

This is a preview of "AWWA M19-2018". [Click here to purchase the full version from the ANSI store.](#)

Manual of Water Supply Practices

M19

Emergency Planning for Water and Wastewater Utilities

Fifth Edition



American Water Works
Association

M19

Emergency Planning for Water and Wastewater Utilities

Fifth Edition



**American Water Works
Association**

Manual of Water Supply Practices — M19, Fifth Edition

Emergency Planning for Water and Wastewater Utilities

Copyright © 1999, 2006, 2018 American Water Works Association

All rights reserved. No part of this publication may be reproduced or transmitted in any form or by any means, electronic or mechanical, including scanning, recording, or any information or retrieval system. Reproduction and commercial use of this material is prohibited, except with written permission from the publisher.

Disclaimer

The authors, contributors, editors, and publisher do not assume responsibility for the validity of the content or any consequences of their use. In no event will AWWA be liable for direct, indirect, special, incidental, or consequential damages arising out of the use of information presented in this book. In particular, AWWA will not be responsible for any costs, including, but not limited to, those incurred as a result of lost revenue. In no event shall AWWA's liability exceed the amount paid for the purchase of this book.

Managing Editor: Melissa Valentine
Sr. Specialist, AWWA Manuals: Sue Bach
Cover Design: Melanie Yamamoto

Library of Congress Cataloging-in-Publication Data

Names: Gay, Stephen D., author. | Borman, Scott D., author. | American Water Works Association, issuing body.

Title: M19 emergency planning for water utilities / by Stephen D. Gay and Scott D. Borman.

Other titles: Emergency planning for water utilities | AWWA manual ; M19.

Description: Fifth edition. | Denver, CO: American Water Works Association, [2018] | Series: AWWA manual ; M19 | Includes bibliographical references.

Identifiers: LCCN 2018014152 | ISBN 9781625762795

Subjects: LCSH: Waterworks--Management. | Emergency management. | Emergency water supply.

Classification: LCC TD487 .G39 2018 | DDC 363.6/10684--dc23

LC record available at <https://lccn.loc.gov/2018014152>

Printed in the United States of America

ISBN 978-1-62576-279-5

eISBN 978-1-61300-460-9



If you are interested in using any part of this publication for training, creating a derivative work, or for any commercial use, written permission from AWWA is required. Please send your request to permissions@awwa.org.



**American Water Works
Association**

American Water Works Association
6666 West Quincy Avenue
Denver, CO 80235-3098
awwa.org

Contents

List of Figures, v	
List of Tables, vii	
Preface, ix	
Acknowledgments, xi	
Chapter 1 Preparedness Culture	1
Developing an Explicit Organizational Commitment to Emergency Preparedness, 2	
Developing the Preparedness Culture, 3	
Supporting the Preparedness Culture with Tools and Tactics, 4	
Evaluating the “Strength” of the Preparedness Culture, 5	
References and Supplemental Readings, 5	
Chapter 2 Risk and Resilience Assessment	7
What is a Risk and Resilience Assessment?, 7	
Goals of a Risk and Resilience Assessment, 8	
Managing a Risk and Resilience Assessment, 8	
Conducting a Risk and Resilience Assessment, 8	
Threat Considerations, 9	
Acceptable Levels of Service for a System, 21	
Conclusions, 22	
References and Supplemental Readings, 23	
Chapter 3 Developing an Emergency Response Plan	25
Importance of a Utility Preparedness Program, 26	
Overview of Types of Preparedness Plans, 26	
How to Develop an ERP, 27	
Components of an ERP, 29	
Incorporating the NIMS and the ICS into an ERP, 33	
ERP Maintenance, 35	
References and Supplemental Readings, 36	
Chapter 4 Mutual Aid and Partnerships	37
Identify Key Partnerships, 37	
Establish Collaborative Partnerships, 38	
Mutual Aid, 39	
Mutual Aid in the Water Sector, 39	
Mutual Aid Coordination with Local and State Emergency Management, 41	
WARN Operational Plans, 42	
WARN Exercises, 43	
Local WARN Incident Responses, 44	
Conclusions, 46	
References and Supplemental Readings, 46	

Chapter 5	Internal and External Communications	49
	General Crisis Communications Planning Guidance, 49	
	Internal Communications with Employees, 52	
	Communicating with Emergency Response Agencies and Local Government Agencies, 52	
	Communicating with Customers and the Public at Large, 53	
	Understanding the Traditional Media, 57	
	Using Social Media, 59	
	Communicating with Regulatory Agencies, 61	
	Maintaining Contact Information, 62	
	Conclusions, 62	
	References and Supplemental Readings, 63	
Chapter 6	Training and Exercises	65
	Training and Exercise Matrix, 65	
	Initial and Refresher Training, 67	
	Training Sources and Methods, 69	
	Conducting Exercises, 70	
	Documentation, 76	
	Conclusions, 76	
	References and Supplemental Readings, 76	
Chapter 7	Mitigation	77
	What is Mitigation?, 77	
	Hazard Mitigation, 78	
	FEMA Hazard Mitigation Assistance Grant Program, 80	
	Hazard Mitigation Actions for Utilities, 80	
	References and Supplemental Readings, 91	
Appendix A	Additional Resources for Emergency Preparedness and Response	93
Appendix B	Emergency Response Plan Crosswalk for Plan Review Foreword Section	95
Appendix C	Federal Policies That Support Preparedness Planning	101
	Glossary, 107	
	Acronyms, 109	
	Index, 111	
	AWWA Manuals, 117	

Figures



- 1-1 The Preparedness Culture cycle, 2
- 2-1 Risk assessment process as described in ANSI/AWWA J100, 9
- 2-2 Seismic hazard map of the United States, 11
- 2-3A Landers–Big Bear earthquake fault offset, 12
- 2-3B Landers–Big Bear earthquake pipe broken in the fault offset, 12
- 2-4 Seismic forces on water storage tank, 13
- 2-5A Ground crack resulting from lateral spreading in Kobe, Japan in 1995, 14
- 2-5B Ductile-iron joint pulled apart due to lateral spreading, 14
- 2-6 Flooded K.R. Harrington Water Treatment Plant in Nashville, 17
- 2-7 Flooding at the Nashville Omohundro Water Treatment Plant, 18
- 2-8 Water utility interdependencies with other infrastructure systems, 22
- 3-1 Interconnection of various preparedness plans, 26
- 3-2 ICS diagram, 33
- 4-1 Water/Wastewater Agency Response Network program map (as of November 2015), 40
- 4-2 Water/Wastewater Agency Response Network coordination with local, state, and federal emergency management, 42
- 5-1 Communication facilitates resource requests, 61
- 5-2 Communication improves regulatory agency support of program operations, 62
- 6-1 Example of an emergency preparedness training matrix, 66
- 6-2 Example of a multiyear training and exercise plan, 68
- 6-3 Emergency preparedness training plan model, 69
- 6-4 Discussion-based and operations-based exercises, 71
- 6-5 Exercise program management, 75
- 7-1 Collapsed spring-vibration isolator supporting an emergency generator in Whittier, California, 85
- 7-2 Mitigation option for water storage tanks, 88
- 7-3 Mitigation options for pipelines at fault crossings, 89

This page intentionally blank.

Tables



- 2-1 Example disaster effects matrix, 10
- 3-1 Types of preparedness plans, 27
- 6-1 Training methods and their general parameters, 70
- C-1 Policies and legislations that support preparedness planning, 102

This page intentionally blank.

Preface

Water and wastewater utilities, hereafter referred to as the *utility*, are responsible for providing adequate supplies of safe drinking water and for reliably collecting and treating wastewater. This manual addresses best practices for the prevention, mitigation, response, and recovery of utility operations during critical incidents and is intended for use by utilities of any size. The subject of this manual is closely tied with the AWWA management standards ANSI/AWWA G430, Security Practices for Operation Management; ANSI/AWWA G440, Emergency Preparedness Practices; and ANSI/AWWA J100, Risk and Resilience Management of Water and Wastewater Systems. This manual provides the reader with useful information and resources for satisfying the requirements set forth in the standards and related resources. Where applicable, the requirements of these standards are referenced in text box.

This fifth edition of AWWA Manual M19, *Emergency Planning for Water and Wastewater Utilities*, has been updated to align with current emergency planning best practices. Throughout the manual, the reader will find references to resources designed to support risk assessments as well as to develop mutual aid opportunities and mitigation activities.

This manual comprises the following chapters that discuss proven methodologies and best practices used by water utilities in emergency planning:

Chapter 1, Preparedness Culture, discusses how a preparedness culture increases the effectiveness of utility response to incidents as well as best practices for developing and promoting this response.

Chapter 2, Risk and Resilience Assessment, describes how water utility leaders can better understand risks to their mission and critical assets, how this assessment supports emergency planning by identifying and prioritizing utility-specific risks, and how to identify investments that can pay the greatest dividends during and after an incident.

Chapter 3, Developing an Emergency Response Plan, discusses the basic principles and elements of a preparedness plan, and highlights plan development, emergency procedures, organizational use of an incident command system, and maintenance.

Chapter 4, Mutual Aid and Partnerships, discusses the value in developing partnerships between utilities and other organizations and describes in detail the Water/Wastewater Agency Response Network (WARN), which provides mutual aid and assistance.

Chapter 5, Internal and External Communications, discusses the various modes and messages of communication with stakeholders that are critical to utility emergency response.

Chapter 6, Training and Exercises, describes how utility personnel can practice preparing for and responding to incidents to build skills that will minimize losses and expedite recovery.

Chapter 7, Mitigation, describes how to increase a utility's resilience and preparedness through risk-management activities including hazard mitigation.

This page intentionally blank.

Acknowledgments

The AWWA M19 Emergency Planning for Water Utilities Manual Subcommittee, which developed this manual, had the following personnel at the time:

Stephen D. Gay, *Chair*

S. Bach, Staff Advisor, AWWA, Denver, Colo.
D.S. Borman, Benton/Washington Regional Public Works Authority, Rogers, Ark.
R. Bova, Suffolk County Water Authority, Oakdale, N.Y.
J. Cassidy, Critical Situation Management Inc., Marysville, Pa.
J. Crisologo, California Department of Public Health, Glendale, Calif.
S.A. Dennis, Alameda County Water District, Fremont, Calif.
D. Flancher, Standards Engineer Liaison, AWWA, Denver, Colo.
S.D. Gay, City of Westminster, Westminster, Colo.
M.F. Goddard, Seattle Public Utilities, Seattle, Wash.
D. Goldbloom-Helzner, US Environmental Protection Agency, Washington, D.C.
C. Grieves, Baxter & Woodman Inc., Crystal Lake, Ill.
M. Howe, Executive Director/Secretary Treasurer, Texas AWWA, Austin, Texas
J.L. Ignatowski, Ignatowski Environmental Engineering Consultant, Vienna, Va.
B. Kerr, Kerr & Associates Consulting, Victoria, B.C., Canada
H. Klein, Garden State Laboratories Inc., Hillside, N.J.
J. W. McLaughlin, Merrick & Company, Charlotte, N.C.
V. Morello, Broward County Water and Wastewater Services, Pompano Beach, Fla.
K. Morley, Manager Federal Relations, AWWA, Washington, D.C.
J.W. Moyer, AECOM, Morrisville, N.C.
S. Neumeister, Southeastern Technical Solutions, Port Saint Lucie, Fla.
K. Novick, Gradient Planning, LLC, Middletown, Conn.
J.W. Porco, Michael Baker Corporation, Pagosa Springs, Colo.
K. Raman, KUV Consultants, LLC, Phoenix, Ariz.
R.A. Riordan, City of San Ramon and CH2M, San Ramon, Calif.
L.P. Warren, Launch! Consulting, Charlottesville, Va.
J. Whitley, Bureau of Reclamation, Denver, Colo.
R. Wilson, CSC, Darien, Conn.

This manual was also reviewed and approved by the AWWA Standards Council and the Standards Committee on Emergency Preparedness Practices. The Standards Committee on Emergency Preparedness Practices had the following personnel at the time of approval:

D. Scott Borman, *Chair*

General Interest Members

T.P. Allman, Naval Facilities Engineering Command, Misawa, Japan
D.M. Apanian, USEPA Region 4, Atlanta, Ga.
J.E. Crisologo, State Water Resources Control Board, Glendale, Calif.
D.M. Flancher,* Standards Engineer Liaison, AWWA, Denver, Colo.
R. Ford,* Standards Council Liaison, CH2M, Parsippany, N.J.
K. Morley,* Manager Federal Relations, AWWA, Washington, D.C.
S.M. Neumeister, Southeastern Technical Solutions, Port Saint Lucie, Fla.
K. Novick, Gradient Planning, LLC, Middletown, Conn.
C. Sapp, CH2M, Sugar Hill, Ga.
G.G. Sturdivan, Sierra West Consultants Inc., Yucca Valley, Calif.
L.P. Warren, Launch! Consulting, Charlottesville, Va.

Producer Members

J.K. Cassidy, Critical Situation Management Inc., Marysville, Pa.
C. Herndon, Herndon Solutions Group, Las Vegas, Nev.

User Members

D.S. Borman, Benton/Washington Regional Public Works Authority, Rogers, Ark.
S.D. Gay, City of Westminster, Westminster, Colo.
M.F. Goddard, New Orleans Sewerage and Water Board, New Orleans, La.
H. Klein, Garden State Laboratories Inc., Hillside, N.J.
M.R. Nandagopal, City of Spokane, Spokane, Wash.
C. Perry, City of Hurst, Hurst, Texas
K. Schweitzer, Hicksville Water District, Hicksville, N.Y.
S. Stephens, Austin Water Utility, Austin, Texas
P. Thompson, Suffolk County Water Authority, Oakdale, N.Y.

* Nonvoting

Preparedness Culture

One mark of a utility that has the capacity to respond effectively to emergencies is a strong preparedness culture. This culture is evident when an emergency response plan (ERP) is kept current—staff are trained in their responsibilities as they relate to the plan; resources necessary to implement the ERP are supported by the budget; staff are aware of emergency preparedness activities and participate in them; an explicit organizational commitment to emergency planning is made; and a management process is in place for staff to take corrective action when necessary improvements are identified. Improvements are identified through risk assessments, plan updates, training, exercises, incident investigations, and other activities described in this manual. When a utility has a preparedness culture, the ERP “lives” as a resource that is adapted and updated whenever there are significant changes that affect the plan. Also, staff are empowered to speak up and constructively affect change that ultimately improves the utility’s level of preparedness. With this culture in place, preparedness is not a burden but an aspect of the utility that is valued and protected by staff, leadership, and other stakeholders due to its significant benefits.

Most utilities are very good at meeting their mission during normal operations, which include small and even routine process upsets. However, when upsets become nonroutine and large in scale or when emergencies arise, utilities with strong and effective preparedness cultures are better equipped to restore the critical lifeline services they provide each community. In contrast, those utilities that lack a strong preparedness culture struggle to restore services, which in some cases exacerbates the situation.

This chapter outlines and defines the concept of “culture” within an organization and presents the core components of a strong emergency preparedness culture within a utility. Organizational culture refers to a system of shared meaning that distinguishes the organization from other organizations. This shared meaning is held by organization members. A strong culture is characterized by the organization’s core values being both intensely held and widely shared (Wiener 1998). A preparedness culture, therefore, is one where being prepared for emergencies is highly valued. The core components of the preparedness culture cycle, as illustrated in Figure 1-1, include the following: