Chapter 1: Introduction to the Manual

Section 1.1 Purpose of the Manual

The purpose of this manual is threefold:

1. To protect the waters of the State of New York from the adverse impacts of urban stormwater runoff
2. To provide design standards on the most effective stormwater management approaches including:
    - Incorporation of green infrastructure achieved by infiltration, groundwater recharge, reuse, recycle, evaporation/evapotranspiration through the use of green infrastructure techniques as a standard practice
    - Design and implementation of standard stormwater management practices (SMPs)
    - Implementation of a good operation, inspection, and maintenance program
3. To improve the quality of green infrastructure and SMPs constructed in the State, specifically in regard to their performance, longevity, safety, ease of maintenance, community acceptance and environmental benefit

Section 1.2 How to Use the Manual

The *New York State Stormwater Management Design Manual* provides designers a general overview on how to select, locate, size, and design SMPs at a development site to comply with State stormwater performance standards. The manual also contains appendices with more detailed information on landscaping, SMP construction specifications, step–by- step SMP design examples and other assorted design tools. The manual is organized as follows:

Chapter 2. Impacts of New Development

This chapter examines the physical, chemical, and biological effects of unmanaged stormwater runoff on the water quality of local streams and waterbodies. This brief overview provides the background for why the stormwater management manual is needed and how the new criteria will help local communities meet water quality standards.

Chapter 3. Stormwater Management Planning

This chapter explains the required stormwater management planning process and steps for maintaining preconstruction natural hydrologic conditions of the site by application of environmentally-sound development principles, such as preservation of microtopography, organic soil layers and vegetation, green infrastructure, as well as steps involved in treatment and control of runoff discharges from the site in new development and redevelopment projects.

Chapter 4. Unified Stormwater Sizing Criteria

This chapter explains sizing criteria for water quality, runoff reduction, channel protection, overbank flood control, and extreme flood management in the State of New York. The chapter also outlines the basis for design calculations.

Chapter 5. Green Infrastructure Practices

This chapter provides planning and design criteria on green infrastructure approach and specifications for acceptable runoff reduction practices. This chapter contains the following sections:

4. Green Infrastructure Planning
    - Preservation of Natural Features and Conservation Design
    - Reduction of Impervious Cover
5. Green Infrastructure Techniques

Chapter 6. Performance Criteria

This chapter presents specific performance criteria and design specifications for the design of the five groups of structural SMPs. The performance criteria for each group of SMPs include on six factors:

6. Feasibility
7. Conveyance
8. Pretreatment
9. Treatment
10. Landscaping
11. Maintenance

In addition, the chapter provides guidance on design adjustments that may be required to ensure proper functioning in cold climates.

Chapter 7. SMP Selection

This chapter presents guidance on how to select the best SMP or group of practices at a development site, as well as environmental and other factors to consider when actually locating each SMP. The chapter contains five comparative matrices that evaluate SMPs based on the following factors:

12. Land Use
13. Physical Feasibility
14. Watershed /Regional Factors
15. Stormwater Management Capability
16. Community and Environmental Factors

Chapter 7 is designed so that the reader can use the matrices in a step-wise fashion to identify the most appropriate SMP or group of practices to use at a site.

Chapter 8. Stormwater Management Design Examples

Design examples are provided to help designers and plan reviewers better understand the new criteria in this manual. The step-by-step design examples demonstrate how the new stormwater sizing criteria are applied, and some of the design procedures and performance criteria that should be considered when planning a new stormwater management practice.

Chapter 9. Redevelopment Projects

This chapter outlines alternative approaches to stormwater management for redevelopment projects. The approaches defines application criteria, sizing criteria, and performance criteria set forth for compliance with the Department's technical standards.

Chapter 10. Enhanced Phosphorus Removal Supplement

This chapter addresses design standards for "enhanced phosphorus removal" for projects in phosphorus-limited watersheds. To meet water quality objectives the enhanced phosphorus removal standards define the sizing criteria, the use of upstream controls as a primary means for reducing runoff volumes, and details on enhanced performance criteria.

Stormwater Design Appendices

The appendices contain the technical information needed to actually design, landscape and construct an SMP. There are a total of thirteen appendices:

Appendix A. Guidelines for Design of Dams

This appendix provides the general guidelines that New York State Department of Environmental Conservation offers the design engineers on the design of dams. These guidelines represent professional judgment and sound engineering practices for small dams in an average situation. These guidelines are not applicable if unusual conditions exist.

Appendix B. Design Tools

The accurate calculation of stormwater flows may require modifications to some methods to account for small storm hydrology. This appendix provides methodologies to calculate the storage requirements for the channel protection flow event, and a methodology to calculate the peak flow from the small water quality storm.

Appendix C. SMP Construction Specifications

Good designs only work if careful attention is paid to proper construction techniques and materials. Appendix C contains detailed specifications for constructing ponds, infiltration practices, filters, bioretention areas and open channels.

Appendix D. Infiltration Testing

This appendix describes methodologies to test soil infiltration rates, in order to determine if infiltration is an acceptable option on site.

Appendices E-G. Checklists

These three appendices provide example checklists that can be used to assist in the plan review, construction, and operation and maintenance of an SMP.

Appendix H. Landscaping Guidance

Good landscaping can often be an important factor in the performance and community acceptance of stormwater SMPs. Appendix H also includes tips on how to establish more functional landscapes within

stormwater SMPs, and contains an extensive list of trees, shrubs, ground covers, and wetland plants that can be used to develop an effective and diverse planting plan.

Appendix I. Cold Climate Sizing Example

This appendix supplies guidance on sizing SMPs to account for cold climate conditions that might hamper performance. Example sizing designs that illustrate how to incorporate cold climate criteria into SMP design are also included.

Appendix J. Geomorphic Assessment

This appendix provides a description of the Distributed Runoff Control (DRC) methodology to size stormwater practices based on downstream geomorphic characteristics.

Appendix K. Miscellaneous Details

The designs of various structures previously discussed in the manual are presented in Appendix K. These structures help enhance the performance of stormwater management practices, especially in cold climates. Schematics of structures such as weirs, trash racks, and observation wells are included.

Appendix L. Critical Erosive Velocities

This appendix provides data on critical erosive velocities for soil and grasses.

Section 1.3 Symbols and Acronyms

As an aid to the reader, Table 1.1 outlines the symbols and acronyms that are used throughout the text. In addition, a glossary is provided at the end of this volume that defines the terminology used in the text.

Table 1.1 Key Symbols and Acronyms Cited in Manual

Symbol	Definition	Symbol	Definition
A	drainage area	Qf	extreme flood storage volume
Af	filter bed area	Qi	peak inflow discharge
As	surface area, sedimentation basin	Qo	peak outflow discharge
Ai	impervious area for runoff reduction	Qp	overbank flood control storage volume

Table 1.1 Key Symbols and Acronyms Cited in Manual			
Aic	total area of impervious cover	qp	water quality peak discharge
cfs	cubic feet per second	qu	unit peak discharge
Cpv	channel protection storage volume	SMP	stormwater management practice
CMP	corrugated metal pipe	Rv	volumetric runoff coefficient
CN	curve number	R/W	right of way
Cpv-ED	extended detention of the 1 year post-development runoff	RRv	runoff reduction volume
df	depth of filter bed	S	Specific reduction factor
du	dwelling units	SD	separation distance
DOT	Department of Transportation	SPDES	State Pollutant Discharge Elimination System
DPW	Department of Public Works	tc	time of concentration
ED	extended detention	tt	time to drain filter bed
fc	soil infiltration rate	TR-20	Technical Release No. 20 Project Formulation-Hydrology, computer program
fps	feet per second	TR-55	Technical Release No. 55 Urban Hydrology for Small Watersheds
h_f	head above filter bed	TSS	total suspended solids
HSG	hydrologic soil group	Vr	volume of runoff
Ia	initial abstraction	Vs	volume of storage
I	percent impervious cover	Vt	total volume
K	coefficient of permeability		volume of voids

Table 1.1 Key Symbols and Acronyms Cited in Manual			
		Vv	
NYSDEC	New York State Department of Environmental Conservation	WQ_v	water quality storage volume
NRCS	Natural Resources Conservation Service	WQ_v-ED	12 or 24 hour extended detention of the water quality volume
P	precipitation depth	WSEL	water surface elevation