

TNC: Lannon Farm Saturated Buffer

2019 Case Study



Properly evaluating the site saves a lot of headaches!

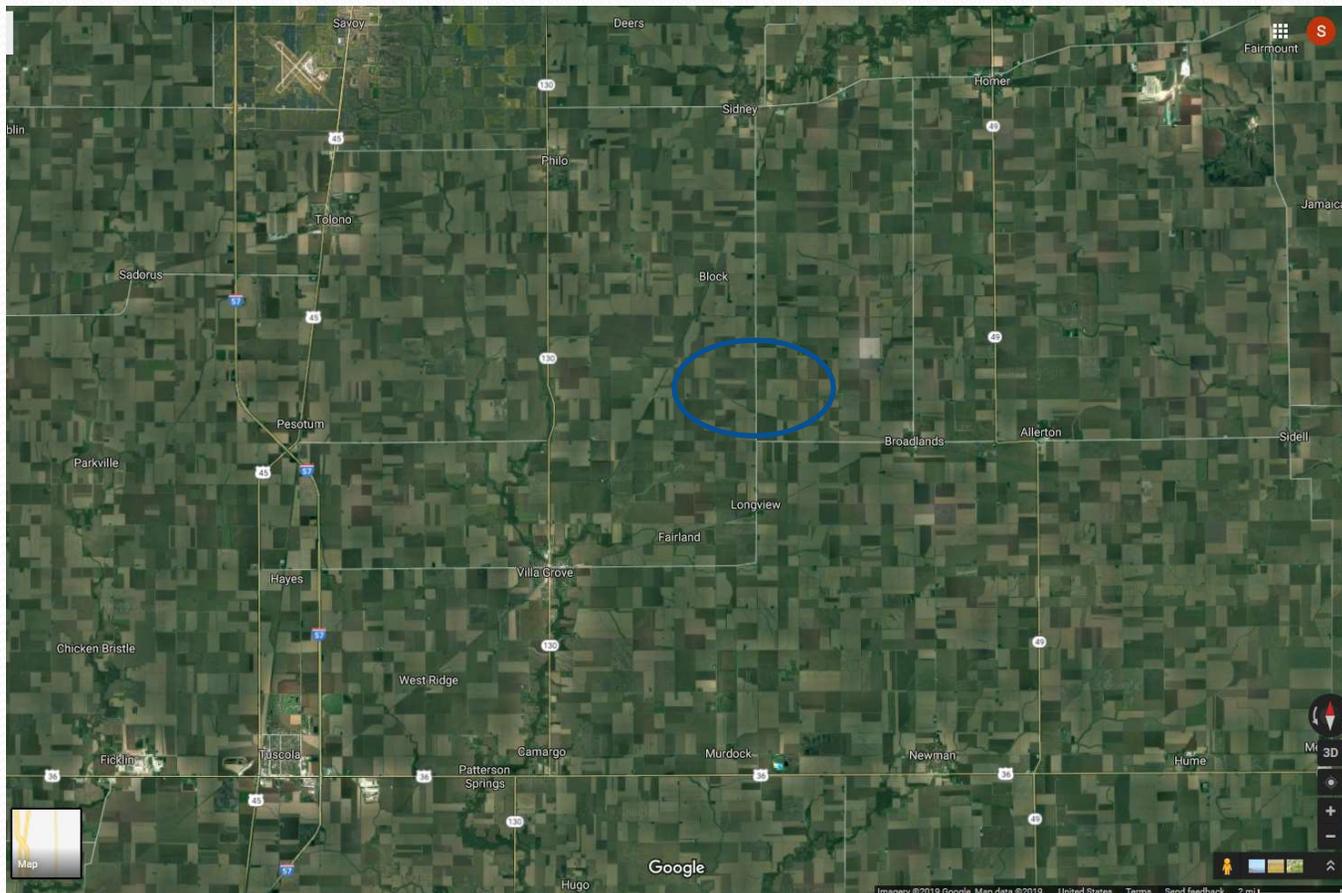
You need:

Enough OM

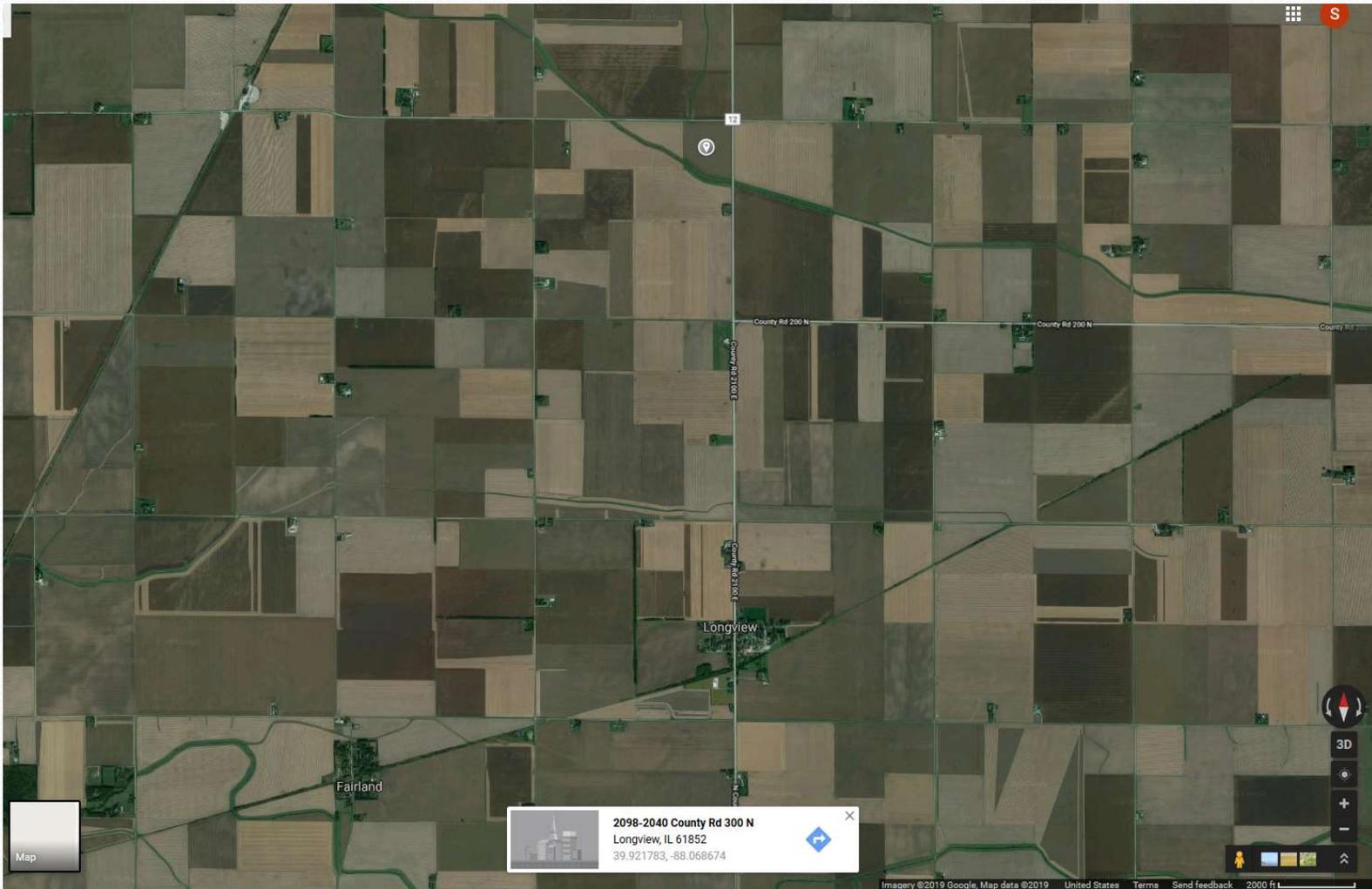
Saturated Soils

Stable streambanks

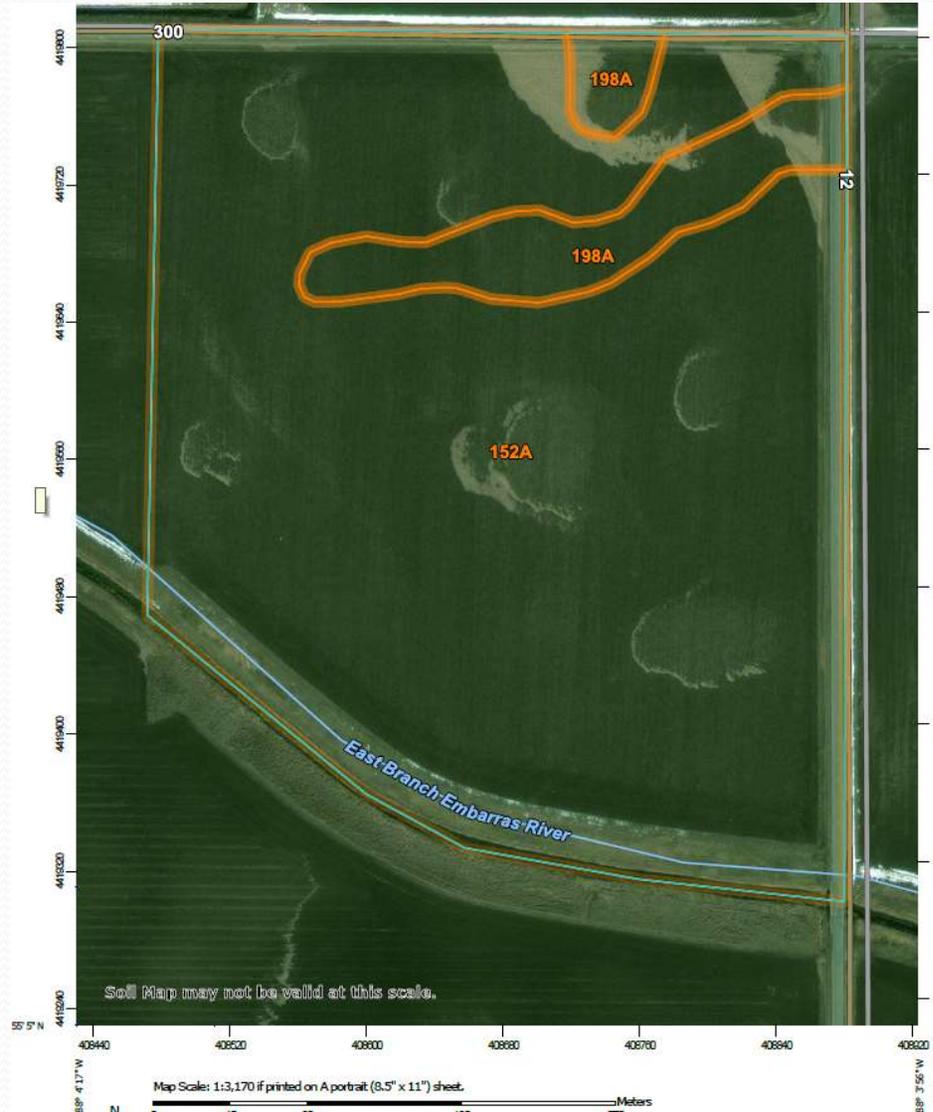
CLUE?



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Soil Boring Locations at Lannon Farm



Soil Profile Description

Soil Profile #: Lannon 1 Date Described: 2/27/19 County: Champaign
 Marker is in the third horizon at _____ inches. Twp.: 17N Range: 10E Sec.: 21
 Property Location: 72' due east of western property boundary; 20' north of creek bank
 Described By: Scott Wiesbrook

<http://www.illinoissoils.org/>



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When you don't have a soil scientist handy ...

... you can probe your own soil core.



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What is 'stable'?

Good



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Good



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Bad



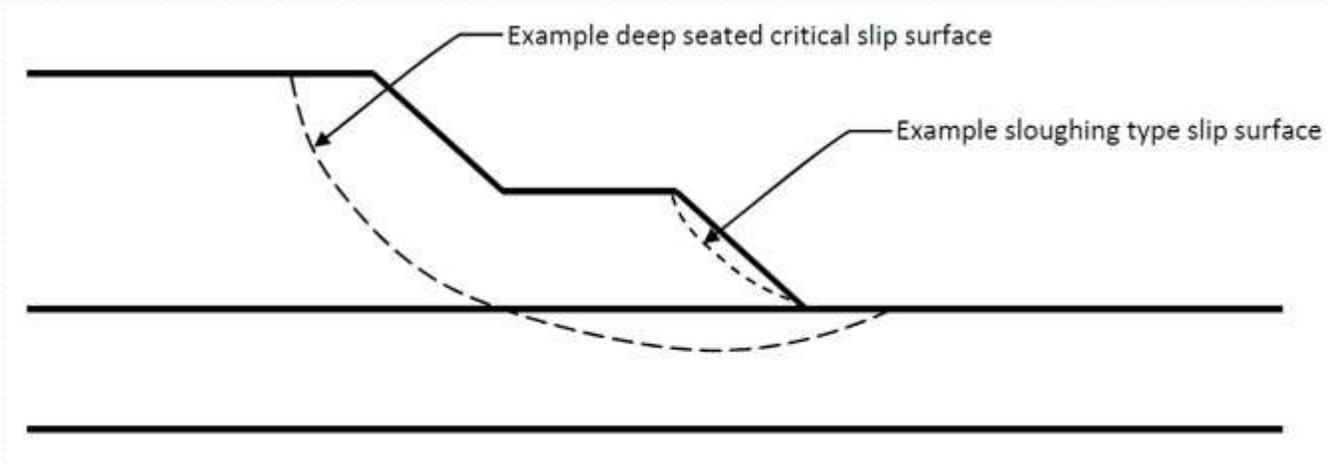
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Bad

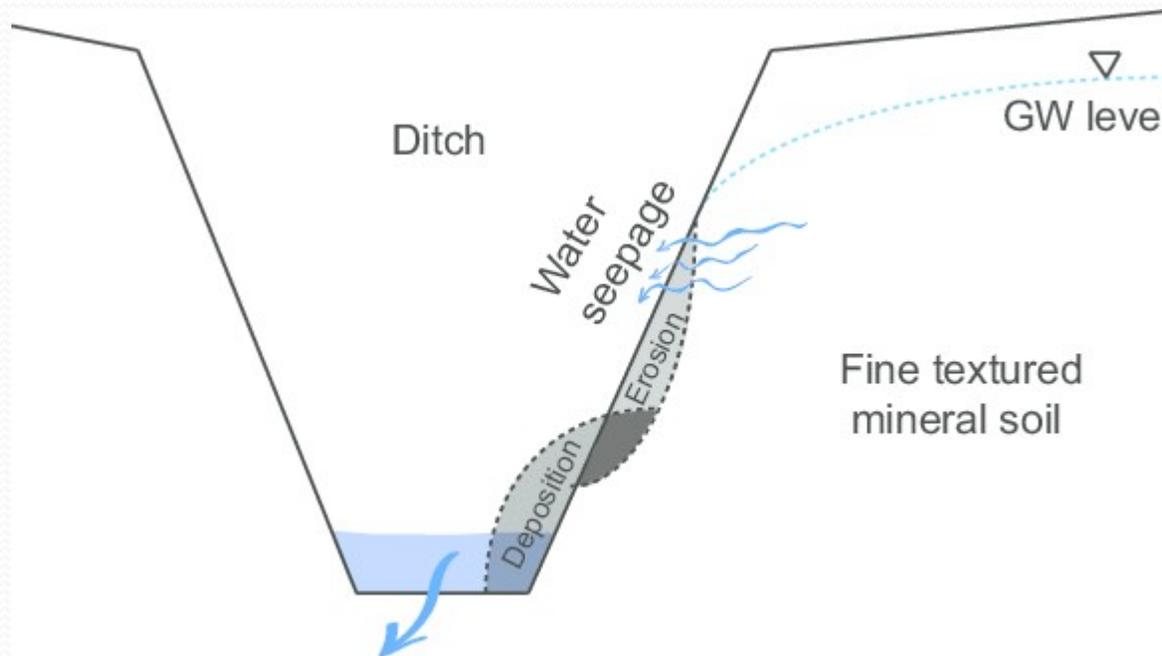


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Why and How?



Why and How?





Properly evaluating the site saves a lot of headaches!

You need:

Enough OM

Saturated Soils

Stable streambanks

Design is a two-step process:

1. Determine System Capacity

2. Size Distribution Pipe

SATURATED BUFFER DESIGN

USDA- Natural Resources Conservation Service

Illinois NRCS Version 2.1 - 4/10/2017

Project Name TNC Saturated Buffer
Site Location Lannon
County Champaign

Designed by: SMAWMS
Checked by: _____

Date: 5/24/2019
Date: _____

Determine System Capacity:

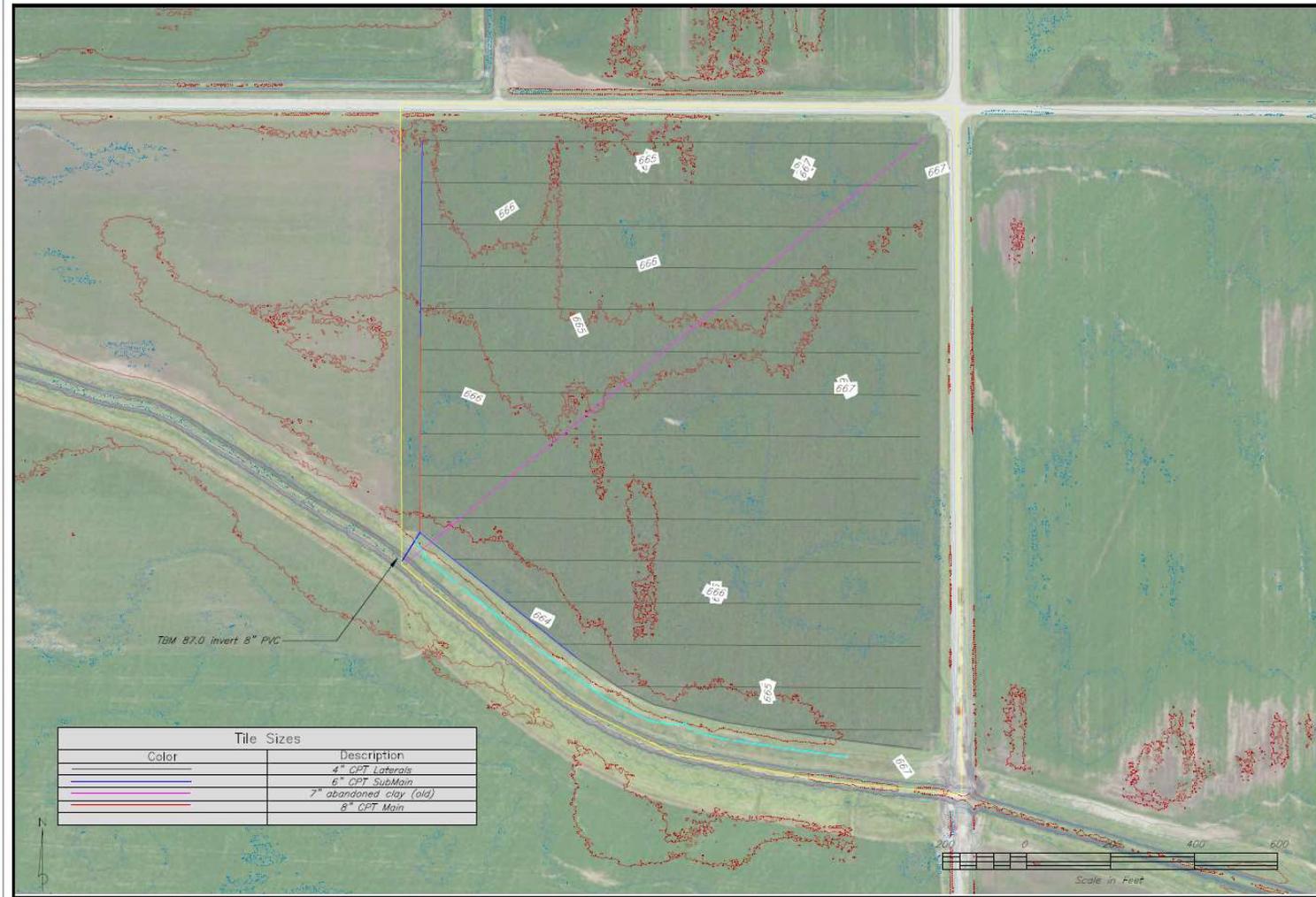
Option 1 - Mainline Configuration		Option 2 - Drainage Coefficient	
Mainline tile size (in)	8	Drainage area of tile system (ac)	46
Mainline tile grade (%)	0.50	Drainage coefficient (inches/day)	0.2
Mainline tile material	CPT Manning's 'n' = 0.016	Capacity of drainage system	0.387 cfs
Peak velocity in mainline given size and grade	1.99 ft/sec	Option 3 - Saturated Buffer system flow rate (Based on DRAINMOD Model or other source)	
Peak flow from mainline size and grade	0.696 cfs	Describe Value Used and source	
Minimum Design Capacity: (5% of Option 1, 2, or 3; whichever is lower)	0.019 cfs		
Selected Design Capacity	0.020 cfs		

Size Distribution Pipe:

Distribution pipe min. grade (%)	0.05
Design distribution pipe diameter (in)	6 in
Distance from dist. pipe to outlet channel, L (ft)	40.0
Ground surface elevation at WCS (ft)	93.0
Depth of impervious layer (ft)	7.4



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Tile Sizes	
Color	Description
	4" CPT Laterals
	6" CPT SubMain
	7" abandoned clay (old)
	8" CPT Main

WMS LLC
 Water Management Solutions LLC
 3013 E Lewis Road, Effingham, IL 62401

File No. 2018 TNC Lannon Sub-Burned
 Drawing No. 5/24/19 4:57 PM
 Sheet 3 of 10

Designer: S. Anderson
 Drafter: S. Anderson
 Checked: _____
 Approved: _____

Existing Tile (ca. 2010)
 TNC Lannon, Springfield, Butler, Champagne County, IL

Date: 05/21/19
 05/21/19

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Drainage Characteristics of Soil Groups

Drummer (152)

Alphabetic Order Numeric Order

- Darwin
- Del Rey
- Denny
- Denrock
- Dockery
- Drummer
- Dunham
- Dupo

E

F

Distribution of Drummer in Illinois

Steady State Drainage Transient Drainage General Information

Drainage Coefficient Spacing Range What is Steady State Drainage?

Depth to Impermeable layer (ft) **4.986876**

Hydraulic Conductivity (ft/day) **3.152**

Drain Depth (ft) 3.5

Depth to mid-drain water table (ft) 1

Calculate Drainage Coefficient (in/day) 0.199

Required Spacing (ft) 100

Specify Data Path Description of Soils and Their Role in Subsurface Drainage Exit

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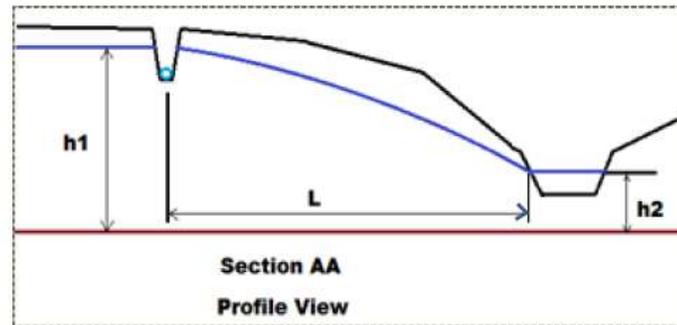
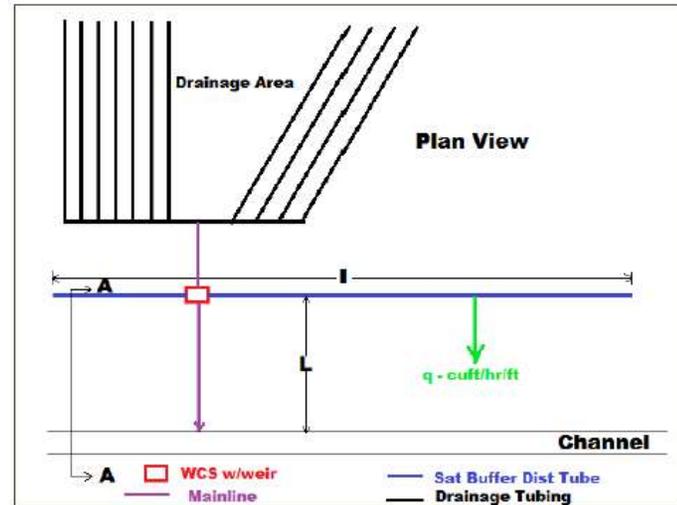


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Selected Design Capacity 0.020 cfs

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Design water control weir elevation (ft)	92.0
Baseflow water elevation in ditch or outlet (ft)	85.6
Head at WCS, h_1	6.4 ft
Head at outlet, h_2	0.0 ft
Soil saturated hydraulic conductivity, K_{sat} ($\mu\text{m/sec}$)	9.70
	0.11 ft/hr
Unit flow from distribution pipe, q ($\text{ft}^3/\text{hr per ft}$)	0.059
$q = \frac{K_{sat}}{2L}(h_1^2 - h_2^2)$	
Distribution pipe length for min. design capacity	1187 ft
Selected distribution pipe length (ft)	1200
Distribution pipe flow rate (ft^3/hr)	70.4
% of drainage system capacity handled by saturated buffer design	5.1%



Notes:

Discussion?

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