the contaminant. Additionally, preparations for public notification may begin during this phase. While proactive surveillance may discover many possible contamination incidents, only a small percentage of these are expected to progress to the credible contamination phase.

- **Credible Contamination Phase** is the continuation of an investigation to determine whether a water contamination incident has definitively occurred. The results from the laboratory analysis are critical to this phase of the investigation. Actions taken during this phase include expanded operational responses as well as additional sampling and analysis. Public notification is issued if not already done so during the possible phase. A credible incident is confirmed when there is definitive evidence, such as positive analytical results, or a preponderance of evidence demonstrating that the water has been contaminated.

- **Confirmed Contamination Phase** begins once there is definitive evidence that water contamination has occurred. During this phase, planning for remediation and recovery begins in earnest. Ongoing communication with the public is essential during this phase to ensure that the affected population is aware of any water use restrictions, and to keep the public apprised of progress during remediation.
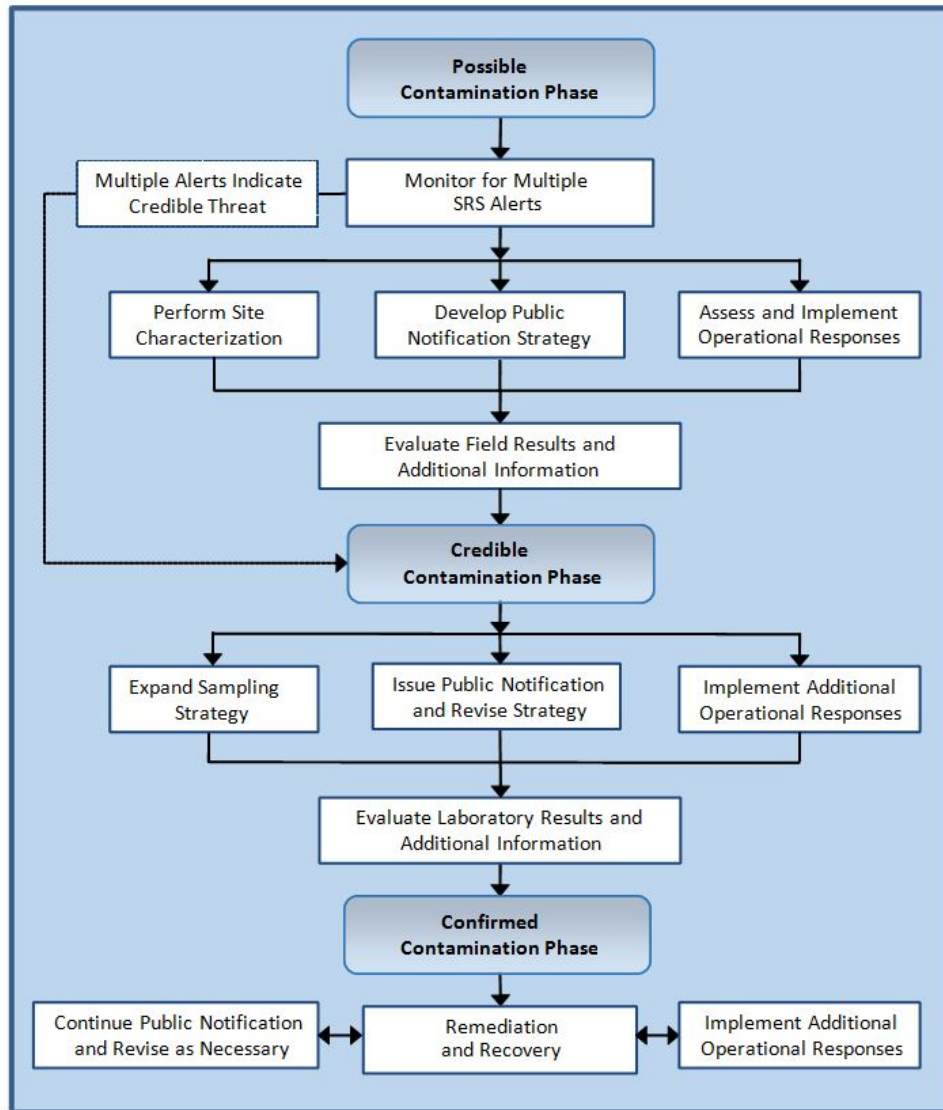

Figure 4. Overview of CMP Phases

Risk Communication Plan: An RCP outlines a process for getting the necessary information to the target audience in an appropriate manner. Communication during a contamination incident is critical and information must be presented in a timely, accurate and effective manner. The purpose of an RCP is to guide the utility and its partners regarding:

- When and how to make notifications, including public notifications
- How to identify target audiences and develop messages
- How to work with the media
- How to develop a delivery system for the message

DID YOU KNOW?

Several utilities who implemented an SRS developed RCPs that supplement their CMPs. An RCP generally describes the responsibilities of the utility's Public Information Officer during all phases of CM. An RCP also covers communication within the utility and with external agencies, as well as with the press and the public. An RCP may include an overview of basic crisis communication principles, CMP decision trees adapted for use by the Public Information Officer, a section with tools and resources that provide templates and sample notification documents and contact information.

Response Partner Networks

A robust response partner network provides a framework within which the utility and its response partners can effectively and efficiently coordinate their respective responsibilities during a water contamination incident. **Figure 5** illustrates the various local, state and federal agencies that may become involved as a water contamination incident escalates. This configuration reflects the manner in which a contamination incident is initially investigated by the utility and local responders before involving state, regional and federal partners as the incident escalates or when local capabilities are overwhelmed.
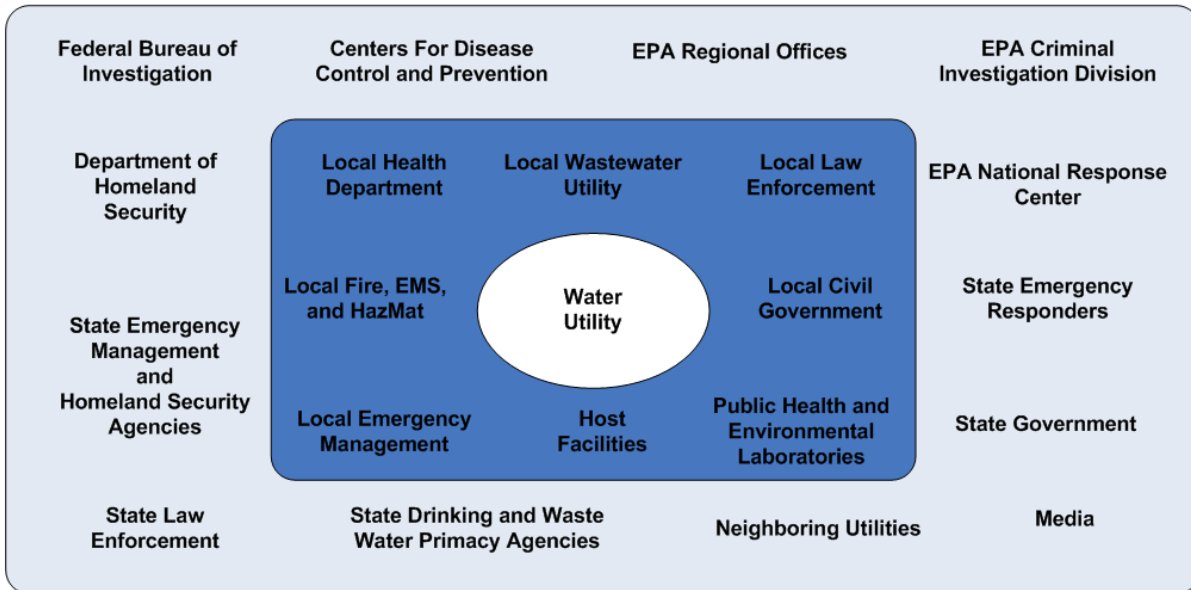

Figure 5. Example Response Partner Network

The roles and responsibilities section of a CMP describes the responsibilities of the utility as well as local, state and federal partners. **Table 1** provides a general overview of the roles and responsibilities that select response partners may play in implementing a CMP.

Table 1. Typical Responsibilities of Potential Response Partners in a CMP

Partner	Typical Responsibilities
Drinking water utility incident command	Coordinates and implements overall CM activities including credibility determination, response actions, and remediation and recovery. Provides appropriate notifications to response partners.
Local health department	Supports development of public notifications and serves as a conduit to state and federal health departments and agencies. Provides information related to health risks associated with suspected contaminants.
Local fire departments and hazardous materials team (HazMat)	Coordinates with local fire units, helps protect the public and may assist in distribution of alternate drinking water supply. HazMat may support sampling activities.
Local law enforcement	Supports investigation activities by controlling access to a suspected contamination site. May serve as a conduit to state and federal law enforcement and intelligence agencies. May assist in distribution of alternate drinking water supply.
Environmental and public health laboratories	Provides analytical support for water samples during response and remediation efforts. State public health laboratories provide access to the Centers for Disease Control and Prevention's Laboratory Response Network.
State drinking water and wastewater primacy agencies	Provides consultation during response and remediation, and advises the utility regarding regulatory requirements for treating contaminated water, public notification, environmental concerns about discharged water and the quality of alternate drinking water supplies.
Local government	Communicates with constituencies regarding protective actions, details of the investigation and updates on recovery efforts.

Communication Equipment and Methods

A variety of equipment and methods can be used to communicate information about a water contamination incident with both internal and external response partners. Internal communication occurs among utility employees as well as those persons involved in the investigation of and response to an incident. External communication involves coordination with outside agencies, as well as populations potentially impacted by an incident.

Communication equipment and methods can include the following, many of which your utility may already use:

- Social media
- Landline telephones
- Cell phones
- Email
- Audiovisual systems (including intercoms and closed-circuit television monitors)
- Written bulletins or newsletters
- Auto-dialer or reverse 911 voice recording systems
- Hand-held radios

(Photo Credit: Lt. Col. Todd Harrell, 1.12.2014)

Each of these communication channels has inherent positive and negative characteristics, and good communication planning should incorporate a combination of methods so that various groups of personnel can exchange required information in a timely manner. When identifying the appropriate means of communication, the following questions may be considered:

- Does the communication method reach all targeted CM participants?
- Is the method reliable?
- Is the method fast enough to support timely decisions and actions?
- Is the method likely to be compromised by the circumstances resulting from a water contamination incident?
- Is there a back-up or redundant system?
- Will the method preserve information security?

Regardless of the equipment and methods used to disseminate the message, your utility should ensure that the public and response partners are both receiving and understanding the message. A few quick follow-up calls to customers and response partners could achieve this as well as monitoring chatter on social media sites.

Topic 3: What are common design goals and performance objectives for CM?

The design goals and performance objectives established for CM by the utility provide the basis for the design of an effective component.

CM Design Goals

Design goals are the specific benefits that utilities expect to achieve by implementing CM. The fundamental design goal of CM is the ability to investigate, respond to and recover from water contamination in a timely, efficient and coordinated manner. This goal is realized through the planning and procedures developed as part of the utility CMP. In addition to this fundamental CM design goal, other design goals can be established, examples of which are listed in **Table 2**.

Table 2. Examples of Common CM Design Goals

Design Goal	Description
Strengthened incident command structure	Develop a utility incident command structure to respond to all hazards, while also outlining a unified command structure that integrates response partner roles and responsibilities.
Improved information sharing and communications	Establish procedures and protocols in an RCP that allow a utility to effectively communicate not only with its own personnel, but also with external stakeholders such as customers and the media. Also, evaluate and identify any communication shortfalls in advance and work to fill gaps before an incident occurs. These communication protocols can be leveraged during response to any type of emergency.
Strengthened interagency relationships	Work collaboratively with public health and emergency response partners in developing response procedures. This process allows a utility to establish and develop relationships with local, state and federal partners in a manner that improves support during any type of emergency.

CM Performance Objectives

Performance objectives are measurable indicators of how well the SRS meets the design goals established by the utility. Throughout design, implementation and operation of the SRS or its components, the utility can use performance objectives to evaluate the added value of each capability, procedure or partnership. While specific performance objectives should be developed by each utility in the context of its unique design goals, general performance objectives for an SRS are defined in the *Water Quality Surveillance and Response System Primer* (USEPA, 2015a) and are further described in the context of CM as follows.

- **Timeliness of Response**: For CM, timeliness of response refers to the time it takes a utility to verify, characterize and respond to a water contamination incident as detected by one or more of the SRS surveillance components. Factors that impact this performance objective include the time it takes to:
  - o Notify response partners
  - o Deploy field personnel and equipment
  - o Collect and screen drinking water samples
  - o Identify and implement operational responses
  - o Implement public notification
  - o Restore the system to normal operations

(Photo Credit: Staff Sgt. De-Juan Haley, 1.11.2014)

- **Sustainability**: Sustainability is usually defined in terms of costs and benefits. CM is not an equipment intensive component, and thus the cost to implement and maintain this component is measured in labor hours. Developing the CMP and conducting the exercises entail the most significant implementation costs, and both require the efforts of utility personnel and response partners. The cost of maintaining CM may include labor hours associated with coordination of exercises and training events to maintain readiness for response to possible water contamination incidents.

Topic 4: What are cost-effective approaches for CM?

Utilities can take the following simple steps to develop the foundation for CM:

- Develop an initial CMP to guide basic actions, such as the formation of the utility incident command structure and implementation of operational responses.
- Establish a response partner network that includes potential stakeholders and their resources. For example, USEPA developed a checklist to help identify some items that should be coordinated with a local emergency management agency before an incident occurs (USEPA, 2012).
- Outline emergency communication and notification procedures such as primary and alternate communication methods with both internal and external partners. Also, develop drinking water advisory and public notification templates.

Next Steps

Visit the Water Quality Surveillance and Response Website at http://water.epa.gov/infrastructure/watersecurity/lawsregs/initiative.cfm for more information about SRS practices. The Website contains guidance and tools that will help a utility to enhance surveillance and response capabilities, as well as case studies that share utility experiences with SRS implementation and operation.

References

USEPA. (2012). Coordination of the Water and Emergency Services Sectors: An Important Step to Better Response, 817-K-12-001.

USEPA. (2013). Developing Risk Communication Plans for Drinking Water Contamination Incidents, 817-F-13-003.

USEPA. (2015a). *Water Quality Surveillance and Response System Primer*, 817-B-15-002.

USEPA. (2015b). *Sampling and Analysis Primer*, 817-B-15-002F.