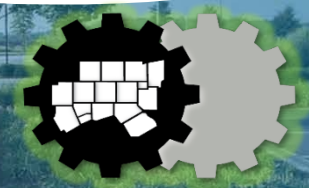
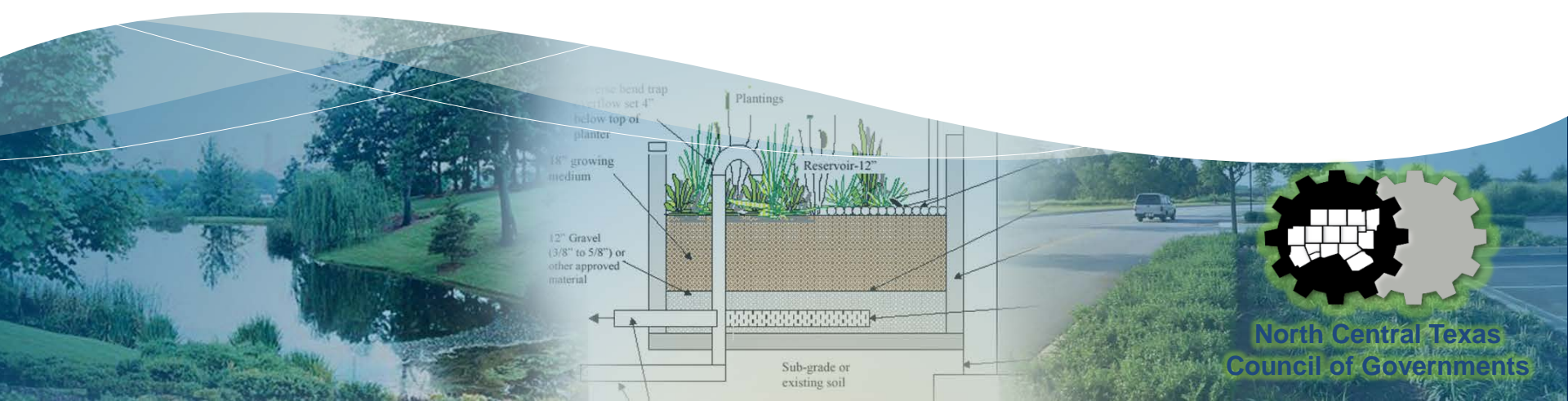




integrated Stormwater Management

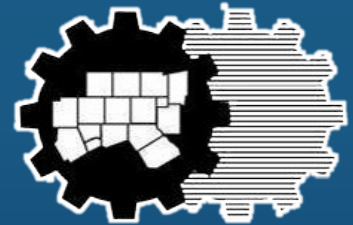


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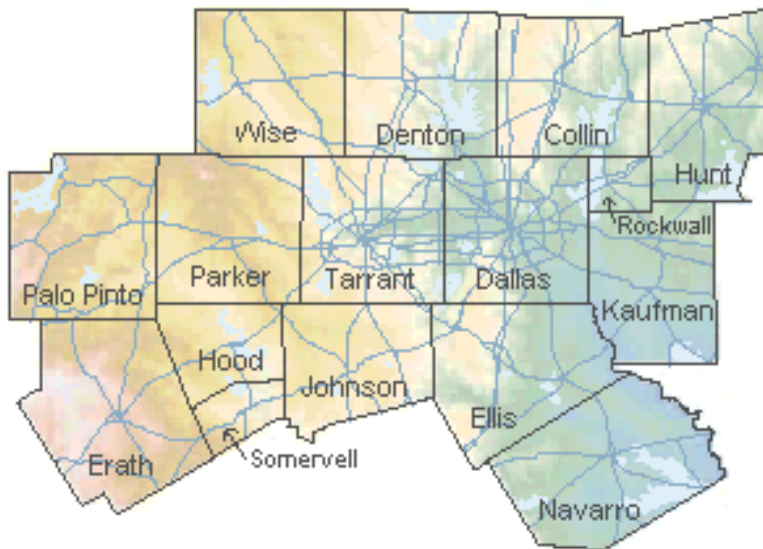
What is iSWM?



- A regional program to assist local governments:
 - Manage stormwater impacts
 - Meet MS4 Permit requirements



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- Collaborative effort between:
 - 60+ local governments
 - iSWM Committee
 - Regional Public Works Council
 - Consultant team led by Freese and Nichols

iSWM Resources

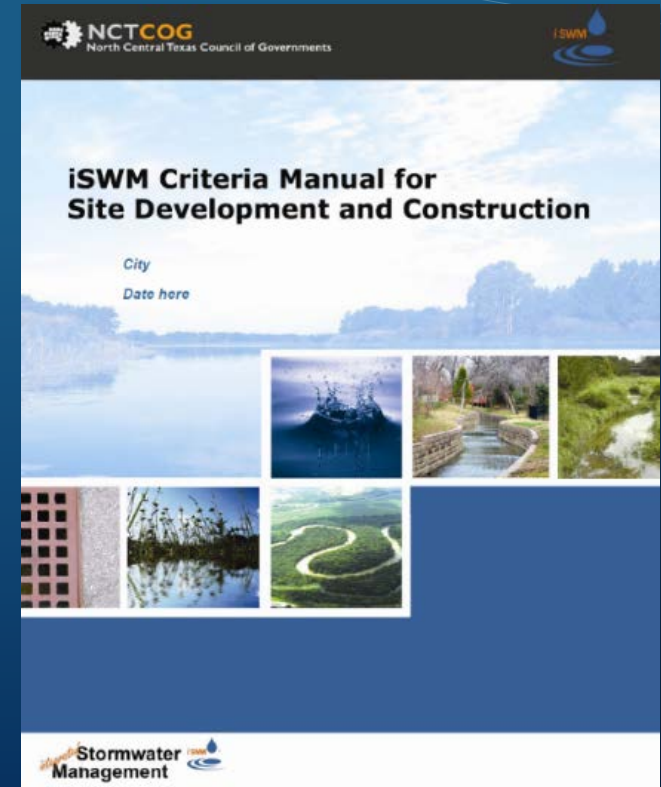


What's in the Criteria Manual?

- **Ch. 1:** Overview of iSWM Criteria Manual
- **Ch. 2:** *integrated* Development Process
- **Ch. 3:** *integrated* Design Criteria
- **Ch. 4:** *integrated* Construction Criteria

Technical Manual:

- Technical and design information
- Online resource for use by local governments and design community
- Separate volumes for easy download and use



Outcome Focused Implementation



North Central Texas Council of Governments ISWM PROGRAM IMPLEMENTATION TIERED MEASUREMENT

SUBMITTING COMMUNITY: _____

Requirements for Implementation Levels

Outcome Category	Gold	Silver	Bronze
Mandatory	10 full application	10 full or partial application	10 full or partial application
Recommended	7 full application	7 full or partial application	4 full or partial application
Optional	3 full or partial application		

Note: The following outcomes apply to land disturbing activities of 1 acre or more for water quality and streambank protection, and apply to all land disturbing activities for flood mitigation and conveyance.

#	Outcome	CHECK COMMUNITY'S LEVEL OF APPLICATION			Full Application	ISWM Criteria Manual Ref.	Equivalent Local Criteria/Ordinance Reference
		N/A	Partial	Full			
MANDATORY OUTCOMES							
1	Site Plan Review Applicability				Stormwater requirements discussed at a pre-development/pre-application meeting or equivalent (Concept ISWM)	Section 2.2, Step 3	
2	Land Use Conditions				Design stormwater infrastructure to fully-developed (built-out) land use conditions	Section 3.6.1	
3	Hydrologic Methods				Limit Rational Method applicability to drainage areas of 100 acres or less and utilize frequency factors (per TM HO Table 1.4); Limit Modified Rational Method applicability to drainage areas of 200 acres or less; For larger areas, require Unit Hydrograph methodology	Section 3.1 Table 3.2; TM* HO** Section 1.2	
4	Open Channel Velocity Criteria/Energy Dissipation				Require maximum permissible channel velocity criteria be met and/or use erosion control measures for 1-, 25-, and 100-yr or similar storm events to protect receiving drainage element from erosion	Section 3.6.3, Table 3.10 and 3.11	
5	Detention Structure Discharge Criteria				When a detention structure is utilized, design facility for fully-developed 1-, 25-, and 100-yr or similar storm events matching pre-development peak flows and velocities; Provide emergency spillway with 6 inches of freeboard to convey fully-developed 100-yr storm event assuming outlet blockage	Section 3.6.3, Detention Structures	
6	Streambank Protection				Require downstream stabilization to prevent erosive velocities; maintain existing downstream velocity conditions with on-site controls; and/or control fully-developed 1-yr, 24-hr storm event release over 24 hours to prevent erosive velocities	Section 1.3, Table 1.3; Section 3.4	
7	Flood Mitigation				Require adequate downstream conveyance for peak discharges; maintain existing downstream peak discharge conditions with on-site controls; and/or provide detention to pre-development peak discharge conditions	Section 1.3, Table 1.3; Section 3.5.2	
8	Construction Controls				Limit erosion and the discharge of sediment and other pollutants from construction sites by adhering to the integrated Construction Criteria or Construction General Permit	Section 4.0	
9	Operations and Maintenance				Define responsible party and requirements for operation, maintenance, frequency of inspection, and enforcement of temporary and permanent stormwater controls and drainage facilities	Section 2.2, Step 5	
10	Downstream Assessments				Confirm no negative impact or mitigate negative impacts of peak discharges and velocities for 1-, 25-, and 100-yr or similar storm events	Section 3.3; TM* HO** Section 2.4	
TOTALS							

North Central Texas Council of Governments ISWM PROGRAM IMPLEMENTATION TIERED MEASUREMENT

RECOMMENDED OUTCOMES							
11	Conveyance Limits				25-yr fully-developed design storm or higher for: streets, roadway gutters, storm drain pipe systems, inlets on-grade and parking lots; 100-yr fully-developed design storm event for: drainage in the right-of-way, drainage easements, and road low points		Section 3.6.2
12	Storm Drain Velocity Criteria				Limit velocity in pipes with minimum and maximum values to prevent clogging and erosion		Section 3.6.1, Table 3.8
13	Spread Criteria				Flow spread limits for various street classifications for 25-yr storm event or higher		Section 3.6.2, Table 3.7
14	Freeboard Criteria				Minimum of 1 foot of freeboard provided for the fully-developed 100-yr storm event for culverts and detention structures; Minimum of 2 feet of freeboard for bridges for fully-developed 100-yr storm event		Section 3.6.3
15	Finished Floor Elevations				Minimum of 1-foot above fully-developed 100-yr storm event water surface elevation or 2-feet above effective FEMA base flood elevation		Section 3.7
16	Water Quality Protection				Require integrated site design practices; treat the water quality volume; and/or enact regional water quality programs		Section 1.3, Table 1.3; Section 3.2
17	Drainage and Floodplain Easements				Required for all drainage systems that convey stormwater runoff across property boundaries and must include sufficient area for operation and maintenance of the public drainage system		Section 3.7
TOTALS							
OPTIONAL OUTCOMES							
18	Open Channel Stability Criteria				Design includes low-flow channel		Section 3.6.3
19	Detention Downstream Timing Analysis				Confirm detention does not exacerbate peak flows in downstream reaches		Section 3.5.2, Option 3
20	Conservation and Utilization of Natural Features and Resources				Ordinances encourage preservation of natural resources such as riparian buffers and/or natural open space areas and utilization of natural design features for stormwater conveyance		Section 3.2.2; TM* PL*** 2.2.1
21	Lower Impact Site Design Techniques				Ordinances encourage reducing limits of clearing and grading and limiting impervious cover per integrated site design practices		Section 3.2.2; TM* PL*** 2.2.2
22	TriSWM				Incorporate practices for improving water quality of runoff from public rights-of-way		Appendix A of the ISWM Criteria Manual
TOTALS							

*TM = ISWM Technical Manual **HO = Hydrology Section of the Technical manual ***PL = Planning Section of the Technical manual

Tier Level Applied For: GOLD SILVER BRONZE

Print Name and Title of Local Stormwater Authority _____

Contact Phone Number and Email _____

Signature of Local Stormwater Authority _____

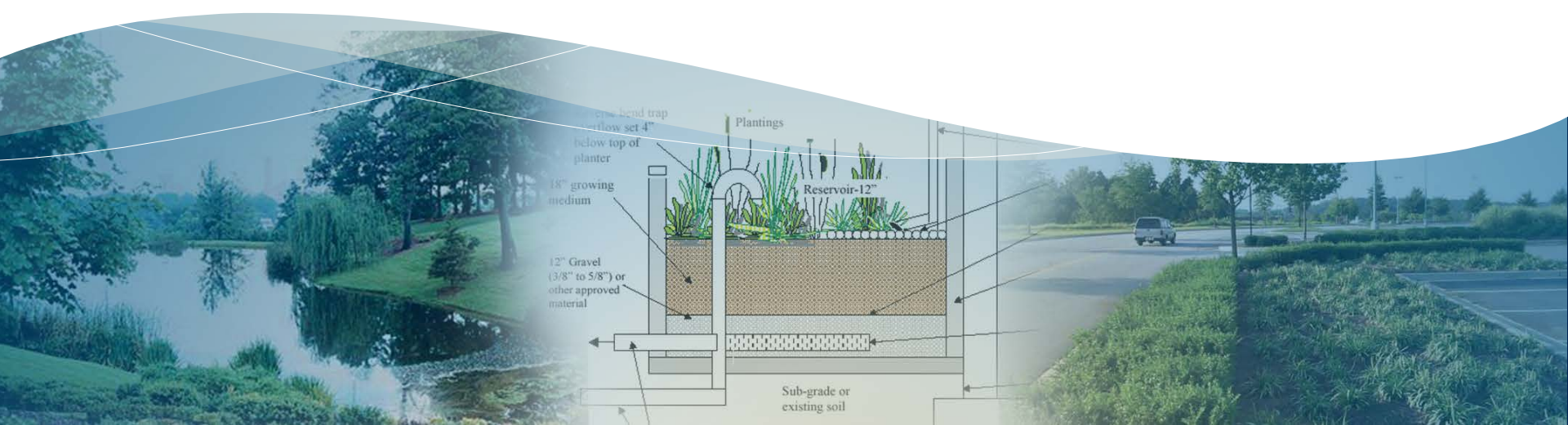
Date _____

For IIS Review Board Use Only:

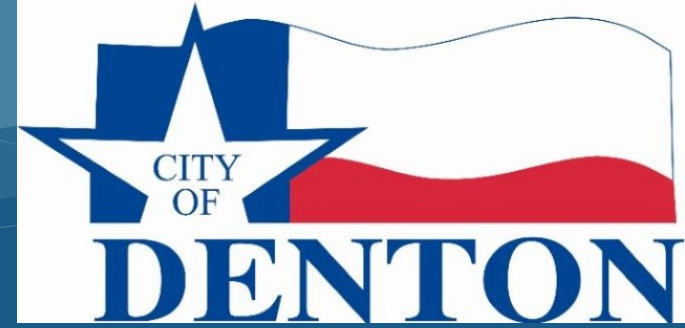
Date of Submittal: _____ Date of Request for Additional Information: _____
 Date of Approval: _____ Date Additional Information Received: _____
 Approved Tier Level: _____ Informational Letter Date Sent: _____



iSWM Certified Communities




City of Denton





CITY OF FORT WORTH
— AN ISWM COMMUNITY —

STORMWATER CRITERIA MANUAL



September 29, 2015



City of Kennedale



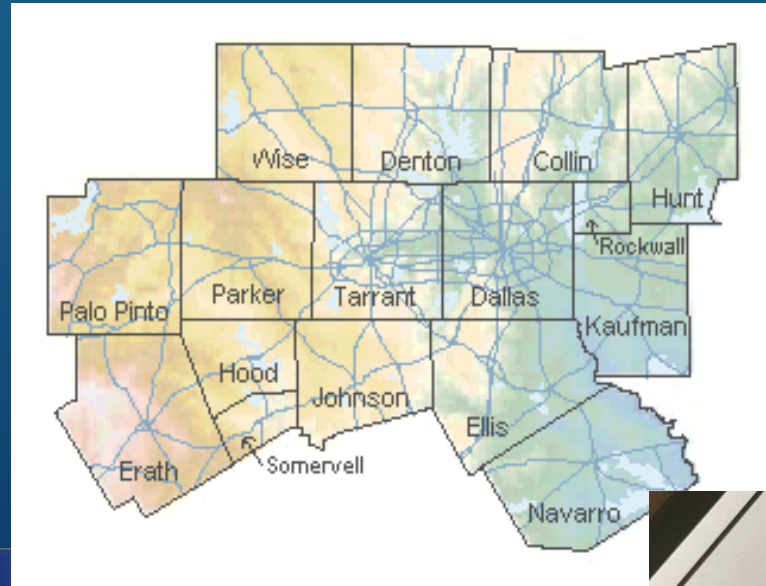
City of Frisco



City of Grand Prairie



.....And more!



Presenting..... New iSWM Website!



HOME ▾ RESOURCES ▾ CASE STUDIES ▾ CONTACT

Helping Communities

meet their construction and post-construction obligations under state stormwater permits.

The iSWM™ Program for Construction and Development is a cooperative initiative that assists cities and counties to achieve their goals of water quality protection, streambank protection, and flood mitigation, while also helping communities meet their construction and post-construction obligations under state stormwater permits.

Development and redevelopment by their nature increase the amount of imperviousness in our surrounding environment. This increased imperviousness translates into lots of natural areas, more sources for pollution in runoff, and heightened flooding risks. To help mitigate these impacts, more than 140 local governments are cooperating to proactively create sound stormwater management guidance for the region through the Integrated Stormwater Management (iSWM) Program.



Reduce Flooding

Designs based on the iSWM program mean that a community can handle stormwater more effectively and with fewer flooding impacts.



Protect Property Values

iSWM reduces the potential for erosion by addressing streambank protection during design, protecting properties and infrastructure along creeks and rivers.



Improve Water Quality

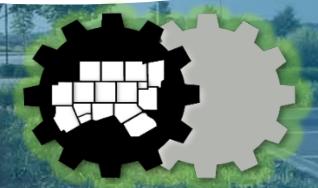
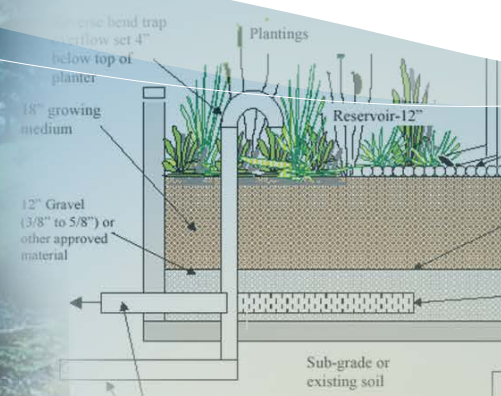
iSWM techniques give a community new tools to improve water quality, thereby reducing costs and protecting residents.

integrated Stormwater Management



iSWM Work Program 2017-2018

Ben Pylant, PE, CFM
Director of Water Resources, North Texas
Halff Associates, Inc.



North Central Texas
Council of Governments

iSWM Workshops

- iSWM Implementation for Planners, Development, and Economic Development
- Rules of Thumb and Lessons-Learned for Engineers
- Bioswales and Infiltration Trenches: Design and Maintenance

**Workshop materials and videos available at
www.iswm.nctcog.org**

Redevelopment Guidance

ISWM REDEVELOPMENT GUIDANCE

COMMERCIAL TO HIGH DENSITY RESIDENTIAL

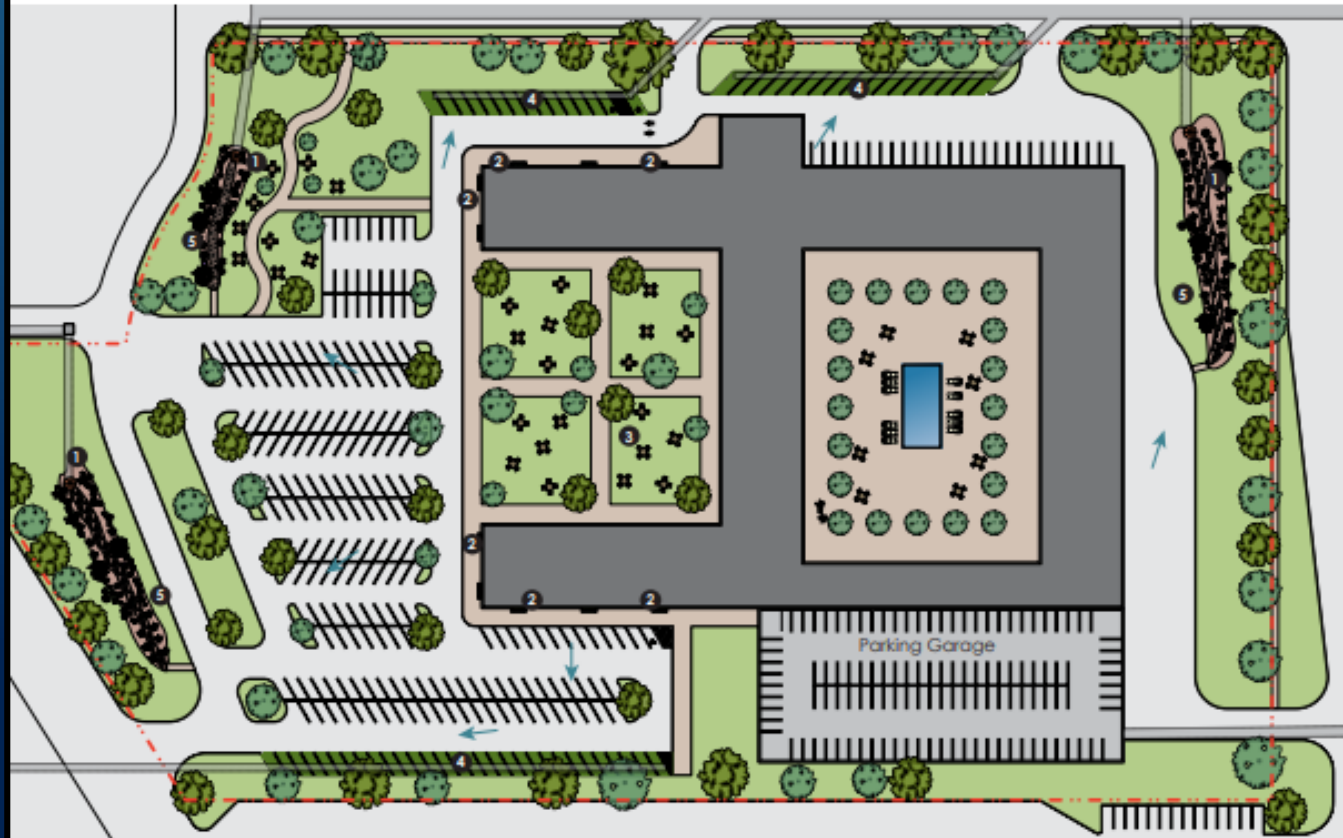
Proposed Changes

- 55% Impervious cover
- 95% of site drains to pervious area or BMP
- Site Information**
 - Building Area 135,978 SF
 - Parking/Paving Area 179,470 SF
 - Landscape Area 220,552 SF
 - Approximately 500 units @ 3 stories
 - Total Site 12.3 acres

Low Impact Development Components of Site Redevelopment

- Building reconfigured to reduce impervious area
- Roof drains rerouted from pavement to bioretention planters with underdrains. **2**
- Seating area with permeable pavers **3**
- Enhanced detention ponds and bioretention areas installed within existing pervious areas **1**
- Pavement runoff redirected from street/drains to detention ponds and bioretention areas through curb cuts and enhanced swale **5**
- Portion of parking lot converted to permeable paving, requires underdrain **4**
- Parking garage addition to reduce surface parking size
- Enhanced site aesthetics, water quality treatment, heat island reduction
- Reference ISWM Technical Guidance Manual for ideal sizing of BMPs

Site redevelopment includes reconfiguring the Commercial site and adding BMPs to attain a site comparable to a High Density Residential site.



1 Enhanced Detention/Bioretenion



2 Bioretention Planters



3 Seating Area with Permeable Pavers



4 Permeable Paving



5 Enhanced Swale



Downstream Assessment Review



Downstream Assessment Summary of Review

INTRODUCTION

The Half Team was tasked with reviewing the downstream assessment process against the current NCTCOG ISWM Technical Manual for Hydrology. The goal was to identify areas for improvement and provide recommendations.

- Benchmarking of criteria used by other municipalities
- Providing other options in the application of the downstream assessment process

Through this review, it was concluded that the current ISWM Technical Manual continues to be applicable for site-specific evaluation of downstream assessment. While many of the researched communities are using an approach to downstream assessment techniques, a more effective approach is found. These findings are presented in more detail in the following sections.

The concerns with the current ISWM downstream assessment process are required during the development submittal and review process. It is credited as being one of the most impactful paradigm shifts in the traditional and historic drainage criteria in the NCTCOG region.

BACKGROUND AND PURPOSE

The purpose of the downstream assessment is to protect downstream channels from increased flooding and downstream channels from increased erosion. The importance of the downstream assessment is to identify developments that have the potential to dramatically impact downstream channels. While smaller sites, however, can be just as dramatic. The assessment of proposed development to a point downstream where the discharge longer has a significant impact on the receiving stream or stormwater system.

Many communities have implemented a detention requirement at the outlet of a site to the pre-development peak discharge. This can have negative timing impacts that could result from a detention requirement.

The downstream assessment was implemented with the original purpose of the following purposes:

- Protect downstream properties from flood or velocity impacts from development
- Provide defensible evidence that a proposed development meets the needs of downstream properties
- Potentially eliminate the need for detaining increased runoff
- Make better informed decisions for the site-specific impacts of development



Downstream Assessment Summary of Review

BENCHMARKING

Grand Prairie, Texas

The City of Grand Prairie is an ISWM Silver Certified Community. The City has taken an approach to evaluating their infrastructure and the flood conveyance capacity of their stormwater systems. Through a comprehensive storm drain study, the City has identified areas where the current storm drain systems do not provide an adequate level of service. By incorporating storm drain trunk lines into an integrated and comprehensive storm drain model, the City determined the existing developed capacity and level of service for their storm drain trunk lines. Designated corresponding land uses have been mapped for reference during the development process. Proposed development with the original design assumptions. If the storm drain system developed conditions and the proposed development does not exceed the zone percentage, then the downstream assessment is often considered complete. If the proposed development is to be installed in an undersized storm drain system or open channel, the proposed development is not a much better starting condition for the downstream assessment process.

This watershed-based approach has often expedited the development review process and identified areas where stormwater mitigation may be necessary. Understanding levels of service early in the development process is critical to planning and budgeting related needs.

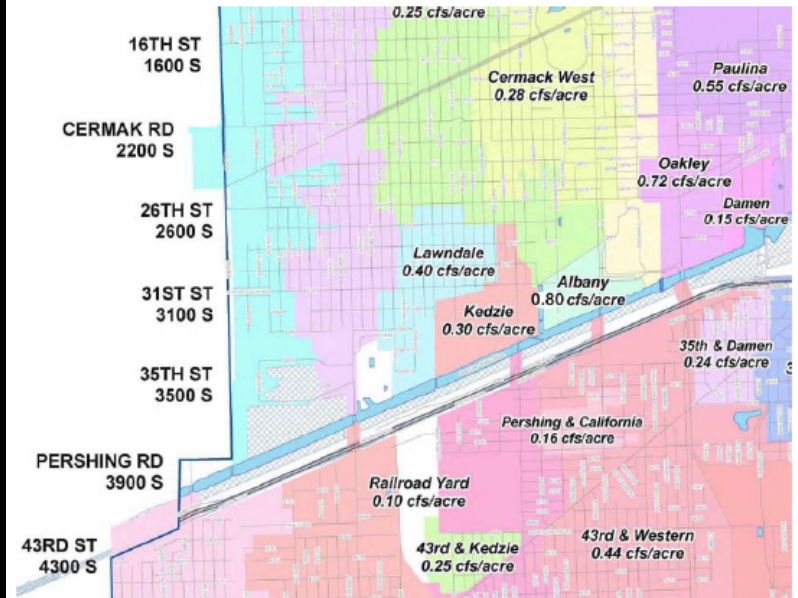


Downstream Assessment Summary of Review

Chicago, Illinois

The City of Chicago has implemented a watershed-based approach to downstream assessment. Most regional solutions in Chicago are not practical for infill situations that often occur in the areas of stormwater concern. As part of their planning efforts, the City analyzed the conveyance capacity of the infrastructure and developed capacity maps that establish release rate thresholds (discharge / acre) for each of the basins within the City. These established release rates are often lower than the release rates of the existing site conditions in areas where the current storm drain systems are undersized. If a redevelopment creates, reconstructs, or resurfaces greater than 7,500 square feet of development, then the release rate requirements are applied.

The sample exhibit below shows an example of the Chicago outlet capacity map that dictates the release rates across the City.



Construction Control Standard Details



iSWM Construction Control Standard Details

Addendum to: iSWM Technical Manual – Construction Controls

The following are a selection of 10 iSWM construction control BMP schematics chosen to be provided in standard details.

1. Rock Check Dams
2. Temporary Erosion Control Blankets
3. Dewatering Controls
4. Filter Tube Curb Inlet Protection
5. Hog Wire Weir Curb Inlet Protection
6. Curb Rock Sock On-Grade Curb Inlet Protection
7. Filter Tube Area Inlet Protection
8. Sediment Basin with Overflow Riser
9. Silt Fence
10. Stabilized Construction Exit

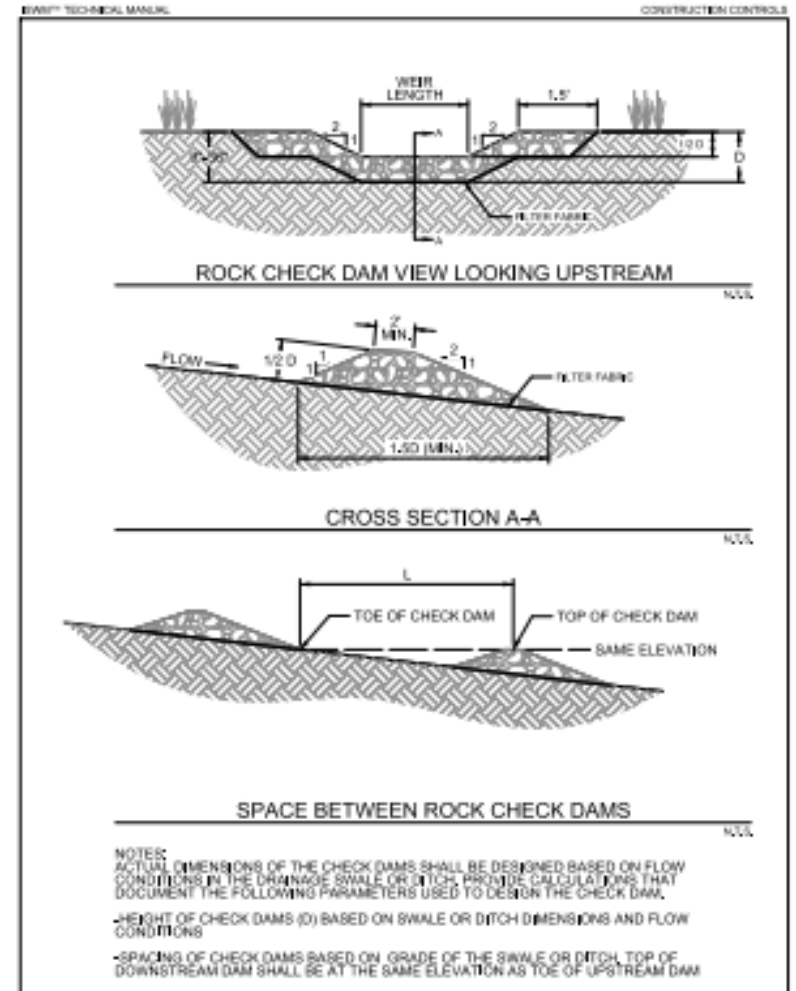


FIGURE 2.1 STANDARD CONSTRUCTION DETAIL - ROCK CHECK DAMS (1 OF 2)

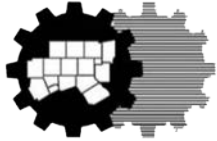
Integrated Site Design Practices Criteria – Ordinance Language Matrix



Integrated Site Design Practices Sample Ordinance Language

Category	iSWM Outcomes	Code Objective(s)	Sample Ordinance Language	Presumptions & Code Connections
Overview	Require integrated Site Design (continued)		<p>fifty percent (50%) natural feature coverage must achieve thirty (30) WQPPs; and sites with less than twenty percent (20%) natural feature coverage must achieve twenty (20) WQPPs.</p> <p>iii. Each regulated project must achieve a certain number of points based on the area of existing natural feature on the site per [Section XXXXi]. Available points are assigned to each site design practice and points may be accrued based on the extent the practice is implemented on the site as compared to the total implementation possible. For example, if a development site has four (4) acres of riparian area and proposes to preserve two (2) acres, the site would only accrue fifty percent (50%) of the total points available.</p> <p>iv. The following table shows the integrated site design practices which may be used to achieve the required water quality protection score and the total number of points available for each: <div style="text-align: center;">[Insert table from iSWM Criteria Manual.]</div></p> <p>v. The following must be submitted with [insert appropriate plan, e.g. stormwater pollution prevention plan, site plan, etc.] for preliminary plan review (PPR): *</p> <ol style="list-style-type: none"> a. Map showing location of boundaries of total existing natural feature? areas and the preservation boundaries which will be maintained during development. b. Completed worksheet (Table 3.5 of iSWM Criteria Manual) and associated calculations documenting accumulated WQPPs. 	
Overview	Require integrated Site Design	Require preservation of environmentally sensitive areas and other buildable areas.	<p>Definition – Environmentally Sensitive Areas: Natural features which can be used in the protection of water resources by reducing stormwater runoff, providing runoff storage, reducing flooding, preventing soil erosion, promoting infiltration and removing stormwater pollutants. These areas include:</p> <ul style="list-style-type: none"> • All of the floodway and flood fringe within the 100-year floodplain, as shown on official FEMA maps; • Wetlands; • Natural drainageways; • Areas of highly erodible soil and soils with high infiltrative ability as defined in [local citation or the NCTCOG Hydrology Technical Manual]; • All riparian buffers within twenty-five (25) feet of the top of bank of any perennial stream, wetland or shoreline; • Slopes exceeding fifteen (15) percent; and • Undisturbed forested and vegetated areas 	<p>Presumes zoning regulations include density limitations.</p> <p>Should limit this provision to low density, rural zones.</p> <p>Should incorporate other preservation criteria such as scenic views and agricultural lands, wildlife management areas, and historic, archeological and culture features in order to ensure preserved areas provide multiple benefits.</p> <p>Open space developments typically allow some managed uses in conserved areas. These uses should be specified in the code as well as the</p>

Contacts



North Central Texas
Council of Governments

Edith Marvin, P.E., C.F.M.

emarvin@nctcog.org

817-695-9211



Derica Peters, C.F.M.

dpeters@nctcog.org

817-695-9217

Ben Pylant, P.E., C.F.M.

Halff Associates, Inc

bpylant@halff.com

817-764-7488

iswm.nctcog.org

