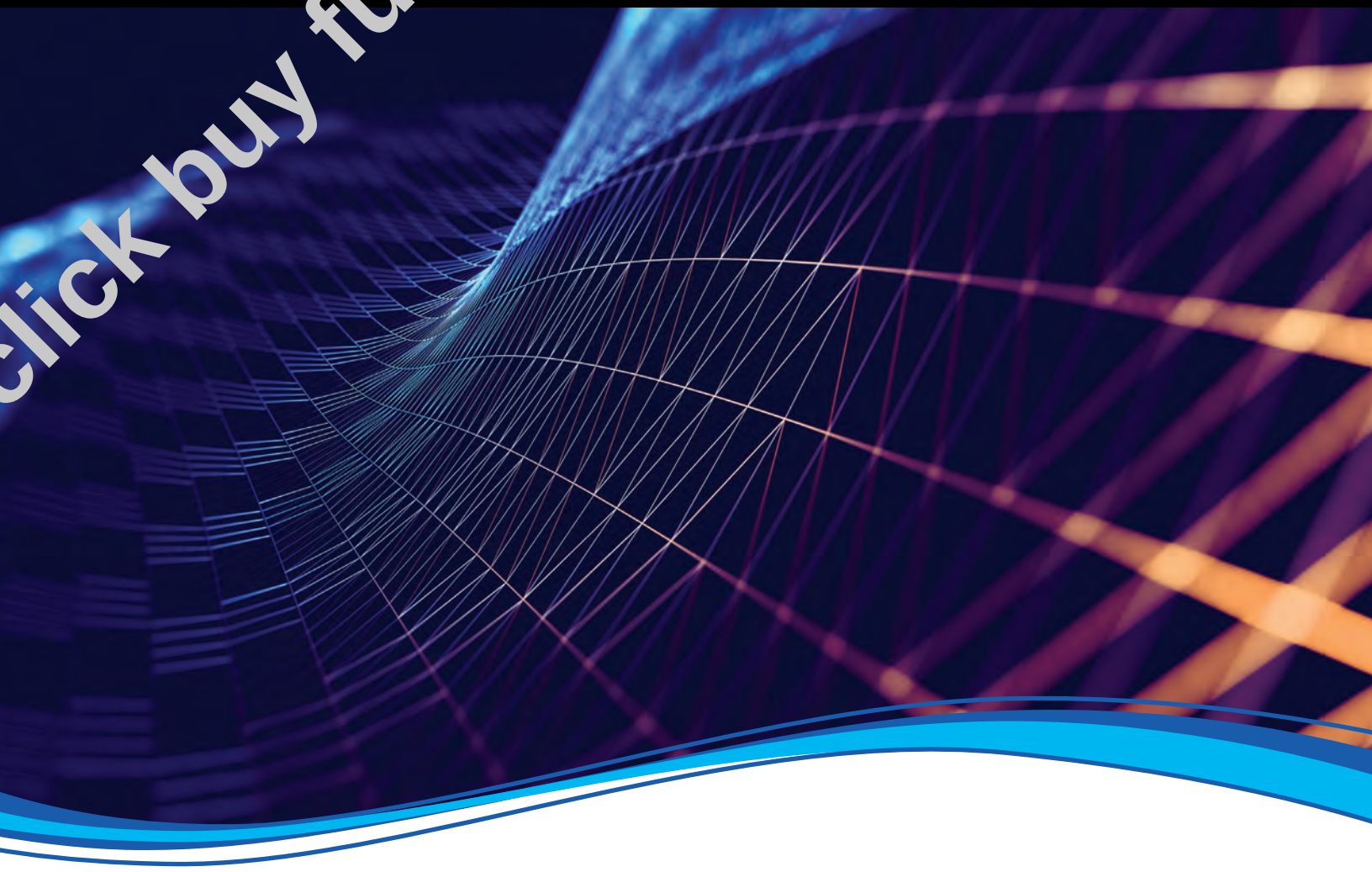
Manual of Water Supply Practices

M77

# Condition Assessment of Water Mains





American Water Works Association

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# Preface

Water main condition assessment currently ranks among the most important subjects to water utilities, and interest in this subject is rapidly growing. As the average age of their infrastructures increases, utilities are increasingly challenged to maintain levels of service while keeping water affordable to all. Condition assessment helps utilities meet this challenge by identifying more precisely where money is best spent, leaving in place pipelines that have adequate integrity and preventing the unnecessary failures of others.

The assessment of buried pipelines is never simple, and water mains are particularly challenging. They are difficult to access, and concerns exist regarding water contamination and the need to maintain water service for sanitation, commerce, and fire protection. Because water main condition assessment is relatively new, there's a scarcity of authoritative, peer-reviewed material to guide utilities. Instead, utilities often are left to rely on the claims of inspection companies, some of which are not well established. This manual fills an important need, providing a comprehensive overview of the many methods that can be used to assess water mains.

Methods range from desktop studies to leak detection to full-length, high-resolution scans from inside the pipes. The choice of method and the interpretation of results are both art and science, with decisions based on economics and risk tolerance. This manual provides the technical information utility managers and engineers need to make informed decisions, along with practical information about how methods can be deployed.

For assessment of most pressure pipelines, a multistep approach is recommended. By starting with simpler, less-expensive examinations, then progressing if necessary to more expensive techniques, resources can be leveraged. Assessment is meant to answer questions about questionable pipes, where a decision is needed that affects service or cost. Assessment is usually less useful when applied to pipes that are known to be in very good or very poor condition. Pipes may be distribution or transmission mains, where the consequences of a break range from mundane to intolerable. In either case, with condition assessment, decisions can be made more confidently and the likelihood of a poor decision reduced. Risks are better managed.

This manual is largely organized around the various inspection methods, with chapters also devoted to program management. The physical inspection techniques focus on detecting degraded materials—corroded metal in particular. Readers should keep in mind that other causes of main failure, including ground movement (pipe bending), pressure surges, casting defects, poorly made welds, and other joint problems may be difficult (if not impossible) to detect in advance of failure.

It is important to understand the limitations of the various inspection methods: what sizes and types of defects might be missed; whether the method has been verified by independent, third-party verifications (dig-ups); and where blind spots exist. Several methods, for instance, have difficulty finding defects near pipe joints. Irregularities such as riveted seams or heavy scales may produce "noisy" data. No method is perfect, and no inspection method finds all possible defects. The methods and techniques included in this manual have been reviewed by the Water Main Condition Assessment Committee and found to be worthy of consideration, but not all have been proven through years of use and *independent* testing. Inclusion in this manual does not imply AWWA or committee endorsement of any particular method or the companies that provide it. Utilities are encouraged to start with the information presented in this manual, consult other publications, seek referrals, and ask hard questions before investing.

The applicability of these methods varies depending on pipe material. Some methods apply to all types of pipe, while others apply more narrowly to metal or reinforced concrete pipes. The focus is also on water mains (large and small). It is usually not economical to assess small service laterals with these methods. Chapter 3 provides guidance regarding which methods can be used for which types of pipe and also regarding selecting and procuring services. This manual focuses on methods that are commercially available in North America, and because the field is rapidly evolving, other methods are expected to be introduced in the next few years. A few of these are listed in Appendix A.

Unlike the other chapters in this manual, Chapter 13 addresses one specific material: prestressed concrete cylinder pipe (PCCP). PCCP has been particularly problematic due to its propensity to fail without warning and in a catastrophic manner. As a result, much attention has been paid to the assessment of PCCP, and many tools and techniques specific to this type of pipe have been developed. Some of these tools are now being applied to other types of material, particularly bar-wrapped steel cylinder concrete pipe.

Through the publication of this manual, AWWA hopes to provide practical information that water utilities will use to better manage their systems. AWWA also seeks your feedback regarding this manual and other ways to advance this important discipline. This marks the start of a continuous, dedicated effort to collect and disseminate reliable information on water main condition assessment. Your participation in this process is welcomed and encouraged.

—Water Main Condition Assessment Committee
Dan Ellison, PE – Chair