Use of Drainage Act Assessments to Evaluate Costs of Rural Natural Channel Design

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Presentation Overview

• Purpose of the Presentation
• Overview of the Drainage Act
• Assessment Principles
• Illustrative Example
  – Design Options
  – Evaluating Costs
• Things to Ponder
Drainage Act can be an effective tool for naturalizing channels (creating new and enhancing existing) located on private land.

The purpose of the presentation is to:

• Provide a brief overview of the assessment process
• Compare the cost and impacts of a natural channel design on the property owners in the watershed that are paying for the project.
Overview of the Drainage Act

- Provides a process to resolve drainage problems – referred to as “an area requiring drainage” (ARD)
- Construction of new drains initiated at the request of landowners and improvements to existing drains initiated by either landowners or municipality
- **User-pay**: Costs are assessed to the lands in the watershed, *not* the entire municipal tax base.
- Land owners can become financially responsible for costs, even if drain is not constructed
- Assessment Schedule outlines costs to **all** landowners in the watershed (including agricultural, roads, municipal, etc…)
Assessment Principles

• Acres in watershed divided by property into agriculture, forest, road, etc…

• Benefit value is the estimated value the drain provides to the properties due to:
  – Better subsurface and surface water drainage
  – Direct connection
  – Increased market value

• Benefit Value from the drain must be higher than the associated costs
Assessment Principles

- **Allowances** are compensation provided to a property owner affected by the drainage works including:
  - agricultural land taken permanently out of production
  - temporary construction corridors and access
  - damage to crops

- **Benefit** assessment is the share of the cost of the drain assessed as benefit to the properties.

- **Special benefit** is where a feature provides value only to the individual property and not the entire watershed. These features can include:
  - additional or larger drain crossings
  - private drain connections
  - decorative structures
Assessment Principles

• Outlet liability assessments are made to all properties and roads in the watershed to allow the right of drainage into a drainage system
  – actively through a direct connection
  – passively through watershed contributions

• Total cost of the drainage system including allowances are assessed to all properties as Benefit, Special Benefit and/or Outlet Liability
Assessment Principles

• **Fairness Test** is the process to ensure that the completed assessments are fair to all properties.

• The Province provides grants towards assessments on agricultural land for cost of municipal drains through the Agricultural Drainage Infrastructure Program (ADIP).
  - Equal to 1/3 of eligible cost items in southern Ontario
  - Equal to 2/3 of eligible cost items in northern Ontario
Option #1 – Buried Pipe
Watershed Boundary

Area Requiring Drainage

Land Temporarily taken out of production

Access for Construction

Property A

Property B

Property C

Property D

Property E

Property F

Natural Watercourse
Option #2 – Trapezoidal Channel
Road Watershed Boundary Area Requiring Drainage

Property A
- Buffer along drain
- Land Permanently taken out of production
- Access for Construction

Property B
-交叉点
- Land Permanently taken out of production

Property C
- Land Temporarily taken out of production

Property D

Property E

Property F
- Natural Watercourse

Road

Machinery Crossing
Option #3 – Natural Channel
Newbury Weir

Machinery Crossing

Buffer along drain

Land Temporarily taken out of production

Access for Construction

Machinery Crossing

Land Permanently taken out of production

Live Crib Wall

Property A

Property B

Property C

Property D

Property E

Property F

Watershed Boundary

Area Requiring Drainage

Natural Watercourse

Road
## Differences between Design Options

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Buried Pipe</th>
<th>Trapezoidal Channel</th>
<th>Natural Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Project Cost</strong></td>
<td>$120,220</td>
<td>$135,870</td>
<td>$367,300</td>
</tr>
<tr>
<td><strong>Length of Drain (m)</strong></td>
<td>1,310</td>
<td>1,310</td>
<td>1,455</td>
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<tr>
<td><strong>Long term maintenance</strong></td>
<td>Medium</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Ongoing Impact / Cost on Agricultural Operation</strong></td>
<td>Low</td>
<td>Medium</td>
<td>High</td>
</tr>
<tr>
<td><strong>Impact on Water Quality</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- <strong>Nutrients</strong></td>
<td>Medium</td>
<td>Medium</td>
<td>Low</td>
</tr>
<tr>
<td>- <strong>Sediment</strong></td>
<td>Low</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td><strong>Water Flow / Velocity at Outlet</strong></td>
<td>High, Flashy</td>
<td>Medium, Flashy</td>
<td>Low, Moderate</td>
</tr>
<tr>
<td><strong>Fish Habitat</strong></td>
<td>None</td>
<td>Good</td>
<td>Excellent</td>
</tr>
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</table>
## Assessment Comparison

<table>
<thead>
<tr>
<th>Costs</th>
<th>Buried Pipe</th>
<th>Trapezoidal Channel</th>
<th>Natural Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total Project</strong></td>
<td>$120,220</td>
<td>$135,870</td>
<td>$367,300</td>
</tr>
<tr>
<td><strong>Construction</strong></td>
<td>$78,600</td>
<td>$70,900</td>
<td>$226,300</td>
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<tr>
<td><strong>Engineering, Construction Supervision, etc…</strong></td>
<td>$39,300</td>
<td>$35,440</td>
<td>$113,130</td>
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<tr>
<td><strong>Allowances</strong></td>
<td>$2,320</td>
<td>$29,530</td>
<td>$27,870</td>
</tr>
<tr>
<td><strong>Land taken out of production – permanently</strong></td>
<td>$0</td>
<td>$22,340</td>
<td>$24,640</td>
</tr>
<tr>
<td><strong>Damages – crops and land</strong></td>
<td>$1,530</td>
<td>$2,580</td>
<td>$2,830</td>
</tr>
<tr>
<td><strong>Land taken out of production – future access &amp; maintenance</strong></td>
<td>$790</td>
<td>$4,610</td>
<td>$400</td>
</tr>
<tr>
<td><strong>ADIP Grant</strong></td>
<td>$32,140</td>
<td>$36,340</td>
<td>$98,210</td>
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</table>
## Individual landowners – Gross Assessment

<table>
<thead>
<tr>
<th>Property</th>
<th>Buried Pipe</th>
<th>Trapezoid Channel</th>
<th>Natural Channel</th>
<th>Premium Factor for Natural Channel vs. Pipe</th>
<th>Premium Factor for Natural Channel vs. Trapezoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$37,460</td>
<td>$42,330</td>
<td>$114,410</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>B</td>
<td>$35,790</td>
<td>$40,450</td>
<td>$109,340</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>C</td>
<td>$20,710</td>
<td>$23,410</td>
<td>$63,270</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>D</td>
<td>$240</td>
<td>$270</td>
<td>$750</td>
<td>3.1</td>
<td>2.8</td>
</tr>
<tr>
<td>E</td>
<td>$2,270</td>
<td>$2,570</td>
<td>$6,960</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>F</td>
<td>$3,710</td>
<td>$4,190</td>
<td>$11,340</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Road</td>
<td>$20,040</td>
<td>$22,650</td>
<td>$61,230</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>Total</td>
<td>$120,220</td>
<td>$135,870</td>
<td>$367,300</td>
<td>3.1</td>
<td>2.7</td>
</tr>
</tbody>
</table>
## Individual landowners – Net Assessment

<table>
<thead>
<tr>
<th>Property</th>
<th>Buried Pipe</th>
<th>Trapezoid Channel</th>
<th>Natural Channel</th>
<th>Premium Factor for Natural Channel vs. Pipe</th>
<th>Trapezoid</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>$24,790</td>
<td>$25,060</td>
<td>$73,110</td>
<td>2.9</td>
<td>2.9</td>
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<tr>
<td>B</td>
<td>$23,150</td>
<td>$14,850</td>
<td>$61,370</td>
<td>2.7</td>
<td>4.1</td>
</tr>
<tr>
<td>C</td>
<td>$12,630</td>
<td>$3,810</td>
<td>$30,840</td>
<td>2.4</td>
<td>8</td>
</tr>
<tr>
<td>D</td>
<td>$170</td>
<td>$190</td>
<td>$500</td>
<td>2.9</td>
<td>2.6</td>
</tr>
<tr>
<td>E</td>
<td>$1,510</td>
<td>$1,730</td>
<td>$4,640</td>
<td>3.1</td>
<td>2.7</td>
</tr>
<tr>
<td>F</td>
<td>$3,470</td>
<td>$1,720</td>
<td>$9,530</td>
<td>2.7</td>
<td>5.5</td>
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<tr>
<td>Road</td>
<td>$20,040</td>
<td>$22,640</td>
<td>$61,230</td>
<td>3.1</td>
<td>2.7</td>
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<tr>
<td>Total</td>
<td>$85,760</td>
<td>$70,000</td>
<td>$241,220</td>
<td>2.8</td>
<td>3.4</td>
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</tbody>
</table>

**Note:** No ADIP grant applied to Property F and Road
Things to Ponder

• What do the different designs mean to individual property owners’ assessments?
  – Insignificant to 1 property (D) at edge of watershed
  – Moderate to 2 properties (E and F) near outlet
  – Significant to 4 properties in ARD (A, B, C and Road)

• How does application of the ADIP grant affect the choice of design?
  – Design choice does not significantly change the percentage of costs landowners receive in grant
  – Costs to both landowners and province impacted by choice
Things to Ponder

Impacts on Agricultural Property Owners

• The pipe design provides advantages:
  – No nutrient management restrictions
  – More available land
  – Less disruption to cropping activity
  – No Conservation Authorities Act regulations

• Channels with buffer:
  – Access to portions of field
  – Weed control
  – Wildlife crop damage

• Meandering channel:
  – less land that can be effectively used for agriculture
Things to Ponder

• **Benefits versus Costs for natural channel design**
  – Are the benefits of the natural channel worth the additional costs?
  – Can the benefit value from a drain include ecological function, habitat features, etc…?
  – How can these benefits be monetized to be included in the benefit value?

• **What options exist to redistribute additional costs of natural channel design?**
## Assumptions and Data

<table>
<thead>
<tr>
<th></th>
<th>Buried Pipe</th>
<th>Trapezoid Channel</th>
<th>Natural Channel</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic Construction Cost</td>
<td>$60 /m</td>
<td>$48 /m</td>
<td>$150 /m</td>
</tr>
<tr>
<td>Crossing Cost</td>
<td>-</td>
<td>$8,000</td>
<td>$8,000</td>
</tr>
<tr>
<td>Engineering, Construction</td>
<td></td>
<td>40% of construction costs</td>
<td></td>
</tr>
<tr>
<td>Supervision, etc…</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Land Prices</td>
<td>$5,000 /ha (pasture) to $36,000 /ha (cropland)</td>
<td>$5,000 /ha (pasture) to $36,000 /ha (cropland)</td>
<td>$5,000 /ha (pasture) to $36,000 /ha (cropland)</td>
</tr>
<tr>
<td>Crop Prices</td>
<td></td>
<td>$1,700 /ha</td>
<td></td>
</tr>
<tr>
<td>Maintenance Frequency</td>
<td>25 years</td>
<td>10 years</td>
<td>50 years</td>
</tr>
<tr>
<td>Assumed Interest Rate</td>
<td></td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Benefit</td>
<td></td>
<td>40%</td>
<td></td>
</tr>
<tr>
<td>Benefiting Properties</td>
<td></td>
<td>Property A, B, C, F and Road</td>
<td></td>
</tr>
<tr>
<td>Outlet Liability Rate</td>
<td>$575.32 /ha</td>
<td>$650.19 /ha</td>
<td>$1,757.55 /ha</td>
</tr>
</tbody>
</table>