Decontamination and Recovery Planning

WATER AND WASTEWATER UTILITY CASE STUDY

United States Environmental Protection Agency

BACKGROUND

Decontamination is a critical component of the recovery phase of a water system contamination incident. Pre-planning and coordination for decontamination and recovery of a water system can minimize the impacts of a water contamination incident to public health and the environment. Most utilities are familiar with decontamination methods such as flushing and chlorination associated with returning a broken distribution line to service or a water system contaminated with a conventional, regulated contaminant. However, to decontaminate and return a water system to service following a non-conventional chemical, biological, or radiological contamination incident requires effective pre-planning, communication, and coordination.

Purpose of the Study:

The primary purpose of this case study was to document the planning and experiences of a large water and wastewater utility's activities related to decontamination and recovery.

Document Audience:

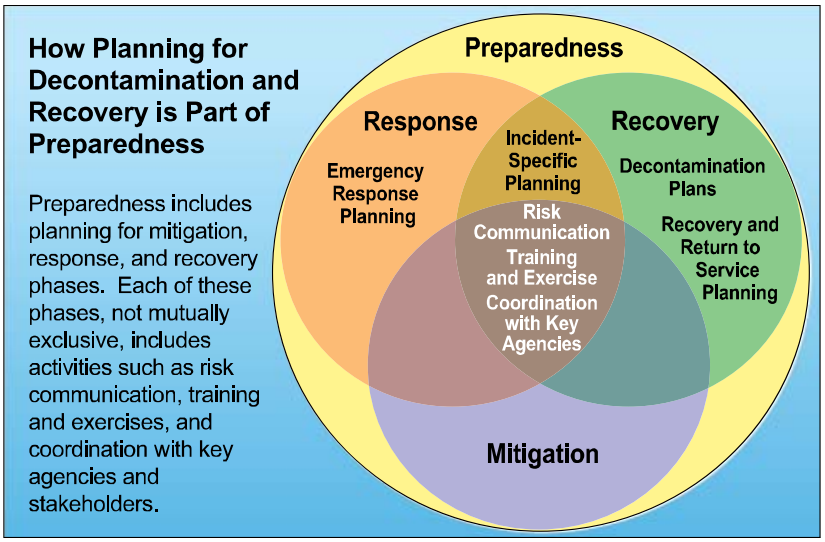
This case study's audience includes members of the water sector, particularly water and wastewater utilities and associated stakeholders.

What's Inside?

For EPA water security information, visit www.epa.gov/watersecurity.

The Case Study Utility

The utility described in this case study is a large combined water and wastewater utility, located in the southeastern coastal United States. The utility was selected for the case study based on its demonstrated commitment to security and emergency preparedness, its ongoing coordination with local emergency response agencies, and its willingness to participate in this study and share its experiences. The utility's emergency management plans are largely driven by the threat of hurricanes with multiple contamination and threat scenarios that could impact critical customers and assets being served. The utility has adopted an all-hazards approach to manage and mitigate diverse risks and its emergency preparedness includes planning for response, recovery, and mitigation phases of an incident. For security reasons the name of the utility is not identified.



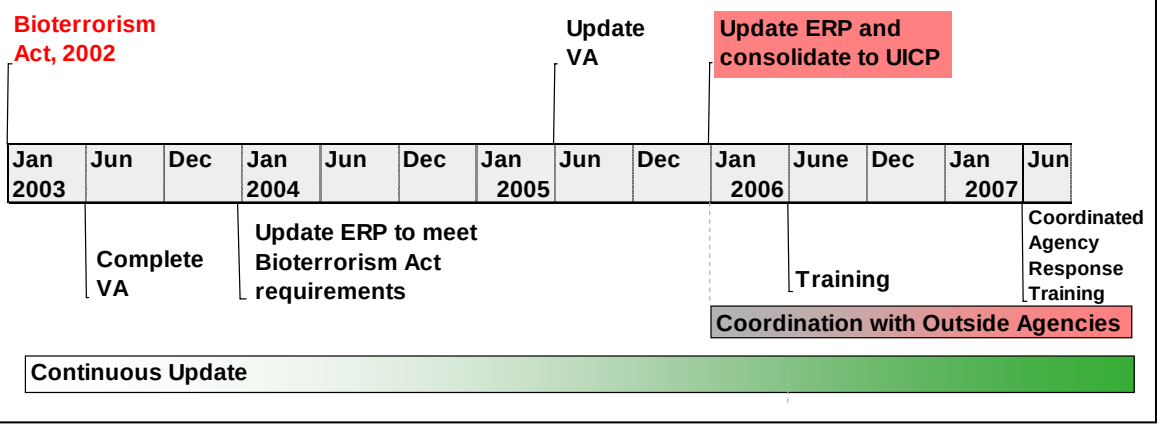
Utility Emergency Preparedness Timeline

The utility completed its vulnerability assessment (VA) in 2003, in response to the 2002 Bioterrorism Act. In 2005, after updating its VA, the utility consolidated all plans and associated documents in a single functional emergency response plan called the Utility Integrated Contingency Plan (UICP). The UICP also included all documents necessary for compliance with various regulations and utility needs. The UICP is a comprehensive guide on the utility's approach for planning, mitigation, response, and recovery from different types of incidents that threaten its water and wastewater infrastructure. The utility's pre-planning and preparedness for

Disclaimer

The information presented in this case study is not intended to revise or update EPA policy or guidance on decontamination or recovery. VAs and response plans are prepared by water utilities to address the specific threats and vulnerabilities relevant to the utility, and may or may not be consistent with those of the case study utility. Mention of trade names or products does not constitute endorsement for use.

FIGURE 1: UTILITY EMERGENCY PREPAREDNESS TIMELINE



decontamination and recovery is an active and ongoing process. Figure 1 provides an overview of the utility's emergency preparedness timeline.

Utility Integrated Contingency Plan

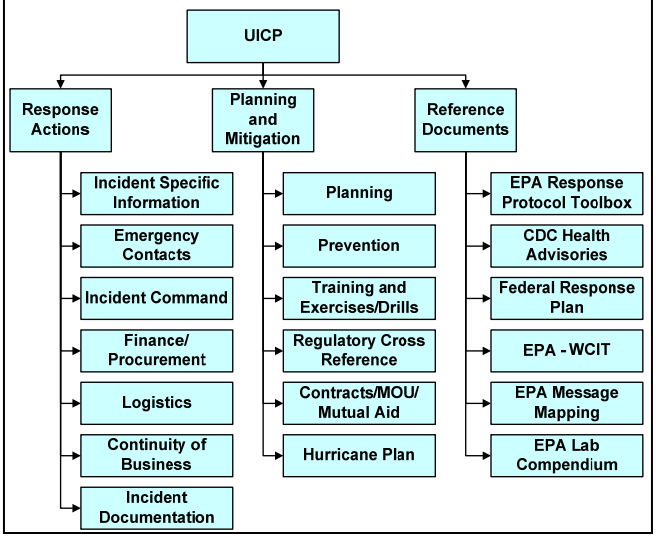
Figure 2 provides an overview of the UICP. The UICP includes the following information:

- Written procedures encompassing the activities necessary to prepare the utility staff to respond to intentional, natural, accidental, indirect and/or technological emergencies and disasters as outlined in Figure 3.
- Information on the implementation for those incidents that pose an unreasonable risk to human health and safety and/or the environment, and/or have the potential to cause a catastrophic impact on the operations of the utility.
- A format adapted from the National Response Team (NRT)[1] Integrated Contingency Plan Guidance and is intended to meet the National Fire Protection Association (NFPA) 1600 Standard[2] for Disaster / Emergency Management and Business Continuity.

The NFPA 1600 "Standard on Disaster Emergency Management and Business Continuity Programs" is designed to be a description of the basic criteria for a comprehensive program that addresses disaster recovery, emergency management, and business continuity.

- Information on applicable Federal, State, and local regulatory requirements for emergency management planning and reporting and National Incident Management System (NIMS)[3] compliance.
- Multiple integrated elements that are critical during the decontamination and recovery phase of a response to a contamination incident, which are contained within its three volumes; Planning and Mitigation; Response Actions; and Reference Material.
- The utility's Response Actions volume is organized to include the NRT Integrated Contingency Plan's three main sections; Introductory Sections, Core Plan, and Supporting Annexes.
- The structure of the utility Response Actions and annexes is based on the structure of NIMS Incident Command System (ICS).
- Site and system schematics; multiple location-specific response plans and different hazard category-specific flow charts and numerous checklists (see Figure 3 for example hazard categories); and prewritten press releases to be used during contamination incidents.

FIGURE 2: UTILITY INTEGRATED CONTINGENCY PLAN CORE ELEMENTS FOR RECOVERY



[1] http:// www.nrt.org
[2] http://www.nfpa.org/assets/files/PDF/NFPA1600.pdf
[3] http://www.fema.gov/emergency/nims/index.shtm

FIGURE 3: EXAMPLE HAZARD CATEGORIES IN UICP

Natural Disasters

- **Hurricanes**
- **Tornados**
- **Flooding**
- **Earthquakes**
- **Thunderstorms**
- **Winter Weather**
- **Flu Pandemic**

Threat of Physical Attack

- **Civil Disturbance**
- **Fire/Explosion**
- **Vandalism**
- **Cyber Intrusion**
- **Main Breaks – Sewer and Water**
- **Weapons of Mass Destruction or Bomb Threat**
- **Hazardous Material Spill**

UICP Field Manuals

The utility has one field manual, the "Quick Guide," which is based on its UICP for use by its employees. It is distributed to employees and facilities and placed in all vehicles. The Quick Guide contains information on immediate response actions for employees during the discovery of a threat/hazard and until a management incident commander takes over. The Guide also includes emergency contact information, the Incident Command/Response Management System overview, threat levels, and incident-specific operations.

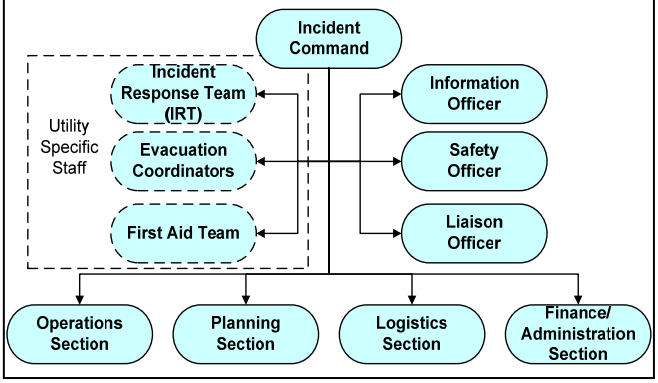
Utility Pre-Planning and Coordination for Decontamination and Recovery

Decontamination and recovery planning and related activities will be incident- and contamination-specific and will begin during the "confirmed" phase (once information collected provides definitive evidence that there is a contamination) of a response to a contamination incident. However, the utility has included plans and information to facilitate and guide decontamination and recovery operations in the event of a contamination incident. This section describes the utility's pre-planning and coordination efforts for decontamination and recovery.

Roles and Responsibilities

The utility roles and responsibilities for incident response and recovery activities are based on the NIMS ICS, which organizes both near-term and long-term field-level operations for small to complex incidents. The utility ICS is structured to facilitate activities in the five major functional areas: command, operations, planning, logistics, and finance and administration. Figure 4 provides a generic overview of the ICS structure.

FIGURE 4: UTILITY INCIDENT COMMAND SYSTEM



The UICP also recognizes the establishment of a Unified Command. A Unified Command is an application of ICS when there is more than one agency with incident jurisdiction or when incidents cross political jurisdictions. Agencies work together through the designated members of the Unified Command to establish their designated Incident Commanders at a single Incident Command Post (ICP) and to establish a common set of objectives and strategies. A Unified Command is used when the complexity of an incident and incident management has grown beyond the utility's capability, is geographically dispersed or other jurisdictions have some authority to the incident (e.g. law enforcement if it is a crime). In addition to the roles and responsibilities of the regular ICS title positions, the UICP also includes the roles and responsibilities of other utility title positions reporting to the Incident Commander (IC); Incident Response Team (IRT), Evacuation Coordinators, and the First Aid Team. Figure 4 shows how each of these positions fit into the utility command structure and the roles of each position are detailed below:

- Incident Response Team (IRT) – managers and senior staff that respond to various emergency or potentially dangerous situations such as chemical leaks and spills; fires; and terrorist activities
  - o Initiates facility and community alarms
  - o Mobilizes emergency response equipment and prepares the site for off-site responders
  - o Mobilizes containment materials
- Evacuation Coordinators – responsible for ensuring all personnel are accounted for
  - o Assist in evacuations and sheltering
  - o Report results on head counts to the IC
  - o Serve as primary point of contact between the IC and personnel at the assembly area

- First Aid Team – meet at the primary assembly area and then report to the IC
  - Respond to all first aid requests and administer care as appropriate
  - Notify municipal first aid, ambulance or hospital as required and coordinate their arrival

Categories of Incident Commanders

The IC will have the authority to coordinate decontamination and recovery planning and all related activities including termination and follow-up activities, unless delegated to a Recovery manager.

Depending on the location and nature of the incident, the utility has designated different senior personnel familiar with the system that may be affected by the contamination incident (i.e. source, treatment, storage, distribution, and wastewater) as the IC and establishes the chain of command under these senior personnel instead of naming a primary IC for the whole utility. Table 1 provides example categories of utility ICs, based on the location of the incident. The supervisor on-site at the incident location serves as the acting IC, until relieved by the pre-designated IC.

Table 1 – Examples of Designated Incident Commanders (ICs) Based on Location of Incident

INCIDENT SITE	INCIDENT COMMANDER (IC)		
	PRIMARY	SECONDARY	TERTIARY
Watershed (WS)	WS Manager	Water Quality (WQ) Manager	WT Manager
Water Treatment (WT)	WT Manager	Asst. WT Manager	WD Manager
Water Distribution (WD)	WD Manager	WT Manager	WQ Manager
Wastewater Collection (WWC)	WC Manager	WWT Manager	WD Manager
Wastewater Treatment (WWT)	WWT Manager	Asst. WWT Manager	WQ Manager
Other	Safety Director	Asst. Safety Director	Deputy General Manager

Coordination with Outside Agencies

The utility recovery planning process is integrated with other local emergency response agencies and jurisdictions. The UICP includes plans for utility coordination with outside agencies during a contamination incident through the utility Liaison Officer. Figure 5 provides examples of key coordinating agencies.

FIGURE 5: KEY COORDINATING AGENCIES

- **Law Enforcement**
- **Fire Departments**
- **HazMat**
- **Local Health Departments**
- **County Emergency Management Agency (EMA)**
- **State Primacy Agency**
- **FBI**
- **EPA**

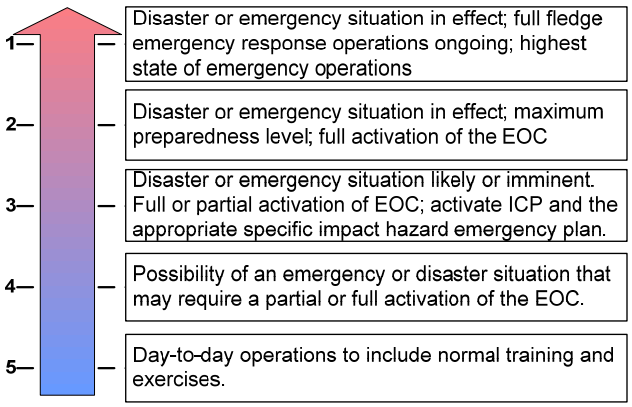
Contamination incidents involving non-conventional biological, chemical, radiological and/or nuclear terrorism related contamination incidents will be coordinated at the local, State, and/or Federal level. Incidents that are not site specific, are geographically dispersed, or evolve over longer periods of time will require additional coordination between Federal, State, local, tribal, private-sector, and nongovernmental organizations.

Incident Operations to Mitigate the Impact on Decontamination and Recovery

Response to Threat Levels

The utility uses Operating Condition (OPCON) levels to convey the magnitude of a potential incident or threat level (Figure 6). As the OPCON level increases, the utility's level of preparedness increases on a scale of 5 to 1. This includes the level of activation of emergency operations and resources. Level 5 is the least complex and includes normal readiness and operations and training and exercises for emergency response. Level 1 is the most complex with the highest level of preparedness–requiring full activation of emergency operations and resources. Response actions to decontaminate and recover the water system following a contamination incident are activated at level 1. OPCON levels 3 to 2 include response actions such as shutting down/isolation of sections of the water system and system pressure monitoring, to minimize the impact on the water system decontamination and recovery following an emergency situation.

FIGURE 6: UTILITY OPERATING CONDITION LEVELS



Each OPCON level is declared when a pre-determined set of criteria has been met and is coordinated with the County Emergency Management Agency and other governmental agencies. Specific security and response actions to be taken and notification procedures to be followed for each OPCON level are identified within the UICP.

Incident Specific Planning

In pre-planning for decontamination and recovery, the utility has considered actual or potential incidents or threats of contamination by identified or unknown agents such as a witnessed introduction of an agent into the water or a verbal threat. Flow charts and supporting tables are provided to assist the responders to make the necessary notifications, assess the situation, and initiate appropriate response actions. The flow charts and supporting action plans and tables are designed as "rip and run" sheets for field use by responders and Incident Command staff at any location of the water system including:

- Source water contamination
- Water treatment plant contamination
- Finished water storage tank contamination
- Water distribution system contamination
- Water and sewer main breaks
- Natural hazards

The specific response actions to be taken during a contamination incident are identified under the following core plan elements:

- Discovery
- Initial Response
- Sustained Actions
- Remediation and Recovery
- Termination and Follow-up

The response actions to be taken for decontamination and recovery can begin at any time following a "confirmed" contamination incident during the sustained actions. See Attachment 1 for an example rip and run sheet highlighting decontamination and recovery components during a distribution system contamination incident.

Hurricane Planning

To maintain the integrity of the water system and to minimize the impact on recovery following a hurricane event, the utility activates its Hurricane Plan in the UICP. Approximately 40% of the UICP is dedicated to hurricane preparedness with the remaining 60% focusing on other potential hazards. The specific steps to be taken will be those appropriate for the OPCON level and will be based on the approaching hurricane's category and the likelihood of a disaster situation. The utility's main objectives for hurricane preparedness are:

- To shut down and isolate the water and wastewater facilities in a timely manner that protects personnel and equipment
- To make the most efficient use of limited resources
- To leave the facilities in the most protected situation possible, allowing for quick reactivation
- To coordinate actions with other State and local agencies while supporting their activities

Examples of hurricane plan activities to mitigate the impact of recovery include:

- Implementing hurricane preparedness procedures as scheduled, including mitigation steps (discussed later) to minimize the impact on decontamination and recovery
- Dispatching emergency teams to designated locations
- Communications and notifications to customers
- Closing down components of the water system as the storm approaches to minimize the impact
- Operation of the water system to keep lines pressurized and water tanks filled
- Protecting the wastewater system wherever possible, according to utility guidance
- Providing emergency services, including alternate water supply
- Re-activating and restoring the system, including decontaminating and repairing damages from water treatment plant outward
- Restoring service to customers according to the Service Restoration Priorities in the UICP

Training and Exercises

The utility routinely conducts tabletop exercises on the UICP and provides the opportunity for staff to participate in NIMS/ICS training. Training and exercises increase preparedness by educating utility staff on emergency situations. The utility has identified appropriate training needs for its staff. Table 2 provides examples of training needs. In addition, the utility uses the Emergency Response Tabletop Exercises for Drinking Water and Wastewater Utilities publication by EPA[4] to conduct exercises.

The utility recently participated in a large scale tabletop exercise with regional responders including public health agencies, law enforcement, HazMat, government agencies, and Utility personnel. The exercise provided training on activation of the UICP and emergency operations center (EOC) for a contamination incident.

Table 2 - Examples of Identified Training Needs for Selected Utility Staff

STAFF POSITION	TRAINING NEEDS
Water System Managers	• Emergency Response Planning (e.g. UICP, FEMA/NIMS ICS courses; participation in The NIMS Compliance Assistance Support Tool (NIMSCAST); table top exercises) • Emergency Response/Risk Communication • Issuing Health Advisories • Participation in post event recovery operations
Water System Operators	• Emergency Response Planning (e.g. UICP, FEMA/NIMS ICS courses, table top exercises) • Emergency Response Communication • Suspicious activity training • Participation in post event recovery operations
Field Support	• Emergency Response Communication • Suspicious activity training
Administrative/ Communication Support	• Emergency Response Planning (e.g. UICP, FEMA/NIMS ICS courses; participation in NIMSCAST, table top exercises) • Emergency Response/Risk Communication

Risk and Crisis Communication

The UICP includes a communication protocol with a flow chart to be followed during the response to a contamination incident (see Attachment 2 for an example flow chart). The utility employs the Message Mapping tool to effectively and efficiently communicate the risks and status of utility actions during a water system incident[5]. Figure 7 provides examples of the utility's planned crisis and risk communication methodologies for use during response and recovery activities. Ongoing communications with the public and media will occur during decontamination and recovery actions for reporting on:

- Implementation of usage restrictions
- Decontamination and recovery goals and objectives
- Results of sampling and analysis
- Nature of the contamination, risks, and risk reduction measures during ongoing decontamination and recovery activities
- Mitigation of incident impacts
- System return to service
- Suspension of restrictions
- Post incident analysis and reporting

FIGURE 7: PLANNED CRISIS AND RISK COMMUNICATION METHODOLOGIES FOR USE DURING INITIAL RESPONSE AND DECONTAMINATION AND RECOVERY BY THE UTILITY

- **Utility hotline with recorded message**
- **Utility call center**
- **Utility web-site**
- **Door-to-door notification**
- **Reverse communication phone systems**
- **Pre-scripted messages using EPA Message Mapping**
- **Press releases/conferences**
- **Public service announcements**

***Message Mapping** is a science-based risk communication tool that enables utility responders to quickly and concisely deliver the most pertinent information about an emergency. Message maps can be developed for area decontamination, damage to water distribution infrastructure, massive power failure response and recovery scenarios.*

Alternative Water Supply

The utility has resources for emergency supply of alternate water in response to partial or total loss of its primary surface water supply or loss of treatment, storage, and distribution system during decontamination and recovery operations. These resources include:

- Utility emergency supplies for partial or total loss of surface water supply – the utility has ground

[4] http://cfpub.epa.gov/safewater/watersecurity/trainingcd.cfm
[5] http://www.epa.gov/nhsrc/news/news040207.html

water sources that can be activated in an emergency to partially replace the primary surface water supply. This includes both ground water wells and aquifer storage and recovery wells.

- Mutual aid agreement with the county for the utility to supply alternate water supplies and sanitation (portable toilets) to county residents – this service will be provided through a combination of the state national guard (tanker trucks) and via a contract with a supplier (bottled water and portable toilets).
- Identified bottled water and tanker sites – the utility has predetermined and arranged for bottled water, tanker locations and sites for portable toilets. The contract includes hauling and disposal of liquid wastes.

Utility Response Actions and Information for Decontamination and Recovery

Once an incident has occurred, the utility has in place specific mitigation, decontamination and recovery steps. These steps depend on the type of incident. Overall, the goal is to mitigate the impact on the water system and return the system to service as quickly as possible.

Mitigation

Mitigation efforts to minimize the impact on decontamination begin once a response to an incident begins. This section highlights the main response actions used by the utility for minimizing the impact of decontamination and recovery.

Monitoring and Isolation

To quickly identify potential problems and isolate the system to mitigate the impact on decontamination and recovery, the utility performs ongoing monitoring.

- *Pressure Monitoring and Isolation*

The utility closely monitors the water pressure in the distribution lines to detect anomalies in the normal water pressure–especially during the approach of a hurricane. A drop in water pressure indicates a main break and the utility quickly takes measures to isolate the affected distribution lines to prevent backflows and mitigate water loss and potential further damage/contamination to the system.

- *Water Quality Monitoring*

The utility monitors basic water quality parameters such as pH, conductivity, total chlorine residual, total coliform, bacteriological count, TOC, alkalinity, hardness, ammonia, nitrate/nitrite, odor, color and turbidity to quickly identify contamination. Key sampling locations and sampling protocols are identified in the Water Contamination Sampling Standard Operating Procedures (SOP) within the UICP.

- *Customer Complaint Surveillance*

Customer complaints are tracked and mapped using a Geographical Information System (GIS) during incidents to assist in identifying potential contamination source(s) and in isolating portions of the distribution system. Customer information software was developed by the utility to track and respond to customer complaints based upon the AWWA Water Quality Complaint Investigator's Field Guide[6].

When a contamination incident is perceived as "possible" or "credible" through the above monitoring practices and also through observed security breaches, witness accounts, notifications, or public health notifications, the utility will implement its standard operating procedure (SOP) to isolate the affected area and implement the relevant response activities.

- *Water Hydraulic Model*

A Water Hydraulic Model of the utility distribution system is used to understand flow characteristics and to determine isolation or unidirectional flushing alternatives during response and recovery activities.

Switch from Chloramines to Chlorine

In an actual pre-hurricane incident the utility will consider a temporary switch from chloramines to free chlorine to provide:

- better disinfection/deactivation to minimize contamination impacts and
- enhanced monitoring of the distribution system during the incident and the recovery phase since changes in free chlorine levels are more effectively detected through online monitors

Global Positioning System (GPS) Tracking of Underground Utility Lines and Other Components

In order to prepare for accurate and timely location of water distribution system assets after a major incident, such as a hurricane, the utility has recorded latitude/ longitude positions for critical resources. The ability to find valves, hydrants, and other water distribution and sewer system equipment and pipelines is valuable in the recovery process when normal location descriptions may no longer be valid or available.

Decontamination Information

Some chemical and biological agents contaminating a water system can be removed through the utility

[6] http://www.awwa.org/bookstore/product.cfm?id=20574

treatment processes such as oxidation and UV treatment, or by flushing the system. SOPs for oxidation, chlorination, and "unidirectional" flushing have been adopted by the utility for ongoing water quality improvement activities. These SOPs have been used with success on multiple occasions to decontaminate and disinfect water distribution lines during line breaks and conventional contamination incidents.

Elevated or residual chlorine levels can also be effective for deactivation of some non-conventional biological and chemical agents in water systems. The utility has identified the characteristics and behavior of chemical and biological agents in drinking water with elevated and residual chlorine and chloramine levels (Table 3). This information advises the utility on the effectiveness of conventional treatment methods to decontaminate specific non-conventional contaminants.

Table 3 - Examples of Decontamination Information for Selected Agent Classes in the UICP

CLASS	Characteristics	Applicable Standards	Symptoms	Response to Chlorine	Response to Chloramine
Biological	x	-	x	x	x
Biotoxin	x	-	x	x	x
Chemical	x	x	x	x	x
Nerve Agent	x	x	x	x	x
Blister Agent	x	x	x	x	x

Recovery and Return to Service

The utility has identified specific steps for recovery and return to service within the different incident-specific response and recovery plans. However, the utility believes that decontamination of some or all of the water infrastructure materials may be difficult or impossible in some specific contamination scenarios.

The UICP includes discussions of decontamination and recovery actions and staff roles and responsibilities to be taken when recovering and returning a contaminated system to service. These actions are incident-specific and included in the various rip and run sheets. Table 4 provides examples of the utility recovery and return to service activities highlighted in the incident-specific response and recovery plans.

The UICP also includes considerations for the removal and replacement of contaminated infrastructure components such as distribution lines, if needed, to lessen the psychological impacts on customers and future use of the water system.

Table 4 - Examples of Recovery and Return to Service Activities

DECONTAMINATION AND RECOVERY ACTIONS	DESCRIPTION
System Characterization	Scientific and engineering methods to observe and record the physical, chemical and biological quality of the water and affected system components.
Provide Long-Term Alternate Water Supply	Planned distribution of bulk and bottled water to homes and businesses during decontamination and recovery.
Inspect, Flush, Decontaminate	Process to determine and implement the measures needed to decontaminate a water system and resume service.
Disposal of Contaminated Water	The process to treat in-situ or collect, remove, and/or dispose of contaminated water in accordance with regulatory and safety requirements.
Sampling and Analysis	Prescribed procedures to assess potential contamination and interpret data collected on water quality.
Verification of Clean-up Goals	Independent analysis of results to determine the validity of water quality data.
Coordination with Health Departments	Preparedness activities on a formal and informal basis to ensure the timely response by local and state regulators to a water emergency.
Notification and Risk Communication	Concise presentation conveying information to the public and media on a public health crisis.
Return to Service	Resumption of normal operating parameters following a contamination event and the decontamination process.
Post Incident Analysis	Continuous analysis of water quality parameters to ensure the mitigation of contamination. Review of lessons learned and analysis of feedback received from participants and stakeholders.

Management of Contaminated Water

In the event the water system becomes contaminated with a biological, chemical, or radiological agent, the utility has identified steps to prevent the spread of contamination, to contain the contaminated water, and to manage the contaminated water, including:

- Isolating the contaminated areas – requires a good understanding of the distribution system configuration and hydraulics and having a plan to ensure valves work when needed.

- Depending on the contaminant and contamination location in the water distribution system, discharging the contaminated water to the utility wastewater system for storage or treatment may be feasible
- Identifying holding tanks (water) and collection systems (wastewater) for containment
- Pre-negotiated agreements with contractors to provide portable tanks or pumper-trucks to haul the contaminated water

Resources

The utility has incorporated the following resources to support decontamination and recovery in the UICP*:*

- Technical expertise from the local Fire Departments and Hazmat and Exposure Teams
- Pre-negotiated agreements with support contractors (laboratory analysis, hazardous materials, engineering, designing)
- Information Resources including EPA Response Protocol Toolbox (RPTB)[7], Centers for Disease Control and Prevention (CDC) Priority Contaminant Profiles[8], NIOSH Pocket Guide to Chemical Hazards[9], EPA Water Contaminant Information Tool (WCIT)[10], EPA Lab Compendium[11], and Jane's Chem-Bio Handbook[12]
- Mutual aid and assistance agreements
  - State Water/Wastewater Agency Response Network[13] (WARN)
- Large Incident Partnerships
  - County Department of Public Works
- Memorandums of Understanding (MOUs). Some examples include:
  - Highly specialized analytical support systems
  - Obtaining additional staff and equipment – pre-arranged contracts for engineering, construction, supplies, debris removal, cost recovery and additional staff or equipment through the recovery phase of an incident
- Additional miscellaneous resources:
  - Water bottling
  - Porta-jons

A WARN is a network of utilities helping utilities. Each utility that is a part of the WARN signs a mutual aid and assistance agreement which covers administrative items such as activation, reimbursement, worker's compensation, liability, and other terms and conditions to allow for resources to be shared more efficiently and effectively. WARN supports continuity of operation and fast response when disaster strikes. WARN could also be used for recovery purposes if other sources for resources are not available.

Why WARNs Work?
- *Expected access to resources*
- *Improved planning and coordination*
- *Consistent with NIMS*
- *Participation is voluntary*
- *Can be activated before emergency declaration*

Cost Recovery

The utility has in place plans for cost recovery during and following a major incident. These plans include:

- Contingency funds for response and initial recovery
- Established reserve fund
- Specialized hazard insurance coverage
- FEMA cost recovery protocols coordinated through contractor support (FEMA Public Assistance Grant Program)

Recovery Experience (Lessons Learned)

The utility has learned from multiple experiences in decontamination and recovery, including:

- The importance of exercising the UICP through relevant tabletop exercises and training, which identify specific locations and incidents and include worst case scenarios, based on experiences with Hurricanes Floyd and Hugo
- Preparation for decontamination and recovery processes from large-scale events affecting critical interdependent infrastructure and exceeding the scope of utility recovery plans, learned when providing mutual aid assistance in Mississippi during the post-Katrina recovery process
- The importance of effective communication systems, backup systems, GPS to locate infrastructure, and enough fuel and resources for a long recovery period, which were the lessons from a utility in the Florida panhandle that experienced a direct hit from Hurricane Ivan

[7] http://www.epa.gov/safewater/watersecurity/pubs/rptb_response_guidelines.pdf
[8] http://www.atsdr.cdc.gov/toxfaq.html
[9] http://www.cdc.gov/niosh/npg/pdfs/2005-149.pdf
[10] http://www.epa.gov/wcit/
[11] http://www.epa.gov/compendium
[12] http://catalog.janes.com/catalog/public/index.cfm?fuseaction=home.ProductInfoBrief&product_id=98327
[13] http://www.nationalwarn.org

- Effective risk communication strategies to impose water restrictions until recovery operations (bridge and water main repair) are complete - learned when a tug and barge striking a bridge damaged the water main crossing the bridge serving an island community.
- The importance of contaminant monitoring, continuous sampling and analysis, rapid response, and risk communication to customers and the public to maintain confidence in the integrity of the water supply and preserve public perception of utility staff professionalism – learned during an accidental industrial hazardous chemical spill into source water upstream of the utility water intake.
- The importance of temporary modifications to the conventional water treatment process to quickly respond to a water contamination incident as well as proactive risk communication, to reassure customers of the safety of the water when the source water was affected by naturally occurring tannic and humic acids causing taste and odor problems
- Sustained and persistent communication with the public on the utility's progress on recovery and decontamination activities that became necessary when the utility used a cement-lined pipe without preconditioning; this caused turbidity and undesirable taste and odor in the drinking water distribution system
- The importance of having a pre-negotiated contract with a HazMat contractor and consultant, for expedited cleanup was tested when an accidental chemical spill caused an exothermic reaction due to two water treatment chemicals being mistakenly added together by a vendor

Acknowledgements

The identity of the case study utility is not being provided as a security pre-caution. However, EPA acknowledges and appreciates the utility's invaluable efforts in support of this project.

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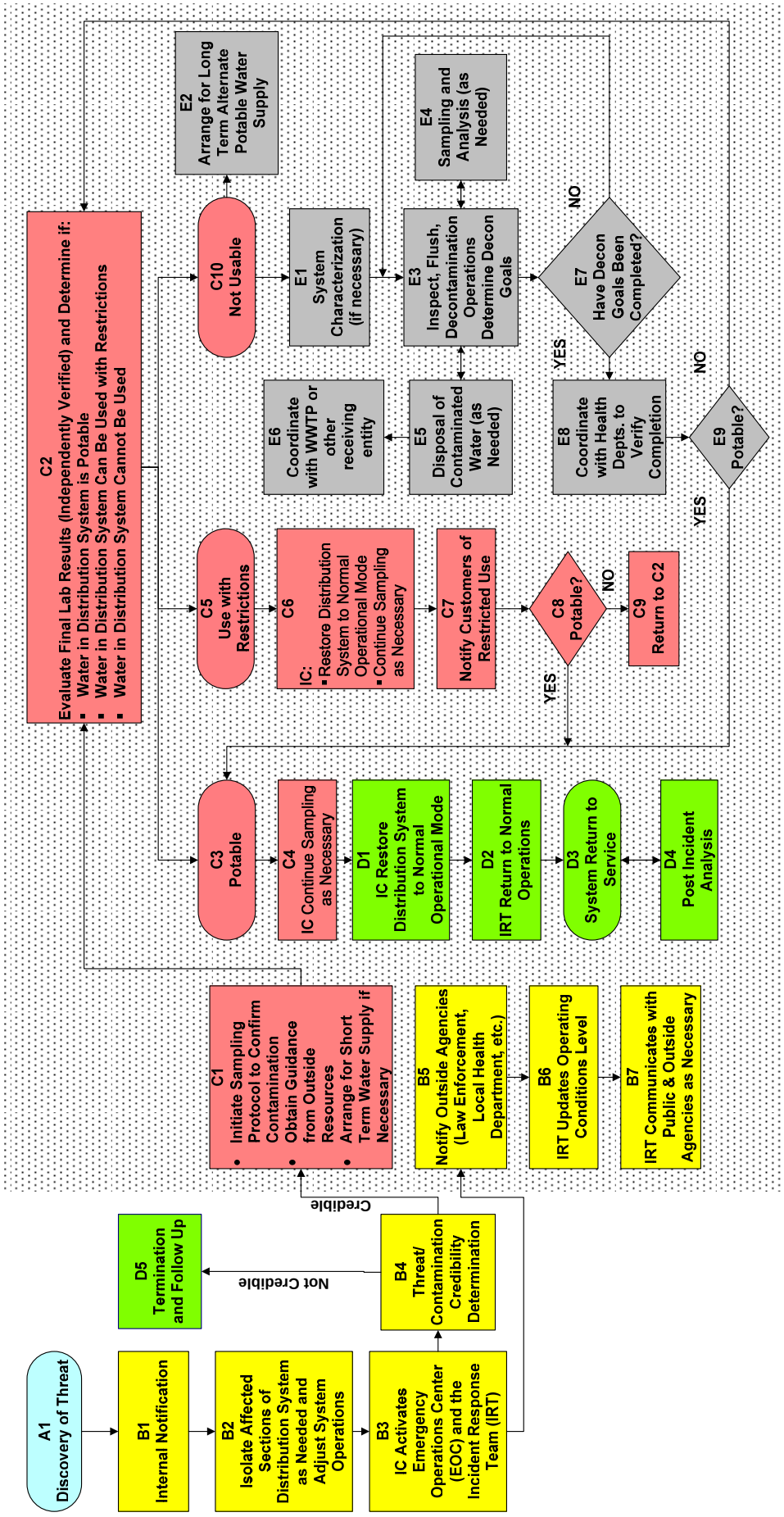
Attachments

An example "rip and run" flow chart for a distribution system contamination event highlighting decontamination and recovery actions (Attachment 1).

An example crisis and risk communication flow diagram for a contamination incident (Attachment 2).

ATTACHMENT 1

EXAMPLE RIP AND RUN FLOW CHART
CONTAMINATION IN WATER DISTRIBUTION SYSTEM

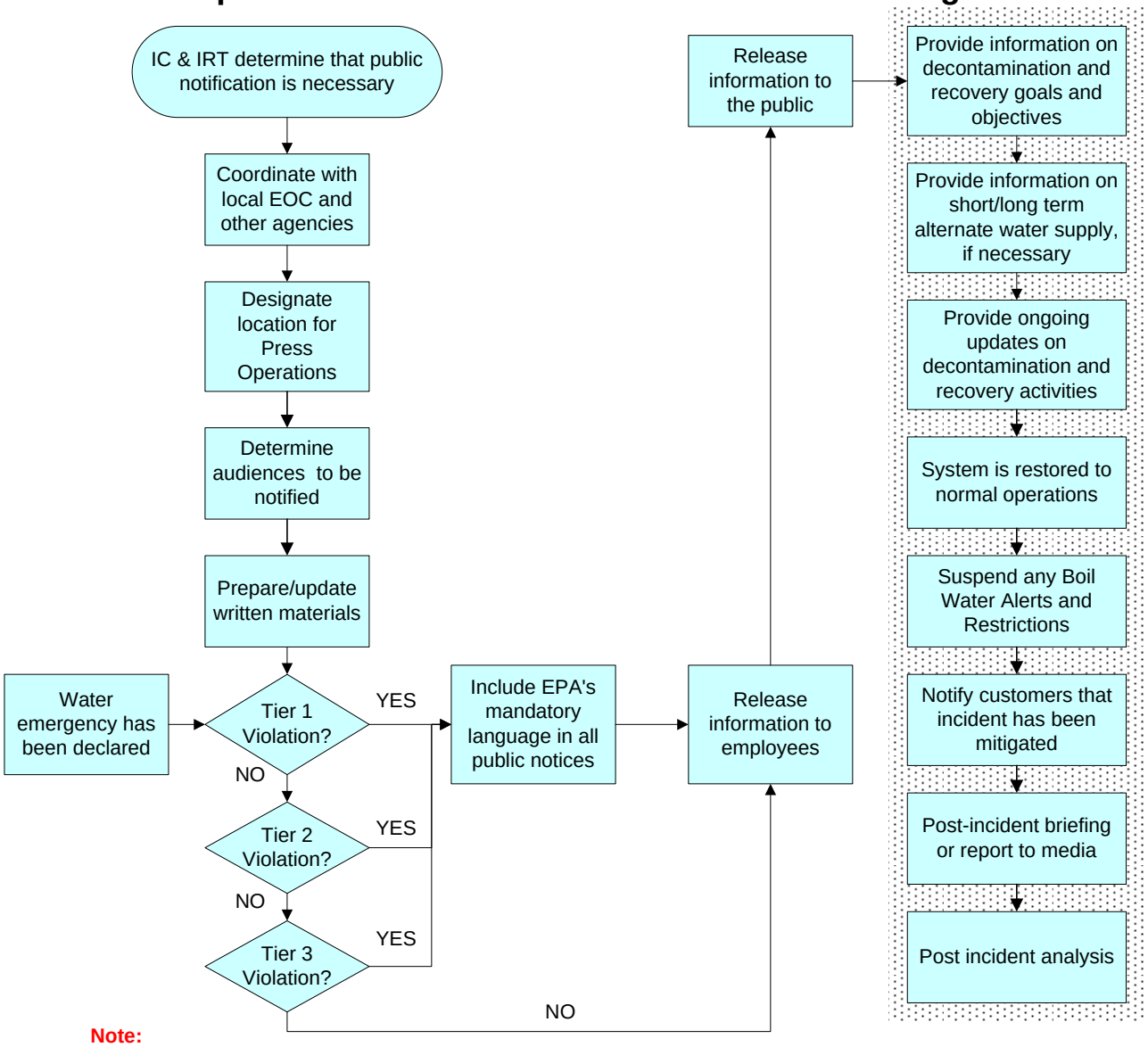


Notes:

- **Response and Recovery Activities following a "Confirmed Contamination" are shown within the shaded area**
- **Consider Public / Media Notifications at every step in the response process**

ATTACHMENT 2

Example Crisis and Risk Communications Flow Diagram



Note:

- **Communications during decontamination and recovery activities are shown within the shaded area**