

# Table of Contents

Glossary .....	viii
Chapter 1 - Introduction/How to Use this Handbook .....	1
1.1 Purpose of this Handbook .....	1
1.2 What is the Countywide Program? .....	2
1.3 How to Use this Handbook .....	2
1.4 Precedence .....	4
Chapter 2 - Background/Regulatory Requirements .....	5
2.1 Stormwater Problems in Developed Areas.....	5
2.2 Low Impact Development Post-Construction Stormwater Controls.....	6
2.3 Municipal Stormwater Permit Requirements .....	8
2.4 Regulatory Authority .....	13
Chapter 3 - Preparing Permit Application Submittals .....	15
3.1 The Development Review Process.....	15
3.2 How to Prepare Planning Permit Submittals .....	17
3.3 How to Prepare Building Permit Submittals.....	29
3.4 Simple Instructions for Small Sites .....	31
Chapter 4 - Low Impact Development Site Design .....	33
4.1 Tree Preservation and Planting.....	34
4.2 Self-Treating Areas.....	38
4.3 Self-Retaining Areas.....	40
4.4 Reducing the Size of Impervious Areas .....	42
4.5 On-Site Water Storage .....	43
Chapter 5 - General Technical Guidance for Stormwater Treatment.....	45
5.1 Hydraulic Sizing Criteria .....	45
5.2 Applicability of Inlet Filters, Oil/Water Separators and Hydrodynamic Separators .....	53
5.3 Using Manufactured Treatment Measures .....	53
5.4 Using Treatment Trains .....	54
5.5 Infiltration Guidelines .....	55

5.6	Technical Guidance for Low-Flow Systems .....	56
5.7	Plant Selection and Maintenance .....	57
5.8	Mosquito Control .....	59
5.9	Incorporating Treatment with Hydromodification Management .....	60
5.10	Using Treatment Measures in Bay Fill Locations.....	60
5.11	Using Treatment Measures in Seismic Hazard Areas .....	61
5.12	Artificial Turf and Stormwater Treatment .....	61
5.13	Getting Water into Treatment Measures.....	62
Chapter 6 –Technical Guidance for Specific Treatment Measures.....		67
6.1	Bioretention Area (Including Bioretention Swale) .....	68
6.2	Flow-Through Planter Box .....	75
6.3	Tree Well Filter.....	80
6.4	Vegetated Buffer Strip.....	84
6.5	Infiltration Trench .....	88
6.6	Extended Detention Basin .....	92
6.7	Pervious Paving .....	96
6.8	Turf Block and Permeable Joint Pavers.....	100
6.9	Green Roof .....	104
6.10	Rainwater Harvesting & Use.....	106
6.11	Media Filter .....	109
Chapter 7 – Hydromodification Management.....		113
7.1	What is Hydromodification? .....	113
7.2	Hydromodification Management (HM) Controls.....	115
7.3	Which Projects need to Implement HM? .....	116
7.4	Hydromodification Management (HM) Requirements.....	117
7.5	How to Implement HM Requirements .....	118
7.6	Area-Specific HM Provisions .....	121
7.7	When On-site HM is Impracticable .....	121
Chapter 8 – Operation and Maintenance.....		123
8.1	Summary of O&M Requirements .....	123
8.2	Preparing Maintenance-Related Documents .....	127
Chapter 9 – Alternative Compliance.....		137
9.1	What Is Alternative Compliance.....	137
9.2	Categories of Alternative Compliance.....	137

9.3 Offsite or Regional Project completion deadlines.....138  
 9.4 When Does the Alternative Compliance Provision Take Effect?.....138

References ..... 139

Appendix A – Plant List and Planting Guidance

Appendix B – Example Development Scenarios

Appendix C – Treatment Measure Design Criteria Regions for San Mateo County

Appendix D – Applicability of Inlet Filters, Oil/Water Separators and Hydrodynamic Separators

Appendix E – Infiltration Guidelines

Appendix F – Mosquito Control

Appendix G – Operation & Maintenance Document Templates

Appendix H – Areas Subject to Hydromodification Management Requirements

Appendix I – Feasibility/Infeasibility Criteria for Rainwater Harvesting and Reuse, Infiltration and Evapotranspiration

Appendix J – Special Projects Criteria

Appendix K – Soil Specifications

Appendix L – BMP Specifications for Small Projects

## List of Tables

Table 2-1: Projects Excluded from Provision C.3 Requirements .....10  
 Table 3-1: Planning Permit Submittal Checklist .....18  
 Table 3-2: Table of Example Stormwater Source Controls .....27  
 Table 3-3: Building Permit Submittal Checklist .....30  
 Table 4-1. Stormwater Treatment Credits for Interceptor Trees .....35

Table 5-1: Flow and Volume Based Treatment Measure Designs ..... 46

Table 5-2: Estimated Runoff Coefficients for Various Surfaces During Small Storms..... 48

Table 5-3: Unit Basin Storage Volume in Inches for 80 Percent Capture Using 48-Hour Drawdowns ..... 49

Table 6-1: Treatment Measures for which Technical Guidance is Provided ..... 67

Table 6-2: Types of Pervious Paving and Possible Applications..... 96

Table 6-3: Permeable Joint Paver Types and Possible Applications ..... 100

Table 6-4: Typical Water Quality Guideline ..... 107

## List of Figures

Figure 2-1: The Water Cycle ..... 5

Figure 2-2: Change in Volume of Stormwater Runoff after Development ..... 6

Figure 2-3: Creek with Natural Banks..... 7

Figure 2-4: Creek Subject to Hydromodification..... 7

Figure 2-5: Bioretention Areas Designed to Maximize or Prevent Infiltration ..... 11

Figure 2-6: Timeline for Implementing New Provision C.3 Requirements.....14

Figure 3-1: Sample Development Review Process ..... 16

Figure 3-2: Turf Block Fire Access Road..... 21

Figure 3-3: Detention Basin/Playing Field ..... 25

Figure 3-4: Cobbles Used to Prevent Erosion in Vegetated Swale ..... 28

Figure 3-5: Flow-Through Planter Boxes in Dense Urban Setting ..... 32

Figure 4-1: Silva Cells stacked three units high ..... 37

Figure 4-2: Self-Treating Area Usage ..... 39

Figure 4-3: Commercial/Industrial Site Compared to Same Site with Self-Treating Areas..... 39

Figure 4-4: Schematic Drainage Plan for Site with Self-Treating Area..... 39

Figure 4-5: Self-Retaining or Zero Discharge area..... 41

Figure 4-6: Schematic Drainage Plan for Site with a Self-Retaining Area..... 42

Figure 4-7: Parking Lifts in Parking Garage, Berkeley ..... 43

Figure 4-8: Installation of Notched Unit Pavers, Portland, Oregon. .... 44

Figure 5-1: Extended Detention Basin, San Jose..... 47

Figure 5-2: Bioretention Area, Daly City ..... 49

Figure 5-3: Stepped Manhole Design..... 56

Figure 5-4: StormGate Flow Splitter ..... 57

Figure 5-5: Beneficial Insects ..... 58

Figure 5-6: Detention Pond.....60

Figure 5-7 Example of Artificial Turf Installation .....61

Figure 5-8 Cobbles at Storm Drain Inlet .....62

Figure 5-9 Standard Curb Cut Photo .....63

Figure 5-10 Standard Curb Cut Section.....63

Figure 5-11 Standard Curb Cut Plan View.....63

Figure 5-12 Standard Curb Curb Cut with Side Wings Photo .....64

Figure 5-13 Standard Curb Cut with Side Wings Section .....64

Figure 5-14 Standard Curb Cut with Side Wings Plan View .....64

Figure 5-15 Wheelstop Curbs Photo.....65

Figure 5-16 Wheelstop Curbs Section .....65

Figure 5-17 Wheelstop Curbs Plan View .....65

Figure 5-18 Grated Curb Cut Photo.....66

Figure 5-19 Grated Curb Cut Section .....66

Figure 5-20 Grated Curb Cut Plan View .....66

Figure 6-1: Bioretention Area .....68

Figure 6-2: Cross Section, Bioretention Area.....71

Figure 6-3: Cross-Section, Bioretention Area (side view) .....72

Figure 6-4: Check Dams .....72

Figure 6-5: Cross section of bioretention area showing inlet from paving .....73

Figure 6-6: Bioretention Area in Landscaping for Rain Water Leaders.....73

Figure 6-7: Cross section of Lined Bioretention Area (infiltration precluded).....74

Figure 6-8: Flow-Through Planter .....75

Figure 6-9: Plan View of Long, Linear Flow-Through Planter .....77

Figure 6-10: Plan View of Planter.....78

Figure 6-11: Cross Section A-A of Flow-Through Planter.....78

Figure 6-12: Cross Section B-B of Flow Through Planter.....79

Figure 6-13: Above-Grade Planters .....79

Figure 6-14: Close-Up of Flow Through Planter .....79

Figure 6-15: Tree Well Filter .....80

Figure 6-16: Non-Proprietary Tree Filter with Overflow Bypass.....82

Figure 6-17: Cut Away View.....83

Figure 6-18: Roadside, Vegetated Buffer Strip .....84

Figure 6-19: Plan View, Vegetated Buffer Strip .....86

Figure 6-20: Profile View, Vegetated Buffer Strip .....87

Figure 6-21: Infiltration Trench.....88

Figure 6-22: Infiltration Trench Cut-Away View.....90

Figure 6-23: Cut-Away View: Infiltration Trench with Observation Well.....91

Figure 6-24: Extended Detention Basin ..... 92

Figure 6-25: Side View of Riser..... 94

Figure 6-26: Top View of Riser (Square Design) ..... 95

Figure 6-27: Plan View, Typical Extended Detention Basin ..... 95

Figure 6-28: Pervious Concrete..... 96

Figure 6-29: Surface View of Parking Lot..... 98

Figure 6-30: Profile of Pervious Concrete Installation ..... 99

Figure 6-31: Profile of Porous Asphalt Installation ..... 99

Figure 6-32: Turf Block and Pave Mat..... 100

Figure 6-33: Profile of Brick Paver Installation ..... 102

Figure 6-34: Profile of Natural Stone Paver Installation ..... 102

Figure 6-35: Profile of Turf Block Installation..... 102

Figure 6-36: Profile of Unit Paver Installation..... 103

Figure 6-37: Unit Pavers in Private Road, Redwood City ..... 103

Figure 6-38: Notched Pavers..... 103

Figure 6-39: Parking Lot with Turf-Covered Roof..... 104

Figure 6-40: Extensive Green Roof ..... 105

Figure 6-41: Intensive Green Roof ..... 105

Figure 6-42: Plants Supporting Endangered Butterflies ..... 105

Figure 6-43: Rainwater Collection, Mills College, Oakland. .... 106

Figure 6-44: System C Filter Cartridge..... 109

Figure 6-45: Cut Away Profile Views, System A Filter..... 111

Figure 6-46: Profile View, Typical System C Filter Array..... 112

Figure 6-47: Plan View, Typical System C Filter Array..... 112

Figure 7-1: Stormwater Peak Discharge ..... 114

Figure 7-2: Effects of Urbanization on the Local Hydrologic Cycle ..... 114

Figure 7-3: Variation in Rainfall Contribution..... 115

Figure 7-4: Schematic Flow Duration Pond and Flow Duration Curves ..... 120

Figure 8-1: Bioretention Area in Daly City ..... 129

Figure 8-2: Flow-Through Planter..... 130

Figure 8-3: Non-Proprietary Tree Well Filter ..... 131

Figure 8-4 Vegetated Buffer Strip..... 132

Figure 8-5: Infiltration Trench ..... 133

Figure 8-6: Extended Detention Basin..... 134

Figure 8-7: Rainwater Harvesting System, Mills College, Oakland ..... 135

Figure 8-8: Example of Media Filter Cartridge..... 136