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Standard Guidelines for the Design, Installation, and Operation and Maintenance of Stormwater Impoundments

ASCE
AMERICAN SOCIETY OF CIVIL ENGINEERS

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Three Complete Standards

Standard Guidelines for the Design of Stormwater Impoundments

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CHAPTER 1
SCOPE

These guidelines intend to present design guidance for stormwater impoundments. The guidelines' purpose is to focus on local and regional impoundments to manage, treat, and/or attenuate stormwater runoff, thus reducing the impact of stormwater on downstream areas due to land-use changes from water discharge and water quality perspectives.

The guidelines do not address the broader issues associated with larger-scale flood control impoundments and reservoirs, which have unique and multipurpose aspects. These guidelines also do not address applications such as injection systems or impoundments of combined sewer overflows (CSOs).

Both International System (SI) units and customary units are used throughout the guidelines for the narrative, figures, and tables. The formulas are written in dual units or written separately to show the use of either SI or customary units.

1.1 APPLICABLE STANDARDS

The following standards are available from the offices of the cited organizations, e.g., American Society of Civil Engineers (ASCE) in Reston, Virginia, or the U.S. Government Printing Office where indicated. The standards are mentioned in these guidelines at the sections in which they are applicable. Other references as needed for these guidelines are listed in Chapter 12, References.

ASCE. (2004). "Regulated riparian model water code." *ASCE/EWRI 40-03*, Reston, VA.

ASCE. (2009). "Comprehensive transboundary water quality management agreement." *ASCE/EWRI 33-09*, Reston, VA.

OSHA (U.S. Occupational Safety and Health Administration). (2002a). "Occupational safety and health standards." 29CFR1910.146, Dept. of Labor, Code of Federal Regulations, U.S. Government Printing Office, Washington, DC, 467–488.

OSHA (U.S. Occupational Safety and Health Administration). (2002b). "Safety and health regulations for construction." 29CFR1926.652, Dept. of Labor, Code of Federal Regulations, U.S. Government Printing Office, Washington, DC, 377–410.

1.2 SCOPE OF CHAPTERS

Chapter 2, Definitions, defines the specific terms used in these guidelines. Common dictionary definitions will not be included in this document.

Chapter 3, Objectives of Stormwater Impoundments, includes (a) flood attenuation, (b) aesthetics, (c) multiuse facilities, (d) water quality, and (e) underground recharge.

Chapter 4, Types of Stormwater Impoundment Systems, addresses major types of stormwater impoundments, including retention, detention, and combined detention/infiltration facilities. Best management practice aspects of impoundments such as water quality enhancement and infiltration systems and underground stormwater detention, wetlands, and common problems of detention and retention are also discussed in this chapter. Infiltration and evaporation are additional topics discussed in this chapter.

Chapter 5, Regulations and Permits, describes basic requirements for permitting and plan approvals for stormwater impoundments projects. This chapter also describes the general guidance to assist the engineer or designer in developing a project permitting strategy. Local, state, and federal government requirements are discussed separately in this chapter. Local government requirements include land use and floodplain management considerations. State government requirements include environmental impact analysis, dam safety, water rights, and air quality. Federal government requirements include National Pollution Discharge Elimination System (NPDES), Section 401 of the U.S. Environmental Protection Agency (USEPA) Clean Water Act, Section 404 of the Clean Water Act, and Section 10 of the Rivers and Harbors Act of 1899.

Chapter 6, Design Requirements, describes basic requirements for proper design and contract documents. Investigation areas needed are also listed.

Chapter 7, Safety, addresses means of mitigating possible risks of stormwater impoundments to public health, safety, and welfare. This section discusses structural adequacy, drowning risk, and insect problems.

Chapter 8, Inflow Hydrology, describes the hydrologic methodologies and parameters used to quantify the stormwater peak flow rate, volumes, and distribution that are used as the primary inputs to the sizing of stormwater impoundments.

Chapter 9, Hydraulic Design, addresses stormwater conveyance and management as flows enter and leave impoundments and downstream issues that can affect outfall capacity and performance. The summary guidelines covered in this chapter include the hydraulic design of structure inlet and outlet works. The guidelines consider each hydraulic structure element individually and in combination to address the influences that they may have on upstream and downstream system capacity. This chapter covers the hydraulic analysis approach and summarizes design considerations that can affect system capacity and performance.

Chapter 10, Routing, brings together the three essential ingredients in the design and analysis for the attenuation performance of a detention basin, be it constructed, a natural or modified pond, or wetland area, and retention basins or combined detention/infiltration basins. First is the inflow hydrograph (discussed in Chapter 8), which provides the temporal characteristics of the stormwater flow entering the basin. Second is the discharge-elevation relationship (discussed in Chapter 10), which establishes the discharge (flow rate) through the outlet control at various water-surface elevations in the basin. For retention or detention basins with infiltration features, a percolation-elevation