Tax Ditches and Their Role in the Development Process

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Introduction

• Tax Ditch 101
• Tax Ditch Design Methodology
• Contractor Do’s and Don’ts
• Things to consider as a CCR
• Questions
Tax Ditches are organizations formed on a watershed basis to construct and maintain a drainage system. The organizations are managed by officers elected by the taxables.
Tax Ditch Law

• Title 7, Chapter 41 of the Delaware Code passed in 1951 last revised in 2004
  – “Drainage of Lands and Management of Waters; Tax Ditches”
  – Online @: http://www.delcode.state.de.us

• Law Declared:
  – “… that the drainage and the prevention of flooding of lands and the management of water for resource conservation shall be considered a public benefit and conducive to the public health, safety and welfare.”
Tax Ditch Organizations in Delaware

• Over 225 organizations in the state manage 2000+ miles of ditch.

• County Breakdown:
  – New Castle County – 26
  – Kent County – 78
  – Sussex County - 143

• Formed through Superior Court.
How a Tax Ditch Organization is Formed

- Petition
- Planning Order
- Commissioner’s Report
- Hearing & Referendum or 100% Agreement
- Final Order
- Modify Final Order through court order
- Change Process
Tax Ditch Organization’s Powers

Powers as a Governmental Subdivision of the State:

• Levy taxes
• Make & execute contracts
• Receive administrative & technical assistance from Division of Soil & Water Conservation
• Others as defined in §4161 of Title 7 Ch. 41
Tax Ditch Organizations Functions

• Collect Taxes sufficient enough to provide funding required for maintenance.
• Maintain The Drainage System:
  – Control vegetation on ditch bottom and slopes
    • Done every 1-3 yrs
    • Mowing
    • Weed Wiper Bar
  – Dipouts: Restore channels to the designed lines and grades.
  – Removal of Beavers and Beaverdams
Tax Ditch Rights-of-Way

- ROWS provide the area necessary for the Construction and maintenance of ditches.
- The widths of the ROWS are highly variable.
  - By Type
  - By Watershed
  - Within the Watershed
- 3 main types of ROWs
  - Maintenance
    - Typically range 16.5’ to 30’ measured from Top of Bank
  - Construction
    - Vary according to land use in some cases.
    - Usually measured from centerline of the channel.
  - Disposal Limits
    - Area where cleared material is to be placed.
Tax Ditch Design Methodology

Nearly all of Delaware’s Tax Ditches have been designed by the Natural Resources Conservation Service (NRCS) formerly the Soil Conservation Service (SCS)
Except for a few in New Castle County, Tax Ditches were designed to remove EXCESS runoff from Agricultural Fields.

It was considered acceptable for runoff to accumulate to shallow depths for short periods of time so long as there was no crop damage.

The GOAL was to remove excess runoff over a 24 hour period.
Removal Rates
The “C” Curve Method

• This Method is Described in NRCS’s National Engineering Handbook Section 16 Chapter 5
• The removal rate or design capacity, Q, is expressed in cubic feet per second but is not a PEAK discharge.

\[ Q = CM^{5/6} \]

Q = Design Capacity
C = Drainage Coefficient
M = Drainage Area in Square Miles
Drainage Coefficient, C

• C is related to the characteristics of the watershed and the magnitude of the storm to which the watershed is being protected.
• General land use specific numbers have been developed for regions of the U.S.
  – Delaware is in the Northern Humid Region
  – These values were used in the design of early tax ditches
  – C = 37 for Cultivated Crops
  – C = 25 for Pastures
Drainage Coefficient, C continued

• Where land use is changing C can be computed.
  – Method used in later designs
  – \( C = 16.39 + 14.75R_e \)
    • \( R_e \) is the rainfall excess in inches

\[
\begin{align*}
R_e &= \frac{(P - .2S)^2}{P + .8S} \\
S &= \left(\frac{1000}{CN}\right) - 10
\end{align*}
\]

– Where:
  • \( P \) is the amount of Rainfall in inches
    – Typically the 5 yr. 24-hr value was used
  • \( CN \) = Weighted Runoff Curve number for the sub-watershed
Combining Flowrates at Junctions
The “20-40” Rule

1. If one of the tributary drainage areas is between 40% to 50% of the total drainage area then: ADD the design capacities for each tributary.

\[ Q_{\text{junction}} = Q_1 + Q_2 \]

\[ A_1 \approx A_2 \]
Combining Flowrates at Junctions
The “20-40” Rule

2. If one tributary area is <20% of the total area then: calculate \( Q \) using the total drainage area at the junction.

\[
Q_{\text{junction}} = C(A_1 + A_2)^{5/6}
\]

\[
A_1 \leq 0.2 \times (A_1 + A_2)
\]
Combining Flowrates at Junctions
The “20-40” Rule

3. If the smaller of the tributary drainage areas is between 20% and 40% of the total drainage area then:
   calculate Q using methods 1 and 2 and interpolate between the 2 based on the area of the smaller tributary

\[ \frac{.20(A_1 + A_2)}{} \leq A_i \geq \frac{.40(A_1 + A_2)}{} \]
Combining Flowrates at Junctions
The “20-40” Rule

3) Interpolation

\[ A_1 = 30\% \text{ of Total Area} \]

\[ Q_{\text{junction}} = 64.5 \text{ cfs} \]

\[ .20(A_1 + A_2) \leq A_1 \geq .40(A_1 + A_2) \]

\[ A_1 = 30\% \text{ of Total Area} \]
What does this all mean when I size a Stormwater Pond?

- Tax Ditches were designed using a methodology that allowed for short term flooding. The goal was NOT flood protection.
- The water surface in the Tax Ditch will probably be at or beyond the ditch banks in the 10 yr storm event.
- In the future, increased volumes conveyed downstream may need to be considered.
What does this all mean when designing a Stormwater Pond?

- Tailwater in the Tax Ditch MUST be considered when discharging a SWMP into a tax ditch.
- Tax Ditch design capacity cannot be directly translated to a Peak discharge with a known return period.
  - Example: $Q_{\text{design}} = 30$ cfs ≠ 2-year storm
- General consensus of literature and engineers who are experienced in tax ditch design is that the capacity is between the 2-yr and 5-yr peak discharge.
Contractor Do’s and Don’ts

“I was told that is a Tax Ditch and to not get near it.”

Anonymous Contractor
What Can You Do?

• Contractors can do maintenance to the Tax Ditches under the following conditions:
  1. You request permission from The Tax Ditch Managers.
  2. Get Technical Assistance from one of the following agencies:
     – Div. of Soil and Water Drainage Program
     – Kent Conservation District
     – Sussex Conservation District
     – New Castle Conservation District
What is Considered Maintenance?

- **Controlling Vegetation**
  - Woody vegetation can be removed from the banks of the Tax Ditch.

- **Remove Sediment from the ditch** provided that grades are set by one of the agencies mentioned previously.

- **When in doubt call us and ask for help!!!!**
What Can’t You Do?

• Place permanent structures in the Tax Ditch ROW.
• Throw trash or debris (brush, leaves, grass clippings) in the ditch
What are permanent obstructions?

- Houses, Decks, Porches
- Sheds
- Wells
- Septic Systems
- Fences
- Swimming Pools
- Telephone, Electric, and Cable boxes
- Anything else that will prevent equipment from using the ROW
What do you need to know as a Certified Construction Reviewer?
Things to consider as a CCR

- We have asked the delegated agencies to have Tax Ditch ROWs delineated on the Sediment and Stormwater Plans.
- CCRs can help the Tax Ditch Organization and Contractors\Developers save time and money by making sure obstructions are not placed in right-of-way.
- Make sure that new culverts are at the Tax Ditch design grade, NOT necessarily the existing grade.
  - Call us if there is a question
Things to consider as a CCR

• The top elevation of any riprap outlet protection should be slightly below the existing grade so drainage upstream is not affected.
  – Because of the flat (.05%) slopes on many of the tax ditches even minor obstructions to flow can have far reaching impacts.
• Remember that tax ditch ROWs are used for equipment travel and that any SWM facilities cannot obstruct them.
Questions?

• Contact me:
  – Brooks.cahall@state.de.us
  – (302) 856-5488

• Contact the Delegated Agency that approved the Stormwater Plan first on questions on a specific project.
Thank You