TR-16

GUIDES FOR THE DESIGN OF WASTEWATER TREATMENT WORKS

2011 Edition
as Revised in 2016

Prepared by the

New England Interstate Water Pollution Control Commission

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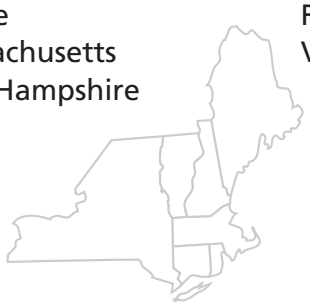

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Cover photos: Top, functioning Warwick, Rhode Island treatment facility (Google Earth photo); bottom, same facility flooded due to major storm in March of 2010; center, elevated pumping station in Warwick, Rhode Island, designed in part in response to new storm patterns in the Northeast.

Introduction to Revised 2011 Edition

In the Northeast and throughout the world, extreme storm events are growing in frequency and force. Hurricanes and blizzards threaten the operation of wastewater infrastructure and in some cases the infrastructure itself. Consequently existing wastewater facilities should be made more resilient though preparedness planning, design changes, and physical upgrades.

To support this important work, NEIWPCC undertook an effort beginning in 2014 at the direction of our Executive Committee to review and revise this book to reflect these resiliency and adaptation considerations. In addition to the revised technical design guidelines in this volume, NEIWPCC is releasing a supplemental guide to provide further information about mitigation measures and present programs, and plans available, in light of lessons learned from facilities that have been affected by major storm events.

New material in this volume defines critical equipment and offers guidance on backup-power requirements, determination of 100-year flood elevation, flood-elevation design considerations, and levels of protection for new equipment. Changes from the 2011 edition include new and revised design considerations in section 1.2.1.h, and expanded discussions of, flooding as an emergency condition under section 1.2.13.4, and of flooding as a consideration when siting water-treatment facilities in section 4.1.2.

There are minor revisions or additions to 1.2.1.i, 1.2.12.a, 2.2.4, 3.1.3, and 3.6.2.7. The revised considerations about flooding also had implications for the discussion of plant hydraulics at 4.3.5.

A wastewater treatment facility must be able to operate under all conditions. Failure to operate can lead to raw sewage being discharged into rivers, oceans, and other bodies of water. The threat that hurricanes and other storms pose to wastewater treatment works is thus a direct environmental threat to communities and the public. As a result, most wastewater plants have precautions and plans in place to remain in service even under extreme conditions.

Nonetheless as storms grow more frequent and more powerful, further improved infrastructure and resiliencies are needed at wastewater plants. Wastewater facilities should prepare for flooding, power outages, equipment damage and failures, and much more.

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INTRODUCTION TO 2011 EDITION

The New England states and New York State are renowned for their lakes, streams, rivers, and coastal waters. These water resources are vital to the region's economy and are precious to its citizens. Effective wastewater treatment is absolutely fundamental to protecting these invaluable assets and to protecting public health. Thus, the proper design, construction, maintenance, and operation of wastewater treatment facilities is crucial. The region is fortunate to have many dedicated professionals who are committed to this effort and have been instrumental in the great successes that have been achieved.

For many years, these professionals have turned to the New England Interstate Water Pollution Control Commission's *Guides for the Design of Wastewater Treatment Works* as a helpful resource. Commonly known as TR-16 (short for Technical Report #16), this document provides guidance of value to engineers who are responsible for designing wastewater treatment plants, state regulators who are responsible for reviewing and approving the designs, and municipalities that may need assistance with the solicitation of professional design services for a wastewater facility. TR-16 is intended for use in conjunction with other available technical manuals, such as those produced by the Water Environment Federation (WEF).

The first edition of TR-16 was developed in 1962 in an effort to standardize wastewater treatment plants and to ensure consistency of design among the facilities in New England. Rapid advances in treatment technology necessitated the publication of an updated edition in 1980, and in 1998, amid the continued technological progress, NEIWPCC published the third edition of TR-16, which was developed with the assistance of a NEIWPCC workgroup formed specifically for the task.

In 2009, NEIWPCC's Executive Committee saw a need to revise the 1998 edition to incorporate advances in technology and eliminate out-of-date material. With guidance from the Executive Committee, NEIWPCC staff formed an advisory board made up of regional wastewater experts. The advisory board identified the changes needed in existing chapters and the new concepts that needed to be incorporated, such as new technologies, energy efficiency, and climate change implications. The board drafted an outline for the revised document, then recruited volunteers from the private and public sector to create the content. For each of the thirteen chapters, a writing group was formed, with one person taking on the key role of group chair. Under the supervision of NEIWPCC's project officer, the process of writing, reviewing, editing, and graphic design began, which ultimately resulted in the publication of this, the 2011 edition of TR-16.

The immense effort involved in creating this resource is justified when you consider what is at stake. Most wastewater treatment infrastructure is owned and operated by local municipalities and directly supported by taxpayers. This infrastructure is one of the largest assets of most communities. It is essential that it be designed to operate effectively and in a cost-effective manner. To achieve this goal, it is imperative that any design guidelines be as up-to-date as possible. Advances in wastewater treatment technology and energy efficiency, new approaches based on the need for sustainability—all must be incorporated, and all have been in this new edition. Note that the absence in this guide of design criteria for any specific process does not imply that the process is unacceptable.

This 2011 edition of TR-16 is the culmination of three years of writing, reviewing, editing, formatting, and coordinating. Its purpose, however, remains the same as in 1962, 1980, and 1998—to provide guidance in the design and preparation of plans and specifications for wastewater treatment works. As a guide, it is not to be construed as superseding the requirements, regulations, policies, and standards of the appropriate state water pollution control agencies. Users of this guide should be aware of all applicable regulations, and local and state regulators should always be contacted before starting facility planning. Users should also be familiar with federal requirements that apply to the development of engineering reports, plans, and specifications.

As is noted within this document, anticipated changes in weather patterns as a result of climate change and sea level rise should be factored into design. More precise predictions about these impacts are being developed and will change as more information is available; it is important to stay abreast of the latest thinking on this critical topic. Also, while this document focuses on traditional, centralized wastewater infrastructure, there is no denying that decentralized treatment systems can be a sound alternative. The New England states and New York State have developed separate guidance for decentralized systems, as well as for green infrastructure, stormwater, and other subjects of growing importance. To the extent possible, all these materials should be considered by municipalities seeking the best solutions for a clean environment.

Lastly, let us never forget that clean water is a finite resource that needs to be protected for future generations. Successful project designs should always have one priority above all others—the long-term protection of the precious water in our lakes, rivers, and streams.

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