Chapter

1

Introduction to the Guidebook

1.0 Introduction

On January 1, 1988, the District of Columbia Storm Water Management Regulations became effective. These regulations require that development and redevelopment projects provide a system to manage the quality and quantity control of storm water runoff from those sites. Inadequate management of increased storm water runoff resulting from development increases combined sewer overflows, overloads system transport capacity of streams and storm sewers, and creates adverse impacts downstream such as flash flooding, channel erosion, and surface and groundwater quality degradation.

As a highly urbanized city with runoff patterns no longer gathering to natural drainage routes, the District of Columbia is very sensitive to urban runoff. Point sources are controlled by permits, pretreatment programs, and technologically advanced treatment facilities. Non-point source pollution, especially due to runoff from the city's impervious surfaces, is more difficult to control. This design manual presents the minimum standard criteria to be used by design engineers and planners for the planning, design, and construction of Best Management Practices (BMPs) in order to comply with the District of Columbia Storm Water Management Regulations (District of Columbia Municipal Regulations (DCMR) Title 21, Chapter 5).

1.1 Purpose And Scope of the Guidebook

The purpose of 21 DCMR, Chapter 5 is to promote public health, safety, and welfare by establishing requirements and procedures to control the adverse impacts of increased storm water runoff. The application of the provisions and the procedures stated in 21 DCMR, Chapter 5, together with the specific design criteria stated in the *Storm Water Guidebook*, establishes the District of Columbia's Storm Water Management program. The Watershed Protection Division, within the Department of Health’s Environmental Health Administration (also referred to as the "Department" in this guidebook) shall be responsible for coordinating and enforcing the provisions stated in 21 DCMR, Chapter 5.

This Guidebook is intended only as a guide. The design engineer shall be fully responsible for reviewing, verifying and selecting the applicability of all material presented herein as it pertains to the specific project under design and to submit, as required, all reports, design computations, worksheets, geotechnical studies, surveys, rights-of-way determinations, etc., in a fashion prescribed hereinafter. All such required submittals will bear the seal and signature of the Professional Engineer licensed to practice in the District of Columbia, and who is responsible for that portion of the submitted project.

1.2 Impacts of Urban Runoff

There are two primary impacts that typically result from new development. First, the hydrologic response of the area is changed. This change typically includes increased runoff volumes, flows, velocities, and reduced base flow. Second, increases in human activities, which may range from heavy automobile use to complex chemical processing, generate pollutants which are washed off into District of Columbia surface and groundwater bodies.

1.2.1 Hydrologic Impacts

Urban development can cause significant changes in the rainfall-runoff relationship within a watershed. Typically, the volume and rate of runoff for a given rainfall event increases with urban development (see Figures 1.1 and 1.2). As a result of the transformation from a natural catchment to a typical sewershed, there is an increase in the amount of imperviousness. Also, the natural drainage patterns are modified and the runoff is channeled into storm drains, road gutters, and paved channels. This leads to an increase in runoff velocity, a shorter time for the runoff to travel downstream, and decreased infiltration into groundwater aquifers.

Many small watersheds or small drainage areas in the District of Columbia are rapidly being developed for residential, commercial, and industrial uses. The natural drainage systems or existing storm/combined sewer systems are not capable of adjusting to the dramatic hydrologic changes that occur as a result of such development. A major consequence associated with this phenomenon are the increased magnitude and frequency of flooding often causing flooding of city streets during and after high frequency storm events.

1.2.2 Water Quality Impacts

As land is developed, naturally vegetated areas that once allowed water to infiltrate and purify itself in the soil are replaced with impervious surfaces. These impervious surfaces accumulate pollutants deposited from the atmosphere, leaked from vehicles, or windblown from adjacent areas. During storm events, these pollutants quickly wash off and are rapidly delivered to downstream waters. Some common pollutants found in urban storm water runoff and their sources are profiled in Table 1.1.

Most nonpoint source pollution in the District of Columbia comes from urban runoff, which includes surface runoff, combined sewer overflows, new construction, and land disposal of pollutants. Approximately 65% of the District of Columbia's natural groundcover has been replaced with impervious surfaces. As the percentage of impervious surface increases, the volume and rate of surface runoff increases. With the city receiving an average of 40 inches of precipitation per year, approximately 87,000 ac-ft of overland runoff may potentially reach District of Columbia waterways each year through overland flow, stream flow, and sewer systems. Annual pollutant loads for the District of Columbia were calculated using the Alternative Model for Urban Water Quality (AMUWQ). The model output provides an estimate of the total annual load at the 1982 levels of treatment (Table 1.2).

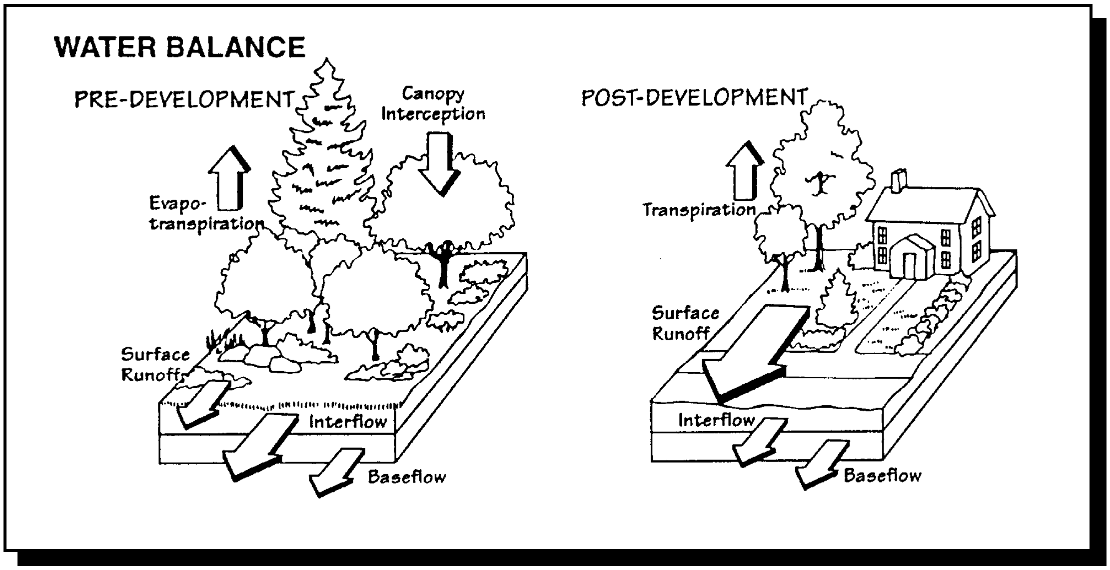

Figure 1.1 Changes in the Water Balance Resulting from Urbanization

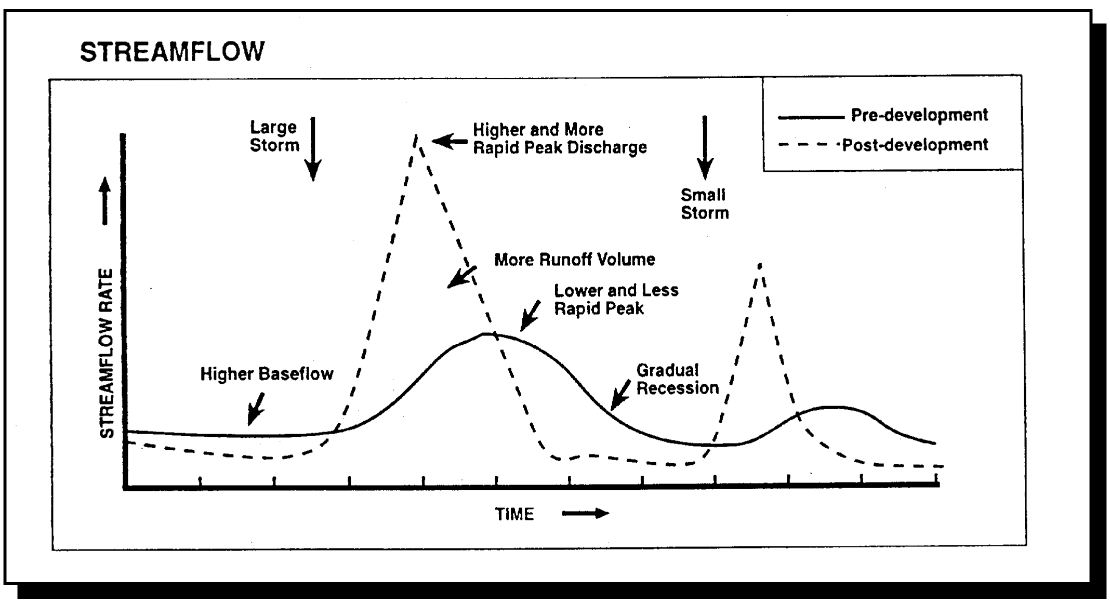

Figure 1.2 Changes in Streamflow Resulting from Urbanization

Table 1.1 Common Pollutants Found in Urban Storm Water Runoff and Their Sources

Pollutant	Automobile/ Atmospheric Deposition	Urban Housekeeping / Landscaping Practices	Industrial Activities	Construction Activities	Non-Storm Water Connections	Accidental Spills & Illegal Dumping
Sediments	X	X	X	X		
Nutrients	X	X	X	X	X	X
Bacteria and Viruses	X	X		X	X	X
Oxygen Demanding Substances		X	X	X	X	X
Oil and Grease	X	X	X	X	X	X
Anti-Freeze	X	X		X	X	X
Hydraulic Fluid	X	X	X	X	X	X
Paint		X		X	X	X
Cleaners and Solvents	X	X	X	X	X	X
Wood Preservatives		X		X	X	X
Heavy Metals	X	X	X	X	X	X
Chromium	X	X	X			
Copper	X	X	X			
Lead	X	X	X			
Zinc	X	X	X			
Iron	X		X			
Cadmium	X		X			
Nickel	X		X			
Magnesium	X		X			
Toxic Materials						
Fuels	X		X	X	X	X
PCBs	X				X	X
Pesticides	X	X	X	X	X	X
Herbicides	X		X	X	X	X
Floatables		X	X	X		

Source: Municipal Handbook, State of California, 1993

Table 1.2 Estimated Total Annual Pollutant Loading to Waterways in the District of Columbia

Pollutant Parameter	**Total Annual Load (million pounds per year)**	**Total Annual Load (pounds per acre per year)**
Biological Oxygen Demand	69.6	1,733
Total Suspended Solids	309.1	7,699
Total Nitrogen	12.0	299
Total Phosphorus	2.95	73
Lead	0.98	24

Source: Young and Danner, 1982