Disaster Management for Water and Wastewater Utilities

MGT343
Course Design Document – ILT

October 2019

FEMA

Course Design Document

Course Description

Overview

The *Disaster Management for Water and Wastewater Utilities* course is designed to provide training to water and wastewater professionals on issues concerning preparing for, responding to, and recovering from natural or human-caused disasters that threaten water and wastewater facilities and systems.

Scope

This course introduces the various natural and human-caused (accidental or intentional) hazards to which water and wastewater systems may be vulnerable and the potential effects of hazards. Planning for and managing incidents are discussed, as well as disaster mitigation, response, and recovery specific to drinking water and wastewater systems. Participants are guided through portions of the Environmental Protection Agency (EPA) *Response Protocol Toolbox* (RPTB) to identify steps in the response and recovery processes. Case studies on a variety of disaster incidents, as well as hypothetical situations for water and wastewater incidents, are examined. Participants are also given the opportunity to practice developing a disaster response and recovery plan for a disaster affecting a drinking water or wastewater facility or system.

Course Goal

Upon successful completion of the course, participants will be able to demonstrate how to prepare for, respond to, and recover from incidents that threaten water and wastewater facilities and systems.

Target Audience

This course was developed for water and wastewater utility personnel, directors, department heads, supervisors/superintendents, operators, field personnel, customer service, lab personnel, inspectors, and engineers; as well as emergency managers, state/local regulatory personnel including tribal councils, city elected officials, senior managers, county elected officials, utility board members, criminal investigators, and public health personnel.

Recommended Training

Successful completion of IS-100PWb, IS-200, and IS-700 are expected, but not required.

Completion of IS-800 is also recommended. The courses can be found online at: http://training.fema.gov/IS/NIMS.asp.

Course Length

16 hours

Participant-to-Teacher Ratio

The recommended Participant-to-teacher ratio for this course is 15 (or less) to 1.

Prerequisites

A FEMA Student ID is required to register for, and participate in, any training provided by FEMA agencies. All FEMA training providers, registration systems, and enrollment procedures are required to use this FEMA SID which can be obtained at the following website: https://cdp.dhs.gov/femasid/ or with TEEX assistance upon arrival for class.

Testing/Certification

The instructor will use oral questioning during the presentation of each module to assess participants' mastery of the material. Problem areas identified during questioning will be reviewed in further detail.

The course activities within each module assess participant understanding and apply knowledge obtained during the module. Discussion of responses further allows the instructor to assess mastery of the module material.

A pre-test and post-test are given to measure participants' understanding of the material. Participants are required to score 70% or better on the post-test in order to receive a course certificate of completion.

TEEX has been approved as a Authorized Provider by the International Association for Continuing Education and Training (IACET), 1760 Old Meadow Road, Suite 500, McLean, VA 22102. TEEX is authorized by IACET to offer 1.6 CEUs for this program. For more information about IACET, please visit their website at www.iacet.org.

This course is certified by the American Council on Education (ACE) for college credit in the lower-division baccalaureate/associate degree category, 1 semester hour in emergency management, risk management, or communications.

This course is approved for water and wastewater licensing CEUs in many states. Please check with the instructor for questions on CEUs as each state, territory, and tribal nation may have different administrative requirements.

Evaluation Strategy

A course evaluation and an instructor evaluation are provided to the participants after the course to assess the quality of the course material and the instructor's performance.

An instructor-led After-Action Review (AAR) is performed at the conclusion of the course to determine if the course sufficiently met the overall goal and that the material presented in the modules met the course objectives. This allows the participants the opportunity to provide feedback for improvements to the course and its delivery.

Course Schedule

Day	Session		Module	Instructional Time
Day 1	AM Session 1	8:00 – 8:30	Course Introduction	:30
		8:30 – 9:00	Course Pre-test	:30
		9:00 – 10:30	Module 1: Threats to Water and Wastewater Systems	1:30
		10:30 – 10:45	Break	:15
	AM Session 2	10:45 – 12:00	Module 1: Threats to Water and Wastewater Systems (continued)	1:15
		12:00 – 1:00	Lunch	1:00
	PM Session 1	1:00 – 3:00	Module 2: Disaster Planning and Management	2:00
	PM Session 2	3:00 – 3:15	Break	:15
		3:15 – 5:00	Module 3: Disaster Mitigation	1:45
Daily Total				**8 hours**
Day 2	AM Session 1	8:00 – 10:00	Module 4: Disaster Response	2:00
		10:00 – 10:15	Break	:15
	AM Session 2	10:15 – 12:00	Module 4: Disaster Response (continued)	1:45
		12:00 – 1:00	Lunch	1:00
	PM Session 1	1:00 – 2:30	Module 5: Disaster Recovery	1:30
		2:30 – 2:45	Break	:15
	PM Session 2	2:45 – 3:45	Module 5: Disaster Recovery (continued) (Practical Exercise)	1:00
		3:45 – 5:00	Course Review and Post-test	1:15
Daily Total				**8 hours**
Total Hours		(*actual times may vary*)		**16 hours**

Course Structure/Content Outline

Module 1: Threats to Water and Wastewater Systems

A. Natural Disasters
   1. Types
   2. Effects of Natural Disasters on Water and Wastewater Systems
   3. Natural Disaster Case Study: The Impact of Hurricane Katrina

B. Human-Caused Incidents
   1. Accidental Incidents
   2. Accidental Incident Case Study: Contamination of Pittsburgh Drinking Water
   3. Intentional Incidents
   4. Intentional Incident Case Study: Vandalism of a Drinking Water Storage Tank, Blackstone, MA
   5. Hypothetical Scenarios: Intentional Water and Wastewater Incidents

C. Characteristics of Terrorism
   1. Motivations of Terrorists
   2. Types of Terrorism
   3. Likely Perpetrators of Intentional Water/Wastewater Incidents

D. Why Water and Wastewater Systems are at Risk
   1. Drinking Water Incidents
   2. Wastewater Incidents

E. Potential Contaminants of Water and Wastewater Systems
   1. Biological Agents
   2. Chemical Agents
   3. Radioactive Materials
   4. Potential Vulnerabilities

F. Treatments for Drinking Water Contaminants
   1. Biological and Chemical Contamination Tables
   2. Water Contamination Information Tool

G. Accidental Disaster Case Study: Alamosa Water Salmonella Contamination

Module 2: Disaster Planning and Management

A. Federal Legislation
   1. Stafford Act
   2. PPD-21: Critical Infrastructure Security and Resilience
   3. PL 107-188: "The Public Health Security and Bioterrorism Preparedness and Response Act"
   4. Vulnerability Assessment

B. Emergency Response Planning
   1. Emergency Response Plans
   2. Water Sector Incident Action Checklists
   3. Operations and Maintenance Plans
   4. General Planning Guidance

C. Incident Management
   1. National Incident Management System
   2. National Response Framework
   3. PPD 8: National Preparedness
   4. National Preparedness Goal
   5. Incident Command System
   6. ICS Structure
   7. Unified Command
   8. National Emergency Response Credentialing Systems
   9. Emergency Operations Center
   10. Multiagency Coordination System
   11. Joint Field Office

D. American Water Works Association Guidance
   1. AWWA Response Guidance
   2. AWWA Publications

Module 3: Disaster Mitigation

A. Natural Hazard Mitigation

B. Human-Caused Disaster Mitigation
   1. Mitigating Accidental Incidents
   2. Mitigating Intentional Incidents

3. Physical Protection Measures
4. Operational Security Measures
5. Early-Warning Systems

C. Policies and Procedures for Disaster Mitigation

1. Employees and Security Measures
2. Cybersecurity Measures
3. The Community and Security Measures
4. Emergency Contracts
5. Mutual Aid Agreements

Module 4: Disaster Response

A. Introduction

1. Accidental Disaster Case Study: Contamination of a Public Water Supply (Charleston, WV–2014)
2. EPA Response Protocol Toolbox

B. Contamination Threat Management Guide (RPTB Mod 2)

1. Threat Management Decision Tree
2. Threat Management Process
3. Response Decisions and Consequence Analysis

C. Site Characterization and Sampling Guide (RPTB Mod 3)

1. Site Characterization Process
2. Safety and Personnel Protection
3. Sample Analysis

D. Public Health Response Guide (RPTB Mod 5)

1. Preparing for a Public Health Response
2. Public Health Response
3. Public Notification

E. Testing and Support

1. Standard Lab Analysis
2. Analytical Difficulties
3. Rapid Analytical Methods
4. Analytical Support
5. Mutual Aid and Assistance Networks

F. Water Information Sharing and Analysis Center
   1. ISAC Membership
   2. Points of Contact

G. Accidental Disaster Case Study: Toledo, Cyanotoxin Contamination
   1. Overview of Cyanotoxin
   2. The Incident
   3. The Response
   4. Factors Contributing to the Incident
   5. Drinking Water Treatment Options
   6. Prevention Measures
   7. EPA Updates

Module 5: Disaster Recovery

A. Cleanup and Restoration of Service

B. Remediation and Recovery Guide (RPTB Mod 6)
   1. Roles and Responsibilities During Remediation and Recovery
   2. Remediation and Recovery Steps for Drinking Water
   3. Remediation and Recovery Steps for Wastewater
   4. Business Continuity Planning
   5. Public Assistance Grant Program
   6. Reimbursement Tips for Response and Recovery

C. Intentional Disaster Case Study: Pittsburgh Drinking Water Contamination
   1. Sequence of Events
   2. Remediation and Recovery

D. Practical Exercise
   1. Purpose
   2. Task
   3. Discussion Notes

Module 1: Threats to Water and Wastewater Systems

Module 1: Threats to Water and Wastewater Systems introduces the many types of disasters that could affect a water or wastewater system or facility. The resulting damage to water and wastewater systems is compared to damage caused by a human-caused incident. The characteristics of terrorism are explained, and the types of weapons that might be used to contaminate drinking water are also discussed. Possible treatments for drinking water contaminants will be introduced.

Terminal Learning Objective

Upon successful completion of the module, the participant will be able to identify all-hazard threats that might affect drinking water and wastewater systems.

Enabling Learning Objectives

1. Determine the effects of natural disasters on water or wastewater systems.
2. Identify the impact of accidental or intentional human-caused disasters at a water or wastewater facility.
3. Describe the characteristics of terrorism.
4. Recognize potential contaminants used against water or wastewater systems.
5. Recognize treatments for potentially hazardous agents.

Lesson Topics

- Natural Disasters
- Accidental or Intentional Human-Caused Disasters
- Characteristics of Terrorism
- Potential Contaminants Used Against Water or Wastewater Systems
- Treatments for Potentially Hazardous Agents

Instructional Strategy

The instructor presents content with the aid of presentation visuals. Questions are posed throughout the module to assess participant understanding and to facilitate group discussions.

Assessment Strategy

The instructor will use oral questioning during the presentation to assess the participants' understanding of content. Any problem areas identified will be discussed in further detail.

Participants apply knowledge gained in this module to complete the practical exercise at the end of Module 5.

Module 2: Disaster Planning and Management

Module 2: Disaster Planning and Management provides an overview of disaster planning and management practices. Key federal legislation for disaster management that pertains to the water and wastewater industries will be explained. The development of an Emergency Response Plan (ERP) is discussed, along with its implementation within the National Incident Management System (NIMS) and the Incident Command System (ICS). Additional guidance in emergency response from the American Water Works Association (AWWA) is also presented.

Terminal Learning Objective

Upon successful completion of the module, the participant will be able to practice disaster planning and management for water and wastewater incidents.

Enabling Learning Objectives

1. Describe key federal legislation pertaining to the water and wastewater industry.
2. Identify the goals of a comprehensive Emergency Response Plan (ERP).
3. Recognize elements of the National Incident Management System (NIMS).
4. Recognize American Water Works Association (AWWA) guidance on emergency response.

Lesson Topics

- Key Federal Legislation
- Emergency Response Planning
- Incident Management
- American Water Works Association Guidance

Instructional Strategy

The instructor presents content with the aid of presentation visuals. Questions are posed throughout the module to assess participant understanding and to facilitate group discussions.

Assessment Strategy

The instructor will use oral questioning during the presentation to assess the participants' understanding of content. Any problem areas identified will be discussed in further detail.

Participants apply knowledge gained in this module to complete the practical exercise at the end of Module 5.

Module 3: Disaster Mitigation

Module 3: Disaster Mitigation presents measures used to mitigate threats from natural or human-caused incidents. Additionally, the importance of employee and community security and threat awareness through policy and procedures will be discussed.

Terminal Learning Objective

Upon successful completion of the module, the participant will be able to identify methods to mitigate disasters that threaten water and wastewater facilities and systems.

Enabling Learning Objectives

1. Identify mitigation methods that may reduce the effects of natural disasters.
2. Recognize mitigation methods that could reduce the effects of human-caused incidents.
3. Explain water and wastewater policies and procedures for disaster mitigation.

Lesson Topics

- Natural Disaster Mitigation
- Human-Caused Incident Mitigation
- Policies and Procedures for Disaster Mitigation

Instructional Strategy

The instructor presents content with the aid of presentation visuals. Questions are posed throughout the module to assess participant understanding and to facilitate group discussions.

Assessment Strategy

The instructor will use oral questioning during the presentation to assess the participants' understanding of content. Any problem areas identified will be discussed in further detail.

Participants apply knowledge gained in this module to complete the practical exercise at the end of Module 5.

Module 4: Disaster Response

Module 4: Disaster Response introduces participants to procedures and resources available in the response to a disaster. Modules from the Environmental Protection Agency (EPA) *Response Protocol Toolbox* (RPTB) pertaining to contamination threat management, site characterization and sampling, and public health response are discussed. Federal and state resources to aid in response actions are also identified. Also, a case study of an accidental water contamination response and recovery is examined.

Terminal Learning Objective

Upon successful completion of the module, the participant will be able to determine appropriate response actions to an actual or threatened incident.

Enabling Learning Objectives

1. Use the EPA *Contamination Threat Management Guide.*
2. Recognize procedures for site characterization and sampling.
3. Apply the steps outlined in the EPA *Public Health Response Guide*.
4. Identify testing and support service available from the state and federal governments.
5. Explain the purpose of the Water Information Sharing and Analysis Center (ISAC).

Lesson Topics

- *Contamination Threat Management Guide* (RPTB Mod 2)
- *Site Characterization and Sampling Guide* (RPTB Mod 3)
- *Public Health Response Guide* (RPTB Mod 5)
- Testing and Support Services
- Water Information Sharing and Analysis Center

Instructional Strategy

The instructor presents content with the aid of presentation visuals. Questions are posed throughout the module to assess participant understanding and to facilitate group discussions.

Assessment Strategy

The instructor will use oral questioning during the presentation to assess the participants' understanding of content. Any problem areas identified will be discussed in further detail.

Participants apply knowledge gained in this module to complete the practical exercise at the end of Module 5.

Module 5: Disaster Recovery

Module 5: Disaster Recovery offers participants guidance for the recovery stage of a disaster. Goals of recovery are discussed, along with steps for remediation and recovery from the Environmental Protection Agency's (EPA) Response Protocol Toolbox (RPTB), and a case study of an intentional water contamination response and recovery is examined.

Terminal Learning Objective

Upon successful completion of the module, the participant will be able to demonstrate developing a disaster recovery plan.

Enabling Learning Objectives

1. Identify the actions required for cleanup and restoration of water and wastewater services.
2. Explain the steps for remediation and recovery from a water or wastewater incident.
3. Examine the response and recovery methods used in an intentional contamination case study.
4. Practice preparing a disaster response and recovery plan.

Lesson Topics

- Cleanup and Restoration of Service
- Remediation and Recovery Guide (RPTB Mod 6)
- Intentional Disaster Case Study: Pittsburgh Drinking Water Contamination
- Disaster Response and Planning Exercise

Instructional Strategy

The instructor presents content with the aid of presentation visuals. Questions are posed throughout the module to assess participant understanding and to facilitate group discussions. Participants will discuss a case study of a documented incident and apply module content in the development of a scenario at the end of the module.

Assessment Strategy

The instructor will use oral questioning during the presentation to assess the participants' understanding of content. Any problem areas identified will be discussed in further detail.

Participants apply knowledge gained in this module and throughout the course to develop a disaster scenario for which to identify response actions and formulate a recovery plan to help facilitate recovery from the hypothetical incident.