## CITY UTILITIES DESIGN STANDARDS MANUAL

Stormwater (SW) Table of Contents

September 2017

Page

Chapter SW1 Acr	onyms and Definitions	
SW1.01 P	urpose	1
SW1.02 A	cronyms	1
SW1.03 D	efinitions	3
Chapter SW2 Intr	roduction	
SW2.01 P	urpose	1
SW2.02 A	pplicability	1
SW2.03 V	ariance from Standards	1
SW2.04 O	rganization of Stormwater Standards	1
SW2.05 St	tormwater Materials	2
SW2.06 St	tormwater Specifications	2
Chapter SW3 Dra	wings and Submittals	
SW3.01 P	urpose	1
SW3.02 St	tormwater Management Requirements	1
1.	Minimum Plant Sheet Elements	1
2.	Stormwater Management Report	2
3.	Operations and Maintenance Manual (O&M)	3
SW3.03 E	rosion Control Submittal Requirements	3
1.	Construction Plan Elements	3
2.	Construction Components	4
Chapter SW4 Spe	ecial Discharges	
SW4.01 P	urpose	1
SW4.02 St	tormwater Policies	1
1.	Sump pumps	1
2.	Geothermal	1
3.	Curb outlets	1
4.	Environmental Catch Basins	1
5.	Dumpster Leaks	2
6.	Infiltration Practices	2
7.	Below Grade Stormwater Discharges	2

SW4.03 Floodplain Ordinance	2
SW4.04 City of Fort Wayne Ordinance	2
Chapter SW5 Hydrology	
SW5.01 Purpose	1
SW5.02 Rainfall	1
1. Rainfall Distributions	3
2. Design Storm Frequencies	3
SW5.03 Runoff	4
1. Time of Concentration Calculation	4
2. Peak Flow Calculations	4
3. Hydrograph Generation Methods	6
SW5.04 Offsite Hydrologic Analysis	7
Chapter SW6 Storm Sewers	
SW6.01 Purpose	1
SW6.02 Design Storms	1
1. Minor Event Design Storm	1
2. Major Event Design Storm	1
SW6.03 Alignment Criteria	2
1. Placement in Existing Rights-of-Way and Easement	2
2. Minimum Distance from Water Lines	3
3. Minimum Distance from Additional Utilities	3
SW6.04 Hydraulic Design	3
1. Flow Equations and Storm Sewer Sizing	4
2. Hydraulic Grade Line	4
3. Headlosses	5
4. Velocity	5
5. Slopes	6
SW6.05 Construction Materials	6
SW6.06 Pipe Size	6
SW6.07 Manholes	6
1. Manholes	6
2. Spacing	6

3.	Manhole Diameter	6
4.	Transition Alignment	7
5.	Transitions in Grade	7
6.	Transition in Pipe Diameter	7
7.	Bench	8
8.	Adjustment Rings	8
SW6.08 C	Dutlets	8
1.	Erosion Protection at Outlets	8
SW6.09 N	Ion-Gravity Flow Stormwater Systems	9
SW6.10 C	checklists and Design Aids	9
Chapter SW7 Inle	<u>ets</u>	
SW7.01 P	Purpose	1
SW7.02 S	tandard Inlets	1
SW7.03 I	nlet Placement	1
SW7.04 I	nlet Hydraulic Capacity	3
1.	Introduction	3
2.	Sump Condition	4
3.	Continuous Grade Condition	4
SW7.05 G	Gutter Flow	8
1.	Introduction	8
2.	Allowable Use of Streets for Stormwater Flows	8
3.	Gutter Flow Capacity	g
Chapter SW8 Cu	lverts	
SW8.01 P	Purpose	1
SW8.02 G	General Design	1
1.	Federal Highway Administration	1
2.	Indiana Department of Transportation	1
SW8.03 F	lydraulic Design	1
1.	Design Program	1
2.	Backwater	1
3.	Overland Flow Routes	2
4.	Minimum Diameter	2

5.	Flow Velocity	2
SW8.04 D	esign Storm (see Section 3, Hydrology)	
1.	Public Culverts	2
2.	Private Culverts	2
SW8.05 St	ump Culverts	2
SW8.06 St	tructural Design	3
1.	Loading	3
2.	Installation Depth	3
3.	Bedding and Backfill	3
4.	Floatation and Anchoring	3
SW8.07 C	ulvert Length Determination	3
SW8.08 In	let and Outlet Configuration	3
1.	Roadside Safety	4
2.	Trash Racks	4
3.	Erosion Control	4
SW8.09 E	nvironmental Considerations	4
SW8.10 P	ermitting	4
1.	Public Agencies	4
SW8.11 C	ulvert Materials	5
Chapter SW9 Ope	en Channels	
SW9.01 P	urpose	1
1.	Natural Channels	1
2.	Constructed Channels	1
SW9.02 C	hannel Geometrics	1
1.	V Shaped Channels	1
2.	Swales	1
3.	Trapezoidal Channels	2
4.	Composite Channel	2
SW9.03 C	hannel Side Slopes	2
SW9.04 C	hannel Slope	2
SW9.05 C	hannel Linings	3
1.	Grass Lined Channels	3

2.	Riprap or Rock Lined Channels	3
3.	Concrete Lined Channels	4
4.	Manufactured Linings	4
SW9.06 E	asements	4
SW9.07 P	ublic Safety	4
SW9.08 G	eneral Design Requirements	5
1.	Design Storm	5
2.	Channel Lining and Stability	5
3.	Channel Slope (Gradient)	5
SW9.09 H	ydraulic Design	5
1.	Uniform Steady Flow Equations	5
2.	Flow Regime	6
SW9.10 P	ermitting	7
Chapter SW10 Cr	<u>ossings</u>	
SW10.01	Purpose	1
SW10.02	General Design Considerations	1
1.	Jurisdictional Agencies	1
2.	Hydraulic Capacity	1
3.	Minimum Pipe Diameter	1
4.	Structural Design	1
5.	Skew Angle	1
6.	Culvert Length	1
SW10.03	Roadway Crossing Design	2
1.	Hydraulic Design	2
SW10.04	Length Design	2
1.	General	2
2.	Regulated Drain Crossings	2
3.	Length Calculations for Perpendicular Crossings of Roadways or Railroads	2
4.	Length Calculations for Skewed Crossings of Roadways or Railroads	2
SW10.05	Roadway Safety	3
1.	Clear Zone	3
2.	Guardrail and Handrail	3

SW10.06 Construction	3
1. Traffic Control	3
2. Open Trench Installation / Jacking and Boring	3
SW10.07 Permitting	3
1. Private Agencies	3
2. Public Agencies	3
Chapter SW11 Stormwater Management	
SW11.01 Purpose	1
SW11.02 Stormwater Management Plans (SMP) for New Development	1
SW11.03 Stormwater Management Plans (SMP) for Redevelopments	2
SW11.04 Acceptable Stormwater Quality Calculation Methods	4
SW11.05 Reduced Runoff Method for Stormwater Quality Calculations	4
SW11.06 Volume Based Method Stormwater Quality Calculations	5
SW11.07 SCS Method for Proprietary Stormwater Quality Units (SQUs)	6
SW11.08 Stormwater Detention Calculations	7
1. Rational Method	7
2. Hydrograph Method	7
SW11.09 Acceptable Types of Stormwater Storage Facilities	7
SW11.10 Design Standards for Detention and Retention Basins	8
1. Grading Requirements	8
2. Use of Retaining Walls	8
3. Emergency Spillway	8
4. Freeboard	9
5. Minimum Flood Protection Grade	9
6. Pipe Outfalls into the Basin	9
7. Stormwater Basin Control Structures	10
8. Public Protection Guidelines	10
9. Landscaping Guidelines	11
10. Multi use configuration	11
SW11.11 Stormwater Pretreatment	11
1. Forebays	11
2. Biofilters	13

SW11.12	Design Standards Unique to Wet Basins	14
1.	Design Considerations	15
2.	Operation and Maintenance Manual Considerations	16
SW11.13	Design Standards Unique to Dry Basins	16
1.	Design Considerations	17
2.	Operation and Maintenance Manual Considerations	17
SW11.14	Design Standards for Retention Basins	18
SW11.15	Design Standards for Constructed Wetlands	19
1.	Design Considerations	19
2.	Operation and Maintenance Considerations	21
SW11.16	Design Standards for Constructed Bioretention Basins	22
1.	Design Considerations	22
2.	Operation and Maintenance Considerations	23
SW11.17	Design Standards for Water Quality Swales	24
1.	Design Considerations	25
2.	Operation and Maintenance Considerations	25
SW11.18	Design Standards Stormwater Basins Adjoining Open Channels	26
SW11.19	Design Standards for Parking Lot Detention	27
1.	Depth Limitations	27
2.	Parking Lot Detention	27
3.	Outlet Configuration	27
4.	Surcharging	28
5.	Parking Lot Maintenance	28
SW11.20	Design Standards for Underground Detention	28
1.	Materials	28
2.	Configuration	28
3.	Basin Control Structure Configuration	28
4.	Maintenance Access	29
SW11.21	Porous Pavement System Requirements	29
1.	Components	29
2.	Site Requirements	29
3.	Storage Volume	29

4.	Outlet	29
5.	Maintenance	29
6.	Design Considerations for Stormwater Quality	30
7.	Operation and Maintenance Considerations	31
SW11.22	Design Standards for Rainwater Harvesting Methods	31
1.	Design requirements	32
2.	Operation and Maintenance Considerations	32
<u>Chapter SW12 Er</u>	osion Control	
SW12.01	Purpose	1
SW12.02	Authority	1
SW12.03	Principles	1
SW12.04	Regulatory and Technical Standards	2
SW12.05	Best Management Practices	2
1.	A Minimum 50 foot Buffer	3
2.	Site Phasing	3
3.	Topsoil Stockpiling	4
4.	Site Management	5
5.	Temporary Construction Entrance	5
6.	Street Maintenance	5
7.	Concrete Washout Area	5
8.	Contaminated Material Maintenance	5
9.	Bank and Pipe Stabilization	6
10	. Detention and Post Construction Water Quality BMP Sequencing	6
11	. Inlet Protection	6
12	. Temporary Perimeter Protection – Silt Fence	7
13	. Temporary Perimeter Protection – Filter Sock	7
14	. Sediment Control Dewatering Bag	7
15	. River/Lake Shore Protection	8
16	. Erosion Control Blanket	8
17	. Straw Bales	8
18	. Temporary Rock Check Dams	9
19	. BMP Operation and Maintenance Manual	9

SW12.06 Storm Water Pollution Prevention Plan (SWPP)	
1. SWPP Submittals and Approvals	9
2. Amending an Existing SWPP	10
3. SWPP Procedural Steps	10
SW12.07 Inspections	12
SW12.08 Enforcement	