

EARLY STORMWATER PLANNING TOOLS FOR A SUCCESSFUL DEVELOPMENT & REDEVELOPMENT

DECEMBER 16, 2020

INTRODUCTIONS

- NCTCOG Environment & Development

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ISWM BENEFITS & THE DEVELOPMENT PROCESS

WHAT IS ISWM

- Assists cities and counties to achieve their goals of
 - water quality protection
 - streambank protection
 - flood mitigation
- Also helps meet construction and post-construction obligations under state stormwater permits
- Resources
 - Criteria Manual
 - Technical Manuals
 - Training
 - Program Guidance & Supplemental Documents

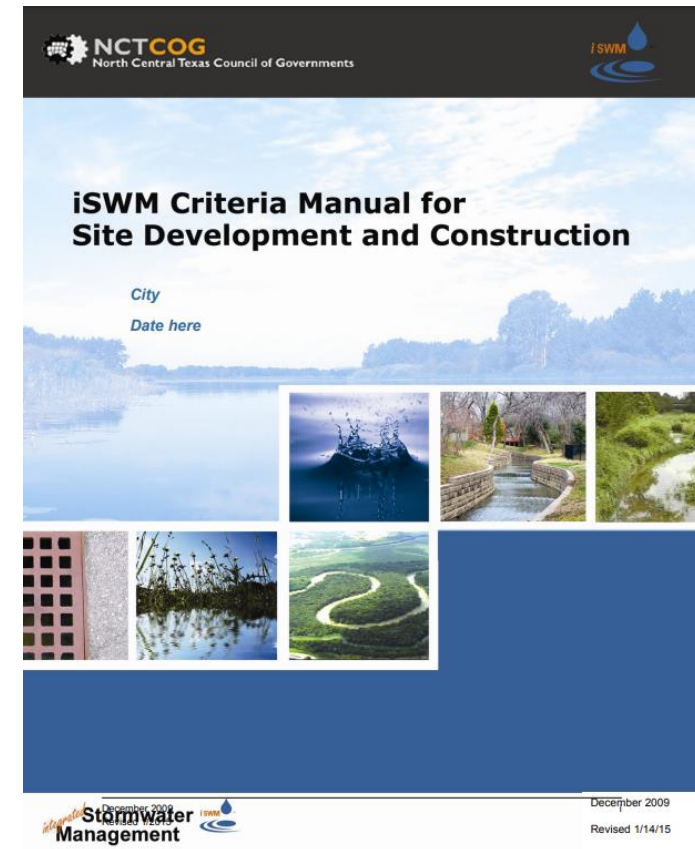


WHAT IS ISWM

- iSWM Overview and Resources
- Hydrologic Methods
- Water Quality protection
- Acceptable downstream conditions
- Streambank protection
- Flood mitigation
- Stormwater conveyance systems
- Easements, plat, and maintenance agreements
- Stormwater control selection / detention
- Integrated construction criteria

Each section REFERS to the iswm criteria manual located here:

http://iswm.nctcog.org/Documents/iSWM_Criteria_Manual_01142015.pdf



ISWM COMMUNITIES



2006 2007 2008 2009 2010 2011 2012 2013 2014

Fort Worth

Roanoke

Benbrook

Dallas

Glenn Heights

Duncanville

Azle

Hurst

Outcome Focused Implementation

Grand Prairie

Southlake

Lakeside

Northlake

University Park

Mansfield

WHY ISWM

- Increased runoff leads to flooding
- Streambank erosion
- Water quality concerns
- Stormwater regulations
- Loss of natural features
- Comprehensive approach needed
- Regional consistency



WHY ISWM

- Address stormwater early in the development process
- Design for multiple storm events
- Use integrated Site Design Practices
- Reduce downstream impacts
 - Water quality
 - Streambank erosion
 - Flooding
- Protect water quality during construction activities



EARLY IN THE DEVELOPMENT PROCESS

- Developer Due Diligence Process
 - Engineer provides assessment of property
- City engagement at conceptual level
 - Discussions with the City on the regulations required and constraints of the property



Photo By Mikel Wilkins



Photo By Mikel Wilkins

EARLY IN THE DEVELOPMENT PROCESS

■ Checklist for Conceptual iSWM Plan

Preparation & Review

- Can help guide discussions between the developer and the engineer and City
- Located in the Criteria Manual

iSWM™ Criteria Manual

**Checklist for Conceptual
iSWM Plan Preparation and Review**

	Included?		
	Yes	No	Comments

Mapping and plans which illustrate at a minimum:
(recommended scale of 1" = 50' or greater)

1. Project Description

A. Name, legal address and telephone number of applicant _____

B. Name, legal address and telephone number of preparer _____

C. Common address and legal description of site _____

D. Vicinity map _____

E. Proposed land use with Standard Industrial Code No. _____

	Yes	No	Comments
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2. Planning Concerns

A. Have any previous drainage or watershed plans been completed in the watershed? (If yes, describe) _____

B. Is there any known history of flooding downstream? (If yes, describe conditions and locations) _____

C. Is there any known history of excessive erosion downstream? (If yes, describe conditions and locations) _____

D. Are there any known downstream drainage constrictions such as undersized culverts or channels? Size? _____

E. Are there any known or suspected wetland areas, mitigation areas, 404 permit areas, or other natural habitat features which require special consideration? _____

F. Are there any existing dams over six feet in height which are or will be subject to TCEQ regulations? _____

G. Are there any existing impoundments subject to TCEQ water rights permitting? (Livestock ponds are not exempt when converted to other uses.) _____

H. Are there any existing environmental concerns on the site requiring special treatment or design consideration (i.e. fuel stations, vehicle maintenance, auto recycling, illegal dump sites, landfills, etc.)? _____

	Yes	No	Comments
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December 2009
Revised 1/2015 70

DEVELOPER DUE DILIGENCE

Example: Development in North Texas

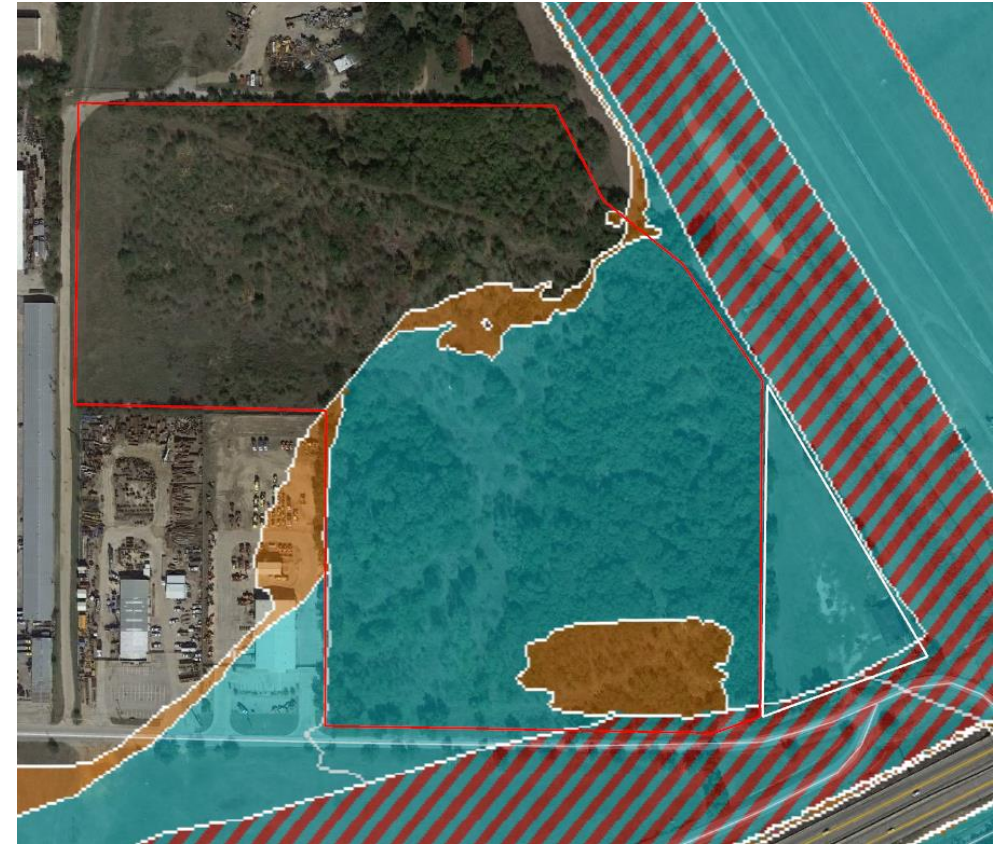
■ Floodplain Reclamation

- Local (City), Regional (NCTCOG/USACE/CDC), and Federal (FEMA) requirements & issues

■ Stormwater

- Downstream Assessment/Stormwater quantity
- Stormwater quality

■ Environmental (Section 404 permitting and Section 408/Federal project)



The process helped developer negotiate on the land sale with the owner

CITY ENGAGEMENT AT CONCEPTUAL LEVEL

- Pre-development meeting
 - Making decisions with limited information
- Development Review Committee (DRC) process
 - Multiple department review
- Common issues:
 - Adequate outfalls
 - Obtaining necessary permits & approvals
 - Detention with recommended iSWM criteria
 - Stormwater quality improvements
 - Push back on more than minimum required
 - Follow through on maintenance



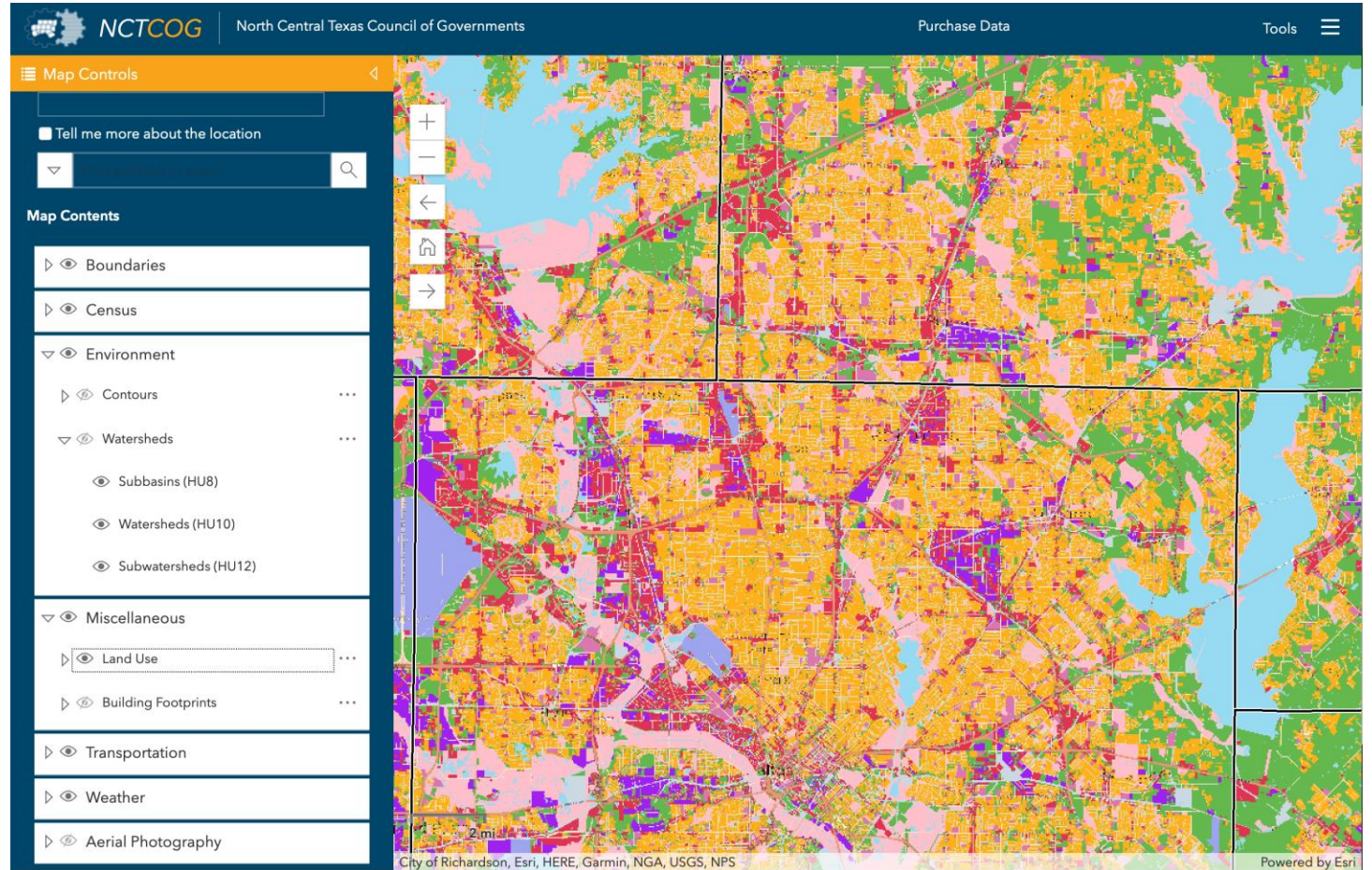
Q & A

PLANNING TOOLS CASE STUDIES

PLANNING TOOLS

DFWMAPS.COM

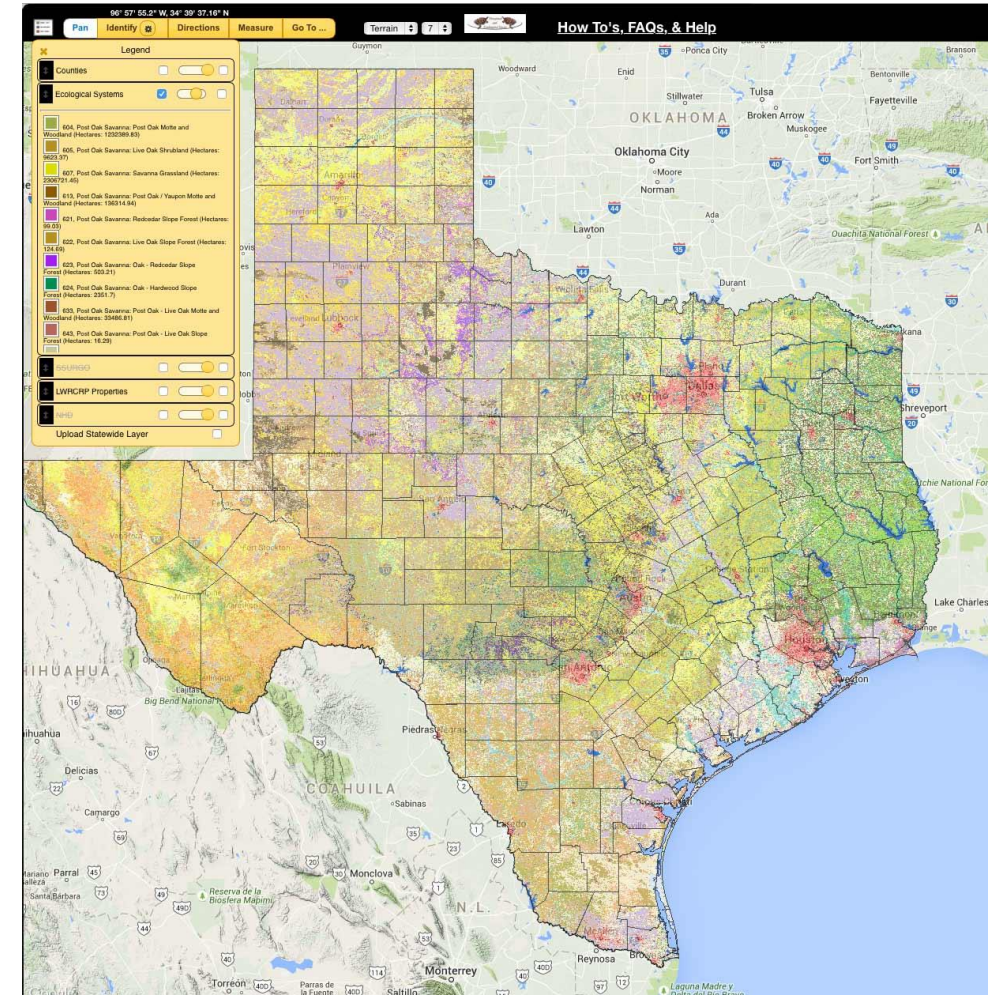
- Historical Aerials
- 2' topography
- Watersheds
- building footprints
- land use



PLANNING TOOLS

TEXAS ECOSYSTEM ANALYTICAL MAPPER

- Woodlands
- Riparian Corridors
- Prairie/Grassland
- Shrubland
- Wetlands
- NHD



PLANNING TOOLS

WEB SOILS SURVEY

- Detailed soils data

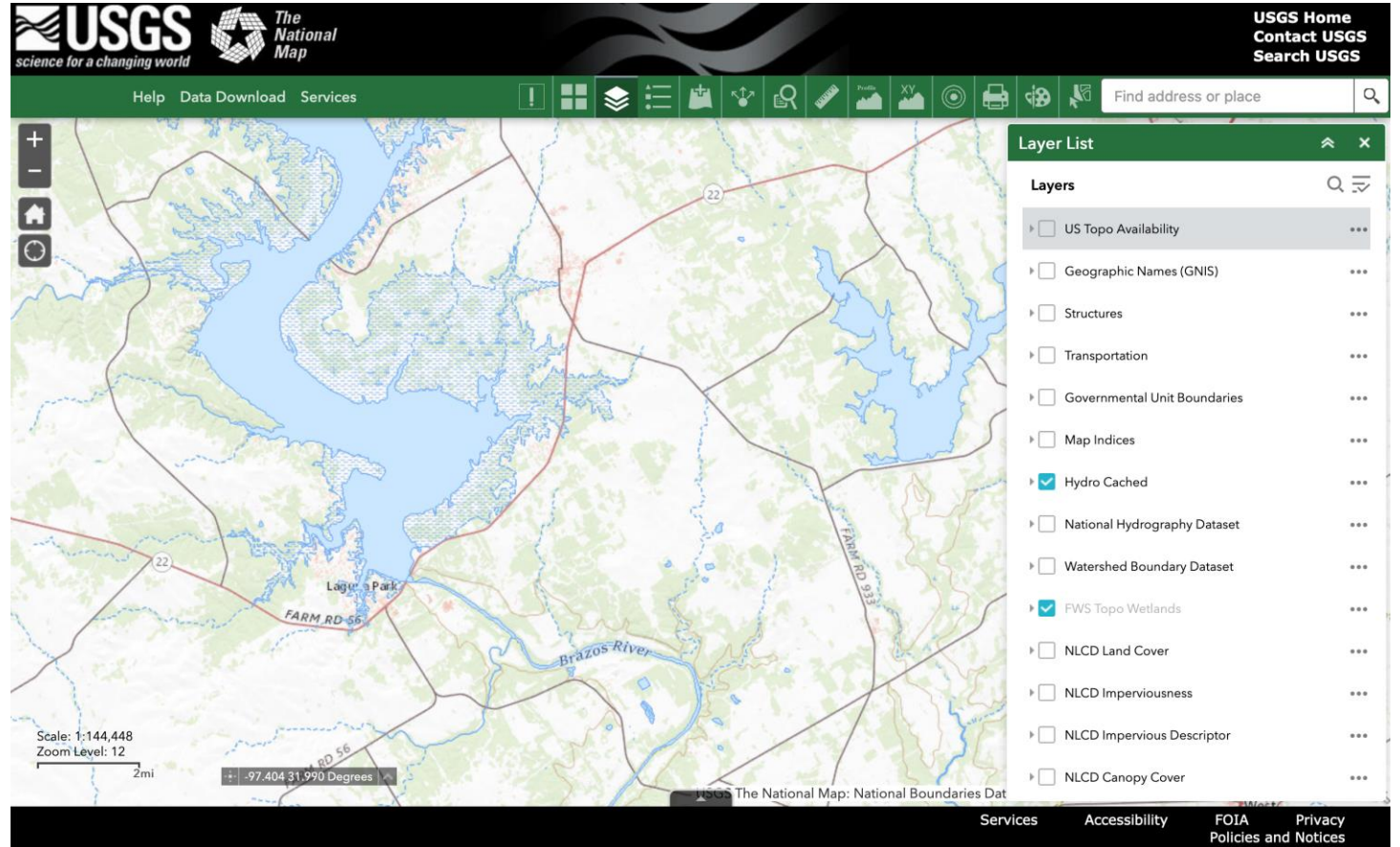
The screenshot displays the Web Soil Survey interface. At the top, there is a navigation bar with links for Contact Us, Subscribe, Archived Soil Surveys, Soil Survey Status, Glossary, Preferences, Link, Logout, and Help. Below this is a secondary navigation bar with buttons for Area of Interest (AOI), Soil Map (selected), Soil Data Explorer, Download Soils Data, and Shopping Cart (Free). The main content area is divided into two panels. The left panel, titled 'Map Unit Legend', shows a table of soil map units for Travis County, Texas (TX453). The right panel, titled 'Soil Map', displays a map of the county with various soil units overlaid in different colors. A scale bar at the bottom of the map indicates 0 to 10,000 feet.

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
AgB	Altoga silty clay, 1 to 3 percent slopes	1,336.6	0.2%
AgC2	Altoga silty clay, 3 to 6 percent slopes, moderately eroded	4,550.2	0.7%
AID	Altoga soils and Urban land, 2 to 8 percent slopes	1,606.2	0.2%
AsB	Austin silty clay, 1 to 3 percent slopes	6,418.6	1.0%
AsC2	Austin silty clay, 2 to 5	7,416.8	1.1%

PLANNING TOOLS

NATIONAL MAP VIEWER

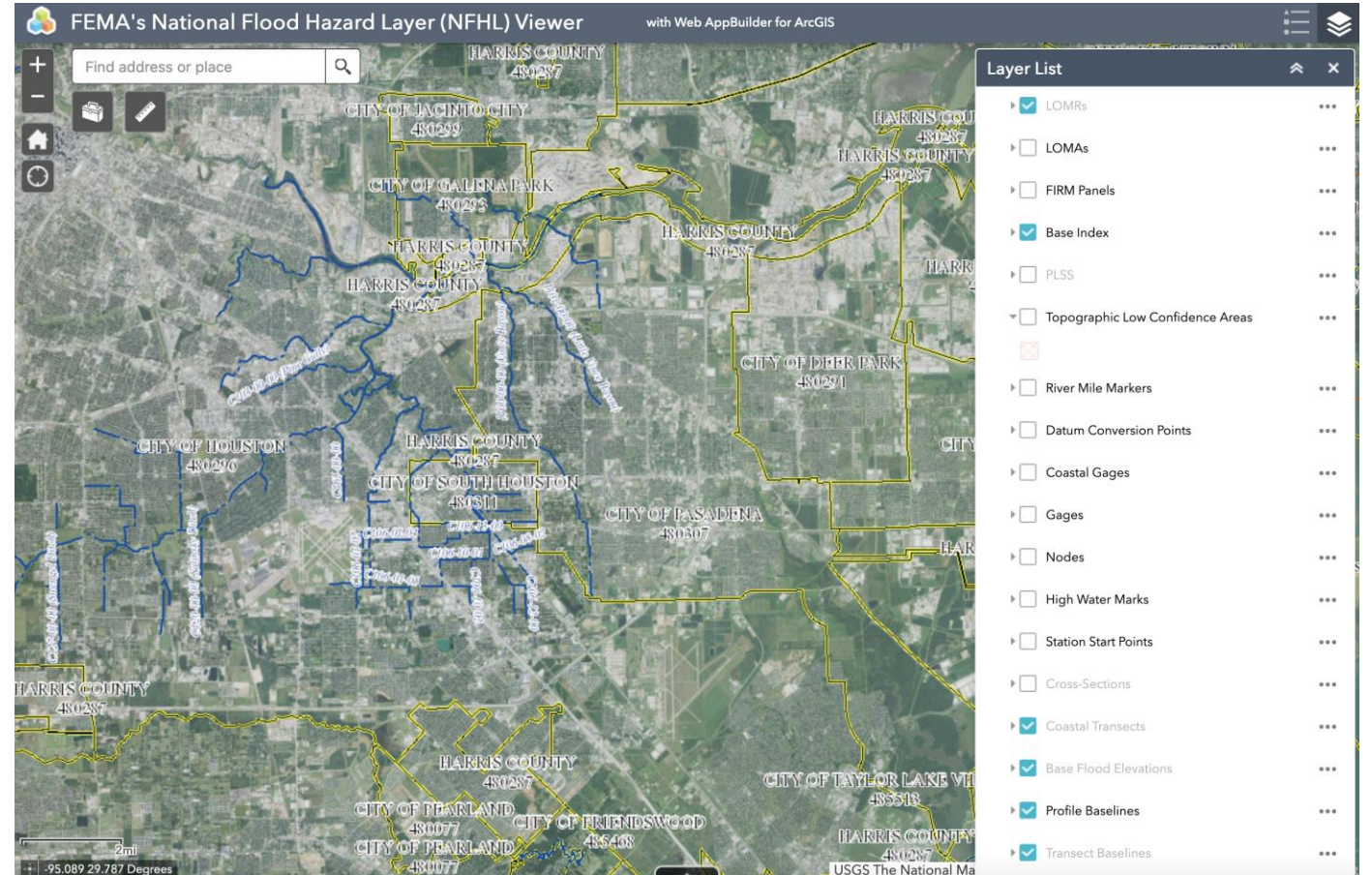
- Hydrologic features
- Wetlands
- USGS topography



PLANNING TOOLS

NATIONAL FLOOD HAZARD MAP VIEWER


- Floodplain
- Floodway
- FIRM Panel Data



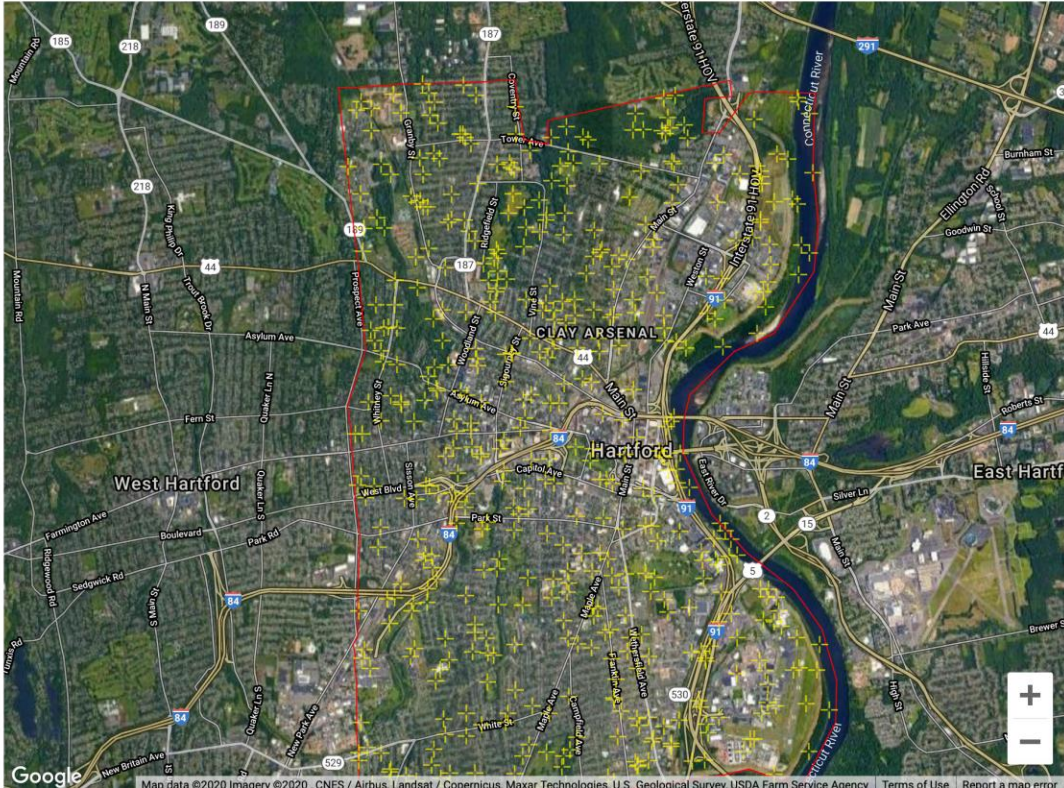
PLANNING TOOLS

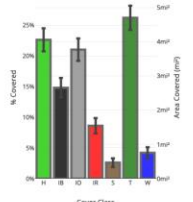
i-TREE CANOPY 7.0

- Tree canopy estimates
- Environmental value


Home Project Menu i-Tree
Feedback

Conduct your survey: Add survey points by clicking or tapping the + button below. With each point you add, the map will shift to a new, random location where you assess the land cover at the yellow crosshairs in the center of the map. The more points you survey, the lower your standard error, and the more precise your sampling will be. More points provide a better estimation of Land Cover across your study area.





[View Results](#)
[Report](#)

ID	Cover Class	Latitude	Longitude
1	Impervious Other	41.74094	-72.65320
2	Impervious Road	41.74315	-72.66277
3	Tree/Shrub	41.76941	-72.68937
4	Grass/Herbaceous	41.78738	-72.69409
5	Tree/Shrub	41.73479	-72.67216
6	Impervious Other	41.78946	-72.66989
7	Tree/Shrub	41.79791	-72.71115
8	Tree/Shrub	41.74369	-72.66156
9	Grass/Herbaceous	41.80402	-72.71483
10	Grass/Herbaceous	41.79908	-72.65136

[Save your Project](#)
[Save](#) Save often - don't lose your data!

CASE STUDY SCREEN SHARE

Q & A

HIGHLIGHTS OF NCTCOG / ISWM RESOURCES

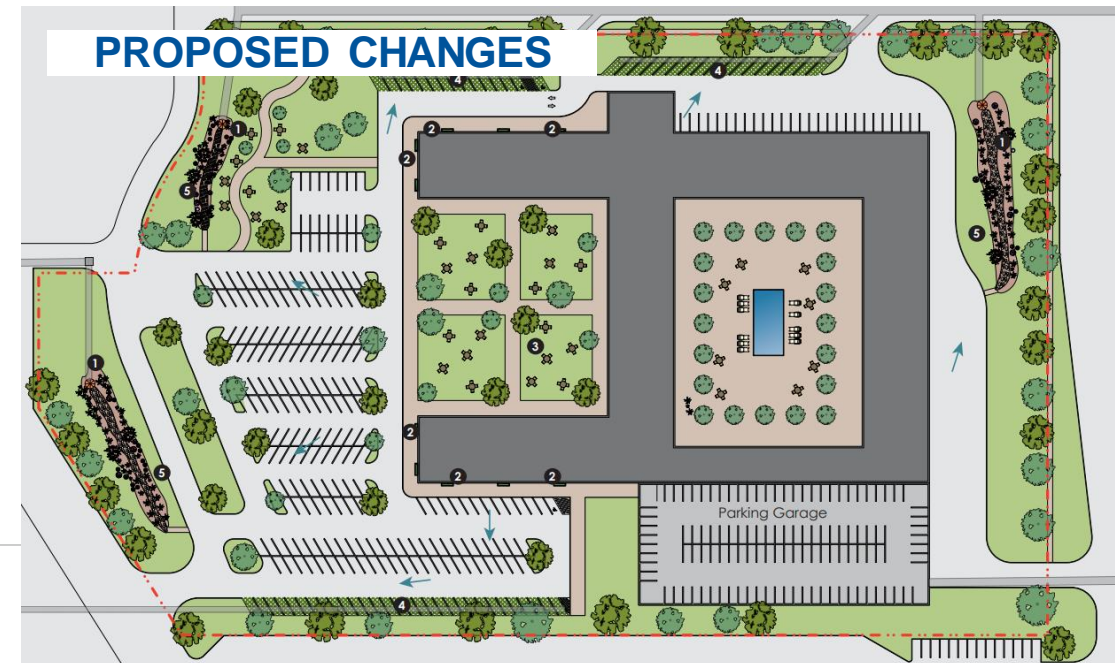
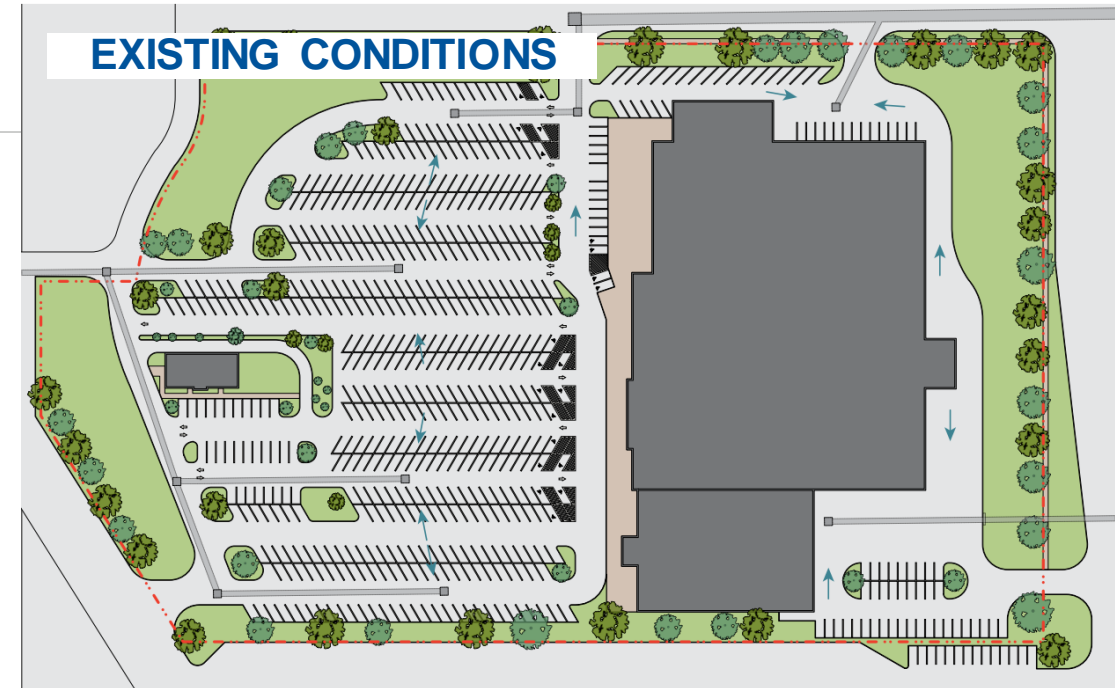
HIGHLIGHTS OF NCTCOG / ISWM RESOURCES

- Redevelopment Guidance
- BMP Installation video
- iSWM Criteria Inventory
- Site Development Controls Manual Updates— to be available 2021
- Hydrologic Technical Manual Atlas 14 Rainfall Update
- Proprietary Devices Guidance
- iSWM Construction Standard Details

REDEVELOPMENT GUIDANCE

■ Low Impact Components of Site Redevelopment

- Commercial to high density residential
- For office space to mixed use
- Small commercial



BMP INSTALLATION VIDEO

- Video of the installation of a bioretention facility in Roanoke Town Center, Roanoke, TX Discusses the Installation and Maintenance of a bioretention system
- Designed and Installed by Construction Ecoservices
- Link:
<http://iswm.nctcog.org/training.html#BioretentionInstallation>



ISWM CRITERIA INVENTORY

- Compares city criteria to iSWM criteria for 53 communities and 8 counties
- Categorized as if the city is estimated to follow, partially follow, or not follow various iSWM criteria
- Added watershed boundaries and waterways to maps

iSWM Criteria Community Inventory

Land Use Conditions

LEGEND

- Silver Certified
- Follows iSWM criteria
- Partially follows iSWM criteria
- No coordinating criteria found
- Not reviewed

0 50,000 100,000 Feet

Half Associates, Tetra Tech Inc., and Urban EcoPlan, in partnership with NCTCOG, has completed their Stormwater Criteria Community Inventory.

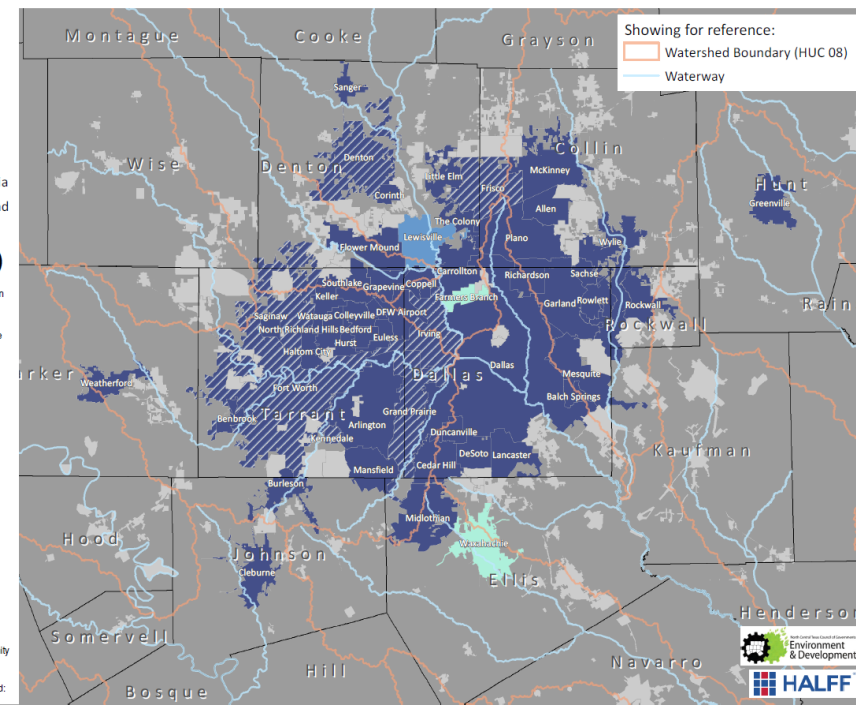
Ordinances and Drainage Criteria Manuals of fifty-three (53) communities were reviewed and compared to seventeen (17) iSWM Design Criteria:

Site Plan Review Applicability
 Land Use Conditions
 Hydrologic Methods
 Open Channel Velocity Criteria/Energy Dissipation
 Detention Structure Discharge Criteria
 Streambank Protection
 Flood Mitigation/Downstream Assessments
 Construction Controls
 Operations and Maintenance
 Conveyance Limits
 Storm Urban Velocity Criteria
 Spread Criteria
 Freeboard Criteria
 Finished Floor Elevations
 Water Quality Protection
 Drainage and Floodplain Easements

Data was also collected from an NCTCOG email survey completed in December 2018 asking if use of fully developed land use conditions was required in drainage criteria. The iSWM criteria review was based off the NCTCOG Tiered Measurement Form which is utilized as a checklist that can be used to determine iSWM status when applying to become an iSWM certified community.

Upon review, each criterion reviewed for each community was placed in one of the three categories:
 Follows iSWM criteria
 Partially follows iSWM criteria
 No coordinating criteria found

Date Completed: 4/20/2020



iSWM Criteria County Inventory

Water Quality Protection

LEGEND

- Follows iSWM criteria
- Partially follows iSWM criteria
- No coordinating criteria found
- Not reviewed

0 70,000 140,000 Feet

Half Associates, Tetra Tech Inc., and Urban EcoPlan, in partnership with NCTCOG, has completed their Stormwater Criteria Community Inventory.

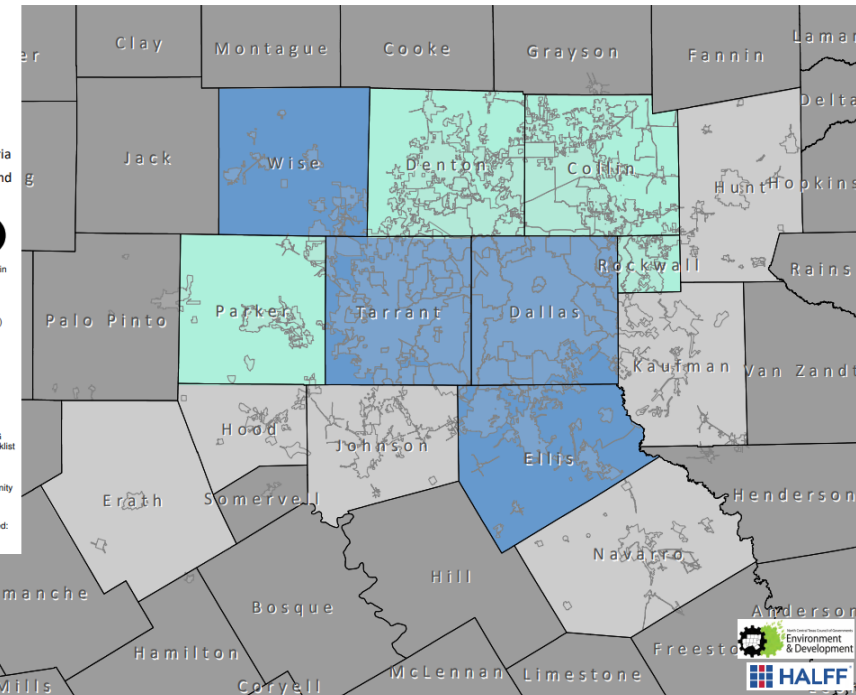
Ordinances and Drainage Criteria Manuals of eight (8) counties were reviewed and compared to seven (7) iSWM Design Criteria:

Land Use Conditions
 Streambank Protection
 Flood Mitigation/Downstream Assessments
 Operations and Maintenance
 Conveyance Limits
 Finished Floor Elevations
 Water Quality Protection

The iSWM criteria review was based off the NCTCOG Tiered Measurement Form which is utilized as a checklist that can be used to determine iSWM status when applying to become an iSWM certified community.



Upon review, each criterion reviewed for each community was placed in one of the three categories:
 Follows iSWM criteria
 Partially follows iSWM criteria
 No coordinating criteria found

Date Completed: 4/20/2020



SITE DEVELOPMENT CONTROLS TECHNICAL MANUAL - COMING SOON

Summary Pages for BMPs

Bioretention

Description
Bioretention facilities, sometimes called rain gardens or bioretention filters, are vegetated basins or landscaped areas that capture stormwater runoff and provide filtration and treatment using engineered filter media. Bioretention areas are flexible per the needs of most site locations.

Design Considerations

- Consists of a grass filter, a sand bed, stormwater ponding area, an organic/mulch layer, planting soil, and selected landscaping for vegetation
- The facility works on any soil group
- Can be designed with an underdrain to send treated water into an outlet
- Use native plants as recommended
- Can be designed in-line or off-line
- Requires a footprint of 5-7% of the tributary impervious area

Key Advantages

- They are highly effective at removing pollutants and reducing peak flow storm events for small storms
- Bioretention areas work well in areas with a small drainage area (recommended for between 2 and 5 acres)
- Bioretention facilities can handle large amounts of impervious areas
- Bioretention areas have relatively low maintenance requirements
- Due to their incorporation of landscaping, bioretention facilities can be used as an aesthetic feature

Limitations

- Landscaping of bioretention facilities in public areas must be maintained to prevent overgrowth
- Bioretention areas cannot be used in areas with steep slopes
- Bioretention areas are not designed to manage peak flows from large storm events

Target Constituent	Removal Rate
Total Suspended Solids	
Total Phosphorus	
Total Nitrogen	
Fecal Coliform	Insufficient data
Heavy Metals	

Implementation Considerations

Land Requirement

Capital Cost

Maintenance Burden

Suitability
The iSWM manual has designated that bioretention facilities are suitable for providing:

Water Quality Protection

Streambank Protection*

On-site Flood Control*

*in certain situations

Maintenance

- Trash, leaf, debris and sediment removal
- Weeding/removing unwanted vegetation
- Replacing dead and dying vegetation
- Raking and replacing the top mulch layer
- Irrigating plants after planting and during the dry season
- Replace soil media on an as-needed basis
- Clean inlet and outlet pipes when required
- Repair eroded locations

Table 1.2

- Simplified version for reference
- No % removals

TABLE 1.2 Design Pollutant Removal Efficiencies for Stormwater Controls

Structural Control	Total Suspended Solids	Total Phosphorus	Total Nitrogen	Fecal Coliform	Metals
Bioretention Areas					
Grass Channel					
Enhanced Dry Swale					
Enhanced Wet Swale					
Alum Treatment					
Filter Strip					
Modified Extended Detention					
Organic Filter					
	Low	Moderate			High

ISWM RESOURCES

■ Hydrologic Technical Manual Atlas 14 Rainfall Update

— USGS rainfall tables were removed and replaced with Atlas 14 rainfall intensities

■ Proprietary Devices Guidance

■ iSWM Construction Standard Details

Table 5.15 AMS-based precipitation frequency estimates for Tarrant County (inches)

Duration	Average recurrence interval (years)									
	1	2	5	10	25	50	100	200	500	1000
5-min	0.405	0.439	0.572	0.673	0.807	0.909	1.012	1.117	1.261	1.371
10-min	0.649	0.704	0.919	1.081	1.297	1.462	1.627	1.791	2.008	2.171
15-min	0.807	0.875	1.137	1.336	1.601	1.801	2.004	2.212	2.493	2.711
30-min	1.117	1.210	1.570	1.842	2.203	2.475	2.752	3.041	3.436	3.746
60-min	1.449	1.572	2.047	2.408	2.888	3.248	3.619	4.011	4.553	4.983
2-hr	1.773	1.935	2.555	3.031	3.671	4.159	4.669	5.215	5.977	6.588
3-hr	1.966	2.154	2.871	3.423	4.173	4.752	5.361	6.013	6.930	7.668
6-hr	2.323	2.558	3.446	4.135	5.077	5.810	6.586	7.419	8.591	9.536
12-hr	2.733	3.016	4.089	4.919	6.051	6.928	7.852	8.840	10.224	11.336
24-hr	3.191	3.522	4.776	5.747	7.069	8.096	9.175	10.321	11.921	13.201
48-hr	3.692	4.063	5.447	6.532	8.033	9.225	10.488	11.816	13.663	15.136
3-day	4.018	4.417	5.901	7.067	8.686	9.976	11.348	12.792	14.805	16.411
4-day	4.258	4.680	6.252	7.488	9.204	10.573	12.030	13.569	15.716	17.433
7-day	4.771	5.249	7.037	8.438	10.375	11.908	13.541	15.281	17.726	19.693
10-day	5.216	5.736	7.688	9.211	11.306	12.950	14.699	16.573	19.213	21.343
20-day	6.739	7.340	9.640	11.404	13.780	15.588	17.492	19.564	22.505	24.891
30-day	8.012	8.684	11.283	13.257	15.883	17.846	19.898	22.138	25.318	27.899
45-day	9.755	10.569	13.712	16.103	19.289	21.690	24.175	26.822	30.508	33.449
60-day	11.294	12.248	15.917	18.720	22.477	25.346	28.296	31.362	35.554	38.840

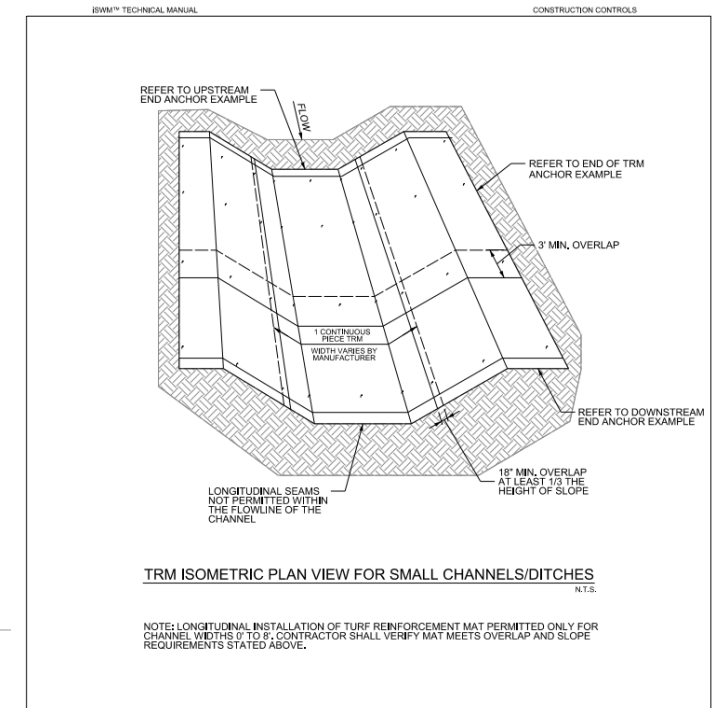


FIGURE 2.11 SCHEMATICS OF PERMANENT TURF REINFORCEMENT MATS (2 OF 3)

THANK YOU FOR ATTENDING!

**WE WILL PROVIDE LINK TO RESOURCES IN THE
FOLLOWING SLIDES.**

PRESENTATION WILL BE PROVIDED TO ALL ATTENDEES.

LINKS TO RESOURCES

- **Checklist for Conceptual iSWM Plan Preparation & Review** – iSWM Criteria Manual Section 5.0
http://iswm.nctcog.org/Documents/iSWM_Criteria_Manual_01142015.pdf
- **DFWMaps.com** – Historical Aerials (1999 – 2019), 2' topography, watersheds, building footprints, land use
<https://dfwmaps.com/>
- **Texas Ecosystem Analytical Mapper** – Woodlands, Riparian Corridors, Prairie/Grassland, Shrubland, Wetlands,
<https://tpwd.texas.gov/gis/team/>
- **Web Soil Survey** – detailed soils data
<https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm>
- **National Map Viewer** – hydrologic features, wetlands, USGS topography
<https://viewer.nationalmap.gov/advanced-viewer/>
- **National Flood Hazard Map Viewer** – Floodplain, floodway, FIRM Panel Data
<https://msc.fema.gov/nfhl>
- **i-Tree Canopy 7.0** – Tree canopy estimates and environmental value
<https://canopy.itreetools.org/>

LINKS TO RESOURCES

— **Redevelopment Guidance**

<http://iswm.nctcog.org/Documents/iSWM-Redevelopment-Guidance.pdf>

— **BMP Installation video**

<http://iswm.nctcog.org/training.html#BioretentionInstallation>

— **iSWM Criteria Inventory**

<http://iswm.nctcog.org/>

Cities – [http://iswm.nctcog.org/Documents/iSWM Criteria Inventory Cities Combined.pdf](http://iswm.nctcog.org/Documents/iSWM%20Criteria%20Inventory%20Cities%20Combined.pdf)

Counties – [http://iswm.nctcog.org/Documents/iSWM Criteria Inventory Counties Combined.pdf](http://iswm.nctcog.org/Documents/iSWM%20Criteria%20Inventory%20Counties%20Combined.pdf)

— **Atlas 14 Rainfall Update**

[http://iswm.nctcog.org/Documents/technical manual/Hydrology 4-2020.pdf](http://iswm.nctcog.org/Documents/technical%20manual/Hydrology%204-2020.pdf)

— **Proprietary Devices memo**

[http://iswm.nctcog.org/Documents/Proprietary Devices Memo 2019-09-26.pdf](http://iswm.nctcog.org/Documents/Proprietary%20Devices%20Memo%202019-09-26.pdf)

— **iSWM Construction Standard Details**

[http://iswm.nctcog.org/Documents/technical manual/iSWM Construction Control Standards 2020.pdf](http://iswm.nctcog.org/Documents/technical%20manual/iSWM%20Construction%20Control%20Standards%202020.pdf)

— **Economic & Environmental Benefits of Stewardship**

<http://eeps.nctcog.org/>