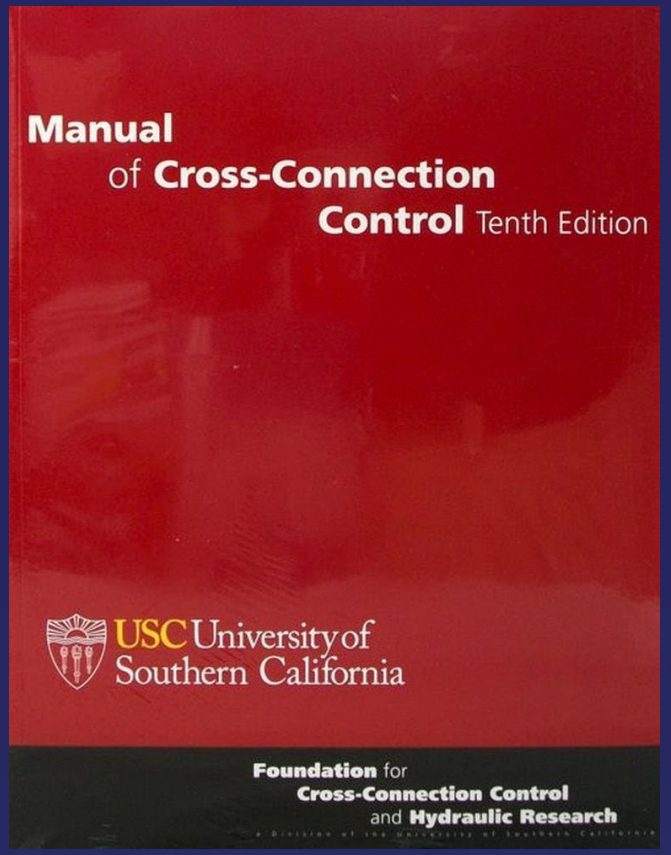
Case Study: 2024 Backflow Response in a Large Public Water System

TCEQ Cross-Connection Control Program

Overview

- The Basics
  - Relevant rules, regulations, and definitions
- The Event
- Response: Strengths and Opportunities

Goal: Understand the requirements and best practices that create a successful backflow response



The Basics
Definitions and Regulations

Source: CBS Austin, knoxpages.com

Hazard Classifications
Non-health vs. Health

- Non-health Hazard
  - A substance that generally would constitute a nuisance or be aesthetically objectionable if introduced into the potable water supply
- Health Hazard
  - A substance that may cause death or illness, spread disease, or have a high probability of causing such effects if introduced into the water supply

Hydraulic Conditions
Backpressure vs. Back siphonage

- Back siphonage
  - A form of backflow due to a reduction in system pressure, which causes a sub-atmospheric pressure to exist in the water system.
- Backpressure
  - An elevation of pressure in the downstream piping system (by pump, elevation of piping, steam pressure, air pressure, etc.) above the supply pressure at the point of consideration, which would cause or tend to cause a reversal of the normal direction of flow.

Source: University of Southern California's Foundation for Cross-Connection Control & Hydraulic Research

Key Regulation
Local Authority

- What other rules do PWSs need?
  - Public water systems must adopt an adequate *plumbing ordinance, regulations,* or *service agreement with provisions for proper* ***enforcement*** *to ensure that neither cross-connections nor other unacceptable plumbing practices are permitted* (See §290.47(b) of this title [relating to Appendices]).
- 30 TAC 290.46(i)

Key Regulations
Customer Service Inspections

- How do we find hazards and cross connections?
  - Customer service inspection (CSI) - An examination of the private water distribution facility *for the purpose of providing or denying water service*. The inspection is limited to the identification and prevention of cross-connections, potential contaminant hazards, and illegal lead materials. (…)
- 30 TAC 30.87(2)

Customer Service Inspections
The Three Reasons

- When do customers need CSIs?
  - A CSI certificate shall be completed *prior to providing continuous service* to new construction, on any existing service either when the water purveyor has reason to believe that cross-connections or other potential hazards exist, or after any material improvement, correction, or addition to the private water distribution facilities. (…)
- 30 TAC 290.46(j)

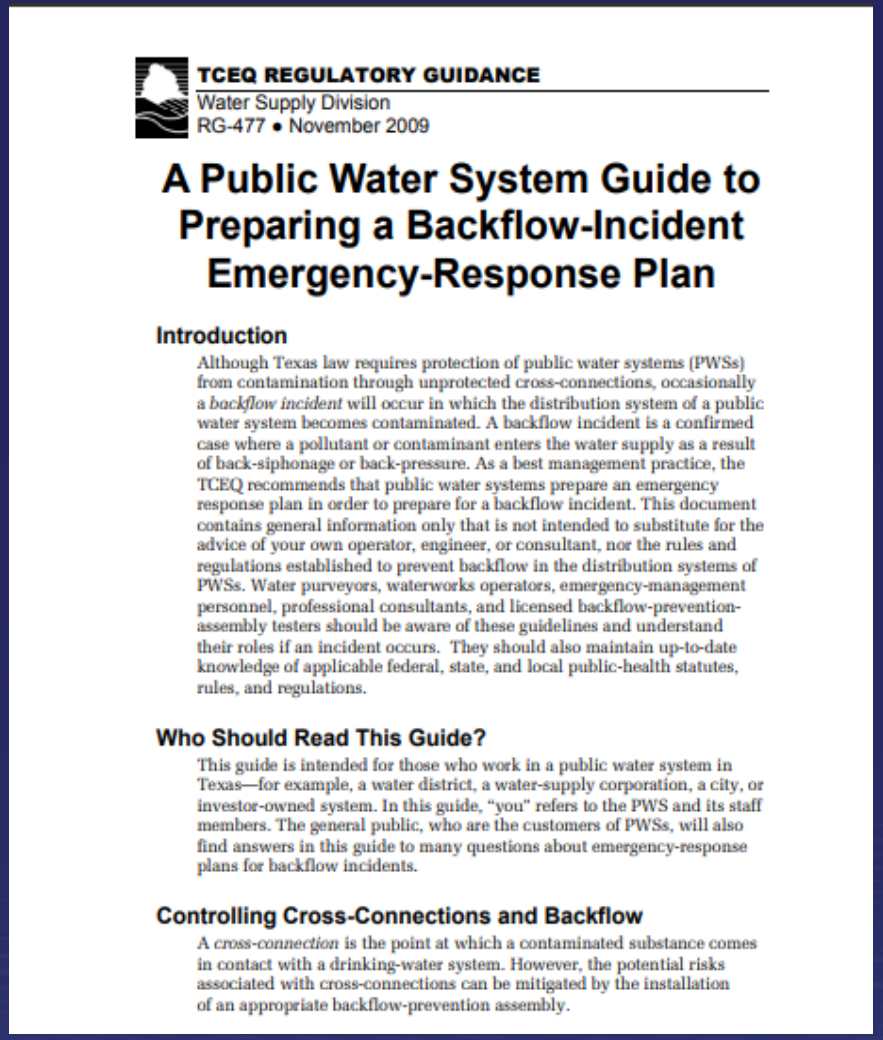
Testing BPAs
Can I Cross-Connect?

- Can I cross-connect?
  - No water connection from any public drinking water supply system shall be allowed to any residence or establishment where an actual or **potential** contamination hazard exists unless the public water facilities are protected from contamination. (…)
- 30 TAC 290.44(h)(1)

Key Regulations
Testing BPAs

- What should I install?
  - The type of backflow prevention assembly required shall be determined by the specific potential hazard identified in §290.47(f) of this title (relating to Appendices).
- 30 TAC 290.44(h)(1)(A)

Technical Guidance
Preparing for & Responding To...



TCEQ REGULATORY GUIDANCE
Water Supply Division
RG-477 • November 2009

A Public Water System Guide to Preparing a Backflow-Incident Emergency-Response Plan

Introduction

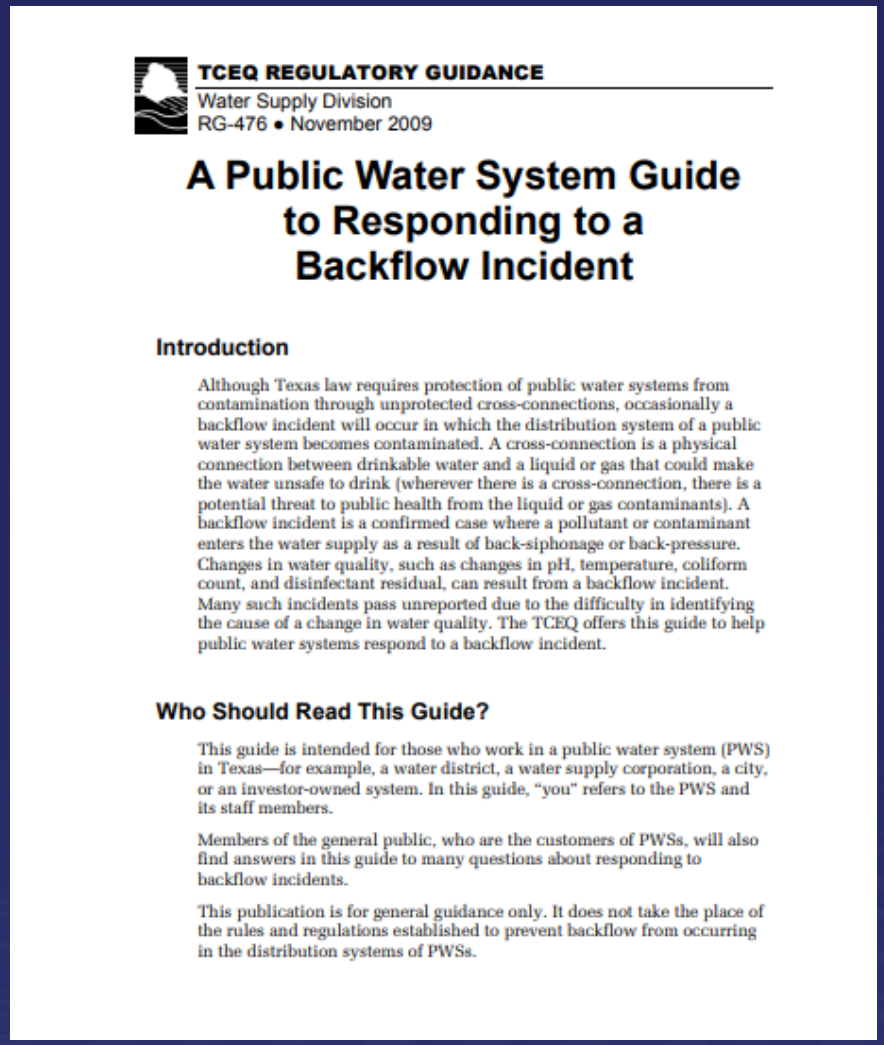
Although Texas law requires protection of public water systems (PWSs) from contamination through unprotected cross-connections, occasionally a *backflow incident* will occur in which the distribution system of a public water system becomes contaminated. A backflow incident is a confirmed case where a pollutant or contaminant enters the water supply as a result of back-siphonage or back-pressure. As a best management practice, the TCEQ recommends that public water systems prepare an emergency response plan in order to prepare for a backflow incident. This document contains general information only that is not intended to substitute for the advice of your own operator, engineer, or consultant, nor the rules and regulations established to prevent backflow in the distribution systems of PWSs. Water purveyors, waterworks operators, emergency-management personnel, professional consultants, and licensed backflow-prevention-assembly testers should be aware of these guidelines and understand their roles if an incident occurs. They should also maintain up-to-date knowledge of applicable federal, state, and local public-health statutes, rules, and regulations.

Who Should Read This Guide?

This guide is intended for those who work in a public water system in Texas—for example, a water district, a water-supply corporation, a city, or investor-owned system. In this guide, "you" refers to the PWS and its staff members. The general public, who are the customers of PWSs, will also find answers in this guide to many questions about emergency-response plans for backflow incidents.

Controlling Cross-Connections and Backflow

A *cross-connection* is the point at which a contaminated substance comes in contact with a drinking-water system. However, the potential risks associated with cross-connections can be mitigated by the installation of an appropriate backflow-prevention assembly.



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A Public Water System Guide to Responding to a Backflow Incident

Introduction

Although Texas law requires protection of public water systems from contamination through unprotected cross-connections, occasionally a backflow incident will occur in which the distribution system of a public water system becomes contaminated. A cross-connection is a physical connection between drinkable water and a liquid or gas that could make the water unsafe to drink (wherever there is a cross-connection, there is a potential threat to public health from the liquid or gas contaminants). A backflow incident is a confirmed case where a pollutant or contaminant enters the water supply as a result of back-siphonage or back-pressure. Changes in water quality, such as changes in pH, temperature, coliform count, and disinfectant residual, can result from a backflow incident. Many such incidents pass unreported due to the difficulty in identifying the cause of a change in water quality. The TCEQ offers this guide to help public water systems respond to a backflow incident.

Who Should Read This Guide?

This guide is intended for those who work in a public water system (PWS) in Texas—for example, a water district, a water supply corporation, a city, or an investor-owned system. In this guide, "you" refers to the PWS and its staff members.

Members of the general public, who are the customers of PWSs, will also find answers in this guide to many questions about responding to backflow incidents.

This publication is for general guidance only. It does not take the place of the rules and regulations established to prevent backflow from occurring in the distribution systems of PWSs.

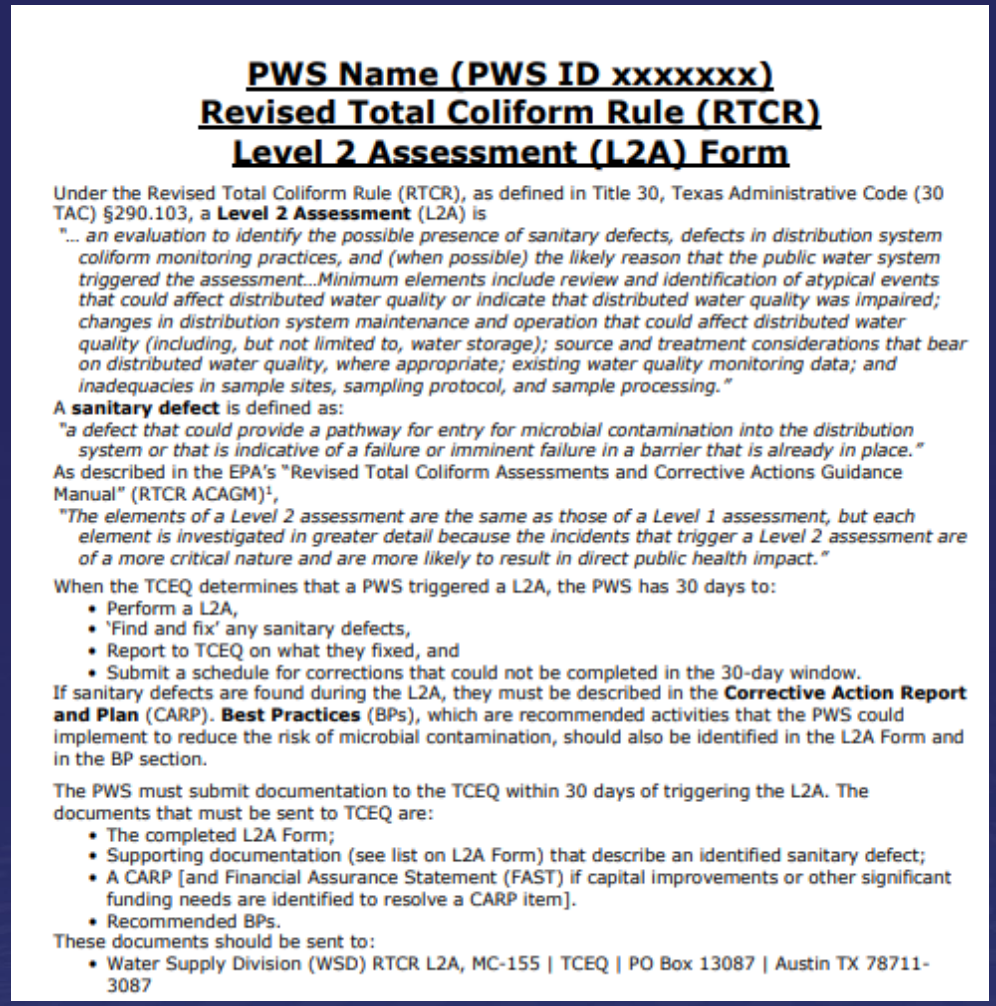
The Event
What led to the Response?

The Event
Background: PWS Details

- Large population
- Maximum Daily Demand: > 50 MGD
- Connections: >80,000
- Surface Water Plants 2
- Pressure Planes: 4

The Event
L2A Triggered

- Level 1 Assessment triggered
  - Early 2024
- Level 2 Assessment triggered
  - 2nd incident of an EC/TC+ in a rolling 12-month period
  - Requires inspection and analysis of factors that could contribute to the EC/TC+
  - Includes review of all water facilities and sampling practices



PWS Name (PWS ID xxxxxxx)
Revised Total Coliform Rule (RTCR)
Level 2 Assessment (L2A) Form

Under the Revised Total Coliform Rule (RTCR), as defined in Title 30, Texas Administrative Code (30 TAC) §290.103, a **Level 2 Assessment** (L2A) is

"... an evaluation to identify the possible presence of sanitary defects, defects in distribution system coliform monitoring practices, and (when possible) the likely reason that the public water system triggered the assessment...Minimum elements include review and identification of atypical events that could affect distributed water quality or indicate that distributed water quality was impaired; changes in distribution system maintenance and operation that could affect distributed water quality (including, but not limited to, water storage); source and treatment considerations that bear on distributed water quality, where appropriate; existing water quality monitoring data; and inadequacies in sample sites, sampling protocol, and sample processing."

A **sanitary defect** is defined as:

"a defect that could provide a pathway for entry for microbial contamination into the distribution system or that is indicative of a failure or imminent failure in a barrier that is already in place."

As described in the EPA's "Revised Total Coliform Assessments and Corrective Actions Guidance Manual" (RTCR ACAGM)[1],

"The elements of a Level 2 assessment are the same as those of a Level 1 assessment, but each element is investigated in greater detail because the incidents that trigger a Level 2 assessment are of a more critical nature and are more likely to result in direct public health impact."

When the TCEQ determines that a PWS triggered a L2A, the PWS has 30 days to:

- Perform a L2A,
- 'Find and fix' any sanitary defects,
- Report to TCEQ on what they fixed, and
- Submit a schedule for corrections that could not be completed in the 30-day window.

If sanitary defects are found during the L2A, they must be described in the **Corrective Action Report and Plan** (CARP). **Best Practices** (BPs), which are recommended activities that the PWS could implement to reduce the risk of microbial contamination, should also be identified in the L2A Form and in the BP section.

The PWS must submit documentation to the TCEQ within 30 days of triggering the L2A. The documents that must be sent to TCEQ are:

- The completed L2A Form;
- Supporting documentation (see list on L2A Form) that describe an identified sanitary defect;
- A CARP [and Financial Assurance Statement (FAST) if capital improvements or other significant funding needs are identified to resolve a CARP item].
- Recommended BPs.

These documents should be sent to:

- Water Supply Division (WSD) RTCR L2A, MC-155 | TCEQ | PO Box 13087 | Austin TX 78711-3087

Assessment
Surface Water Treatment Plants

- Surface water treatment plants
  - Assessed treatment and processes, from intake to entry point
  - Conducted customer service inspections in both treatment plants
  - Identified few to no direct cross-connections
  - Quickly determined the plants were operating correctly and did not pose as source of contamination

Assessment
Water Storage

- Elevated and Ground storage tanks
  - Reviewed cycling and fill methods
  - Reviewed sites for cross-connections
  - Quickly determined these were not sources of contaminant
  - Supply pressure was sufficient and compliant

Assessment
Bulk Water Fill

- Bulk water filling stations
- 290.44(h)(3)
  - Overhead bulk water dispensing stations must be provided with an air gap between the filling outlet hose and the receiving tank to protect against back siphonage and cross-contamination.
  - Lots of construction activity and water needs
  - Issue: Water theft from Hydrants
  - Hydrants were reviewed as potential cross-connections

Incident Response
Strengths and Opportunities

Strength
Identify the Cross-Connections

- Approach like a Triage
- 2 Main CSI targets
  - Health Hazard/Hazardous Facilities
  - Near and around TC/EC+ sites
- Customer service inspection teams
- Coordinate with chlorine residual testing

Opportunity
Identify the Cross Contamination

- Scattered sources of contamination
- Illegal connections
- Undocumented hazard installation
- Some new, some years old
- Few old/preexisting CSIs to rely upon

Strength
Emergency Response Team

- Dedicated Emergency Response (ER) team
  - City Police
  - Fire department
  - Water Utility
  - TCEQ
  - TDEM
  - Texas State Guard
  - Coordination through different roles

Strength
Alternate Water Supply

- Multiple water distribution points through the City
- Clear communication of boil water notice procedures
  - Online, in news, during periodic updates etc.

Source: LMTOnline

Opportunity
Public Communication

- Chain of Command bypassed
  - Photos and misinformation accidentally shared with public early in the response
  - There is not always a "Smoking Gun"
- Public trust at risk
- Political Pressure applied

Strength
Eliminating Contamination

- Enforcement actions followed CSIs
- In line with preexisting effective customer service agreement
  - Included due dates, specific requirements, etc. to return to compliance
- These were tracked with follow-up details and notes

Opportunity
Eliminating Contamination

- Numerous issues found in water distribution system
  - Missing backflow prevention assemblies that were registered
  - Backflow prevention assemblies installed but never registered with the City
  - Hazards installed without any backflow prevention, such as irrigation systems

Opportunity
Eliminating Contamination (continued)

- Difficult to track potential issues
  - No way to effectively track change of use at a property, which may require a CSI
- Industry-wide Challenge
- None of these occurred instantaneously, but instead over long periods of neglect

Strength
Enforcement

- Active efforts to curtail potential contamination sources
  - Water service suspended on more than one occasion
- Noted on follow-ups or immediately on-site
- Included potential sources
  - I.e., water theft identified as potential risk
  - Police began to actively search for and penalize water hydrant theft

Strength
Enforcement (continued)

- §290.46(j)(2)
  - As potential contaminant hazards are discovered, they shall be promptly eliminated to prevent possible contamination of the water supplied by the public water system. The existence of a health hazard, as identified in §290.47(i) of this title, shall be considered sufficient grounds for immediate termination of water service. Service can be restored only when the health hazard no longer exists, or until the health hazard has been isolated from the public water system in accordance with §290.44(h) of this title (...)

Strength
Getting Started

- Coordinated effort to spread out resources to identify contamination
  - Large number of sites that were to be assessed
  - Large variety of site types in need of review
- Backflow events are rarely just one issue
- Break one overwhelming task into multiple smaller ones

Strength
Neighbors Helping Neighbors

- Team of Customer Service Inspectors
  - Included licensed CSIs from other nearby communities
  - Expanded and optimized the number of CSIs conducted

Source: McAllenPublicUtility.com

Opportunity
CSI Reviews

- 290.46(j) Customer service inspections.
  - A customer service inspection certificate shall be completed prior to providing continuous water service to new construction, on any existing service either when the water purveyor has reason to believe that cross-connections or other potential contaminant hazards exist, or after any material improvement, correction, or addition to the private water distribution facilities. (…)

Opportunity
CSI Reviews (continued)

- Review CSIs before filing away
  - Follow-ups if necessary were tracked
- Industry-wide challenge:
  - A brief inspection from an unlicensed person does not replace a CSI
  - A complete CSI includes other items, including lead testing

TCEQ Cross-Connection Control Program

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