Appendix P: Third Party Drainage Solutions
CONCEPTUAL DESIGNS OF CULVERT IMPROVEMENTS No. 143 HAVE BEEN PREPARED UNDER A SEPARATE STUDY (DRAINAGE AND HYDROLOGY REPORT – PRELIMINARY DESIGN HIGHWAY 400).

PROPERTY ACQUISITION: NONE

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 36
CULVERT IMPROVEMENT No. 143
(HIGHWAY 400)
BUNKERS CREEK WATERSHED
SCALE = 1:750
DATE: MARCH 2019

Disclaimer
The information contained in this drawing is solely for the use of the Corporation of the City of Barrie for the purpose for which it has been prepared and Tatham Engineering Ltd. undertakes no duty or accepts any responsibility to any third party who may rely upon this drawing. This drawing may not be used for any purpose other than that provided in the Contract between the Corporation of the City of Barrie and Tatham Engineering Ltd. nor may any detail or element of this drawing be removed, reproduced, electronically stored or transmitted in any form with the express written consent of the Corporation of the City of Barrie.
CONCEPTUAL DESIGNS OF CULVERT IMPROVEMENTS No. 141 & 142 HAVE BEEN PREPARED UNDER A SEPARATE STUDY (DRAINAGE AND HYDROLOGY REPORT - PRELIMINARY DESIGN HIGHWAY 400).

PROPERTY ACQUISITION: NONE

MTO PROPOSED CULVERT IMPROVEMENTS TO BE COMPLETED AS PART OF HIGHWAY 400 IMPROVEMENTS.

Disclaimer
The information contained in this drawing is solely for the use of the Corporation of the City of Barrie for the purpose for which it has been prepared and Tatham Engineering Ltd. undertakes no duty or accepts any responsibility to any third party who may rely upon this drawing. This drawing may not be used for any purpose other than that provided in the Contract between the Corporation of the City of Barrie and Tatham Engineering Ltd. nor may any detail or element of this drawing be removed, reproduced, electronically stored or transmitted in any form with the express written consent of the Corporation of the City of Barrie.
CONCEPTUAL DESIGN OF CULVERT IMPROVEMENTS NO. 31 HAVE BEEN PREPARED UNDER A SEPARATE STUDY (DRAINAGE AND HYDROLOGY REPORT – PRELIMINARY DESIGN HIGHWAY 400)

MTO PROPOSED CULVERT IMPROVEMENTS TO BE COMPLETED AS PART OF HIGHWAY 400 IMPROVEMENTS

PROPERTY ACQUISITION: NONE

Disclaimer
The information contained in this drawing is solely for the use of the Corporation of the City of Barrie for the purpose for which it has been prepared and Tatham Engineering Ltd. undertakes no duty or accepts any responsibility to any third party who may rely upon this drawing. This drawing may not be used for any purpose other than that provided in the Contract between the Corporation of the City of Barrie and Tatham Engineering Ltd., nor may any detail or element of this drawing be removed, reproduced, electronically stored or transmitted in any form with the express written consent of the Corporation of the City of Barrie.

LEGEND
- PR. CULVERT
- PR. STORM SEWER
- PR STORM MAINTENANCE HOLE
- EX. STORM SEWER
- EX. STORM MAINTENANCE HOLE
- WATERCOURSE
- EX. SANITARY SEWER
- EX. SANITARY MAINTENANCE HOLE
- EX. WATERMAIN
- EX. CULVERT
- EX. PROPERTY LINE
- PROPERTY ACQUISITION

DRAINAGE MASTER PLAN
FINAL PREFERRED ALTERNATIVE SOLUTION
PROJECT No. 53
CULVERT IMPROVEMENT No. 31
(HIGHWAY 400 E/W-S & N/E-W RAMP)
DYMENTS CREEK WATERSHED
SCALE = 1:500
DATE: MARCH 2019

DYMENTS CREEK
(REACH DY-2a)

EX. 52.0 m - 1800 mm x 1400 mm
CONC. BOX CULVERT
SLOPE = 0.4%
U/S INV = 228.98
D/S INV = 228.71

PR. MTO REPLACEMENT
52 m - 9000 mm x 1500 mm
CONC. BOX CULVERT

DUNLOP ST W
400 HWY S OFF DUNLOP ST W

Property Acquisition:
None
CONCEPTUAL DESIGNS OF CULVERT IMPROVEMENT No. 33 HAVE BEEN PREPARED UNDER A SEPARATE STUDY (DRAWINGS AND HYDROLOGY REPORT – PRELIMINARY DESIGN HIGHWAY 400)

MTO PROPOSED CULVERT IMPROVEMENTS TO BE COMPLETED AS PART OF HIGHWAY 400 IMPROVEMENTS

THE CITY IS TO PROGRESSIVELY ACQUIRE LAND OR EASEMENTS FOR DRAINS, WATERCOURSES AND STORAGE AREAS CROSSING OR UPON PRIVATE PROPERTY WHERE IT IS CONSIDERED IN THE CITY'S INTEREST TO DO SO (BY-LAW 90-92: TO PROHIBIT OBSTRUCTION OF DRAINS & WATERCOURSES). PROPERTY ACQUISITION VIA EASEMENT, BLOCK, LOT OR PARCEL IS TO THE CITY'S DISCRETION.

Different roads and creeks are mentioned in the drawing:
- **DYMENTS CREEK WATERSHED**
- **55 HART DR.**
- **DUNLOP ST W**
- **HEADWALL/WINGWALLS**
- **CONC. BOX CULVERT**
- **WATERCOURSE**
- **PROPERTY ACQUISITION**

**Legend**
- **PR. CULVERT**
- **PR. STORM SEWER**
- **PR STORM MAINTENANCE HOLE**
- **EX. STORM SEWER**
- **EX. STORM MAINTENANCE HOLE**
- **WATERCOURSE**
- **EX. SANITARY SEWER**
- **EX. SANITARY MAINTENANCE HOLE**
- **EX. WATERMAIN**
- **EX. CULVERT**
- **EX. PROPERTY LINE**
- **PROPERTY ACQUISITION**

**Disclaimer**
The information contained in this drawing is solely for the use of the Corporation of the City of Barrie for the purpose for which it has been prepared and Tatham Engineering Ltd. undertakes no duty or accepts any responsibility to any third party who may rely upon this drawing. This drawing may not be used for any purpose other than that provided in the Contract between the Corporation of the City of Barrie and Tatham Engineering Ltd. nor may any detail or element of this drawing be removed, reproduced, electronically stored or transmitted in any form with the express written consent of the Corporation of the City of Barrie.

**Notice**
- **EX. Tatham (TO BE REMOVED)**
- **D/S INV = 228.13**
- **U/S INV = 228.30**
- **D/S INV = 227.71**
- **U/S INV = 228.13**
- **CULVERT IMPROVEMENT No. 32 (PROJECT No. 55)**
- **CULVERT IMPROVEMENT No. 35 (PROJECT No. 55)**
- **CULVERT IMPROVEMENT No. 32 & 33**
- **PROPERTY ACQUISITION**

The drawing is dated **March 2019**.

---

**HART DRIVE:**
- **ROAD CLASSIFICATION = MINOR COLLECTOR**
- **DESIGN FLOOD FREQUENCY CRITERIA = 1.50 YEAR**
- **MDP RECOMMENDED FLOOD FREQUENCY CRITERIA = 1:100 YEAR**

**EXISTING:**
- **9000 mm x 2000 mm CONC. BOX CULVERT**
- **CONVEYANCE CAPACITY = 54.0 m³/s (FUTURE FLOWS)**
- **DESIGN FLOOD FREQUENCY REGIONAL (HURRICANE HAZEL) STORM DEPTH OF OVERTOPPING = 0.00 m (REGULATORY EVENT)**

**PROPOSED:**
- **9000 mm x 2000 mm CONC. BOX CULVERT**
- **CONVEYANCE CAPACITY = 54.0 m³/s (FUTURE FLOWS)**
- **DESIGN FLOOD FREQUENCY REGIONAL (HURRICANE HAZEL) STORM DEPTH OF OVERTOPPING = 0.00 m (REGULATORY EVENT)**

**Design Flood Frequency Criteria:**
- **MDP**
- **1:100**

**Watercourse Improvements:**
- **A) 55 HART DRIVE (PORTION OF) MINIMUM RECOMMENDED PROPERTY ACQUISITION**
- **PROPERTY ACQUISITION SHOWN ACTUAL PROPERTY ACQUISITION TO BE CONFIRMED AT DETAILED DESIGN**

**Date:**
- **March 2019**

---

**Scale:** 1:1,000

**Legend:**
- **Watercourse**
- **Property Line**
- **Sanitary Sewer**
- **Sanitary Maintenance Hole**
- **Storm Sewer**
- **Storm Maintenance Hole**
- **Property Acquisition**
- **Culvert**
- **Property Line**

---

**DRAINAGE MASTER PLAN FINAL PREFERRED ALTERNATIVE SOLUTION**

**Project No. 54, 55 & 56**
- **Culvert Improvement No. 32 & 33**
- **Watercourse Improvement No. 11**
- **Dyments Creek Watershed**
EX. 57.0 m - 900mm x 900 mm CONC. BOX CULVERT (TO BE REMOVED)

HEADWALL/WINGWALLS

HOTCHKISS CREEK (REACH H0-4)

PR. 57.0 m - 3048 mm x 914 mm CONC. BOX CULVERT

CONNECT EX. STORM SEWER TO BOX CULVERT

EXISTING STORM SEWER TO BE REMOVED

PROPERTY ACQUISITION: NONE

PROPOSED CULVERT IMPROVEMENTS TO BE COMPLETED AS PART OF HIGHWAY 400 IMPROVEMENTS

THE SUBJECT ROAD HAS BEEN IDENTIFIED FOR FUTURE ROAD WIDENING AS PART OF THE TRANSPORTATION MASTER PLAN. THE CULVERT IMPROVEMENT SHOWN HAS BEEN DESIGNED FOR THE EXISTING ROAD WIDTH. THE CULVERT LENGTH TO BE CONFIRMED AS PART OF DETAILED DESIGN IN COORDINATION WITH THE TRANSPORTATION MASTER PLAN.

Disclaimer
The information contained in this drawing is solely for the use of the Corporation of the City of Barrie for the purpose for which it has been prepared and Tatham Engineering Ltd. undertakes no duty or accepts any responsibility to any third party who may rely upon this drawing. This drawing may not be used for any purpose other than that provided in the Contract between the Corporation of the City of Barrie and Tatham Engineering Ltd. nor may any detail or element of this drawing be removed, reproduced, electronically stored or transmitted in any form without the express written consent of the Corporation of the City of Barrie.

LEGEND

PR. CULVERT
PR. STORM SEWER
PR STORM MAINTENANCE HOLE
EX. STORM SEWER
EX. STORM MAINTENANCE HOLE
WATERCOURSE
EX. SANITARY SEWER
EX. SANITARY MAINTENANCE HOLE
EX. WATERMAIN
EX. CULVERT
EX. PROPERTY LINE
PROPERTY ACQUISITION

ESSA ROAD:
ROAD CLASSIFICATION = ARTERIAL
DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 900 mm x 900 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY < 2.0 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY < 1.2 YEAR
DEPTH OF OVERTOPPING = 0.52 m (REGULATORY EVENT)

PROPOSED: 3048 mm x 914 mm CONC. BOX CULVERT
CONVEYANCE CAPACITY = 8.3 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = REGIONAL (HURRICANE HAZEL) STORM
DEPTH OF OVERTOPPING = 0.00 m (REGULATORY EVENT)
METROLINK RAILWAY:

MDP RECOMMENDED DESIGN FLOOD FREQUENCY CRITERIA = 1:100 YEAR

EXISTING: 1600 mm ø CSP CULVERT
CONVEYANCE CAPACITY = 11.3 m³/s (EXISTING FLOWS)
DESIGN FLOOD FREQUENCY = 1:10 YEAR
DEPTH OF OVERTOPPING = 0.89 m (REGULATORY EVENT)

PROPOSED: 3000 mm ø CONC. CULVERT
CONVEYANCE CAPACITY = 37.6 m³/s (FUTURE FLOWS)
DESIGN FLOOD FREQUENCY = 1:100 YEAR
DEPTH OF OVERTOPPING = 0.69 m (REGULATORY EVENT)

CULVERT DESIGNED TO MAXIMIZE FLOODPLAIN
STORAGE USED UPSTREAM OF CROSSING DURING
THE 1:100 YEAR STORM WITHOUT OVERTOPPING THE RAILWAY

Disclaimer
The information contained in this drawing is solely for
the use of the Corporation of the City of Barrie for the
purpose for which it has been prepared and Tatham
Engineering Ltd. undertakes no duty or accepts any
responsibility to any third party who may rely upon this
drawing. This drawing may not be used for any
purpose other than that provided in the Contract
between the Corporation of the City of Barrie and
Tatham Engineering Ltd. nor may any detail or element
of this drawing be removed, reproduced, electronically
stored or transmitted in any form with the express
written consent of the Corporation of the City of Barrie.
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td>m</td>
<td>81</td>
<td>$5,785.00</td>
<td>$468,585</td>
</tr>
<tr>
<td>1.01</td>
<td>2400 x 1800 mm Conc. Box Culvert</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Subtotal: Culvert Improvement $468,585

Construction Contingency: 30% $140,576
Engineering Design Fee: 20% $93,717
Contract Administration / Construction Inspection: 10% $46,859
Utilities / Services Relocation Cost: 15% $70,288
Environmental Assessment Costs: $0

Construction Cost Estimate (2018 Unit Prices): $820,024
Construction Index: 5.2% $42,641
HST: 1.76% $15,183
Total Construction Cost (2019 Unit Prices): $877,848

Total Estimated Project Cost $877,848
### Barrie Drainage Master Plan
Final Preferred Alternative Solution
Project Cost Estimate
February 2019

Project No. 37
Culvert Improvement No. 142 (Highway 400)
Bunkers Creek Watershed

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td>m</td>
<td>86</td>
<td>$12,135.00</td>
<td>$1,043,610</td>
</tr>
<tr>
<td></td>
<td>Subtotal: Culvert Improvement</td>
<td></td>
<td></td>
<td></td>
<td>$1,043,610</td>
</tr>
</tbody>
</table>

- Construction Contingency: 30% $313,083
- Engineering Design Fee: 20% $208,722
- Contract Administration / Construction Inspection: 10% $104,361
- Utilities / Services Relocation Cost: 15% $156,542
- Environmental Assessment Costs: $0

### Total Construction Cost Estimate (2018 Unit Prices): $1,826,318
- Construction Index: 5.2% $94,969
- HST: 1.76% $33,815

### Total Construction Cost (2019 Unit Prices): $1,955,101

<p>| Total Estimated Project Cost | $1,955,101 |</p>
<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td>m</td>
<td>94</td>
<td>$3,970.00</td>
<td>$373,180</td>
</tr>
</tbody>
</table>

Subtotal: Culvert Improvement $373,180

- Construction Contingency: 30% $111,954
- Engineering Design Fee: 20% $74,636
- Contract Administration / Construction Inspection: 10% $37,318
- Utilities / Services Relocation Cost: 15% $55,977
- Environmental Assessment Costs: $0

Construction Cost Estimate (2018 Unit Prices): $653,065
Construction Index: 5.2% $33,959
HST: 1.76% $12,092
Total Construction Cost (2019 Unit Prices): $699,116

Total Estimated Project Cost $699,116
### Project Cost Estimate

**Project No. 39**  
**SWMF Retrofit No. 94**  
**Bunkers Creek Watershed**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>SWMF Retrofit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.01</td>
<td>Strip and Stockpile Topsoil</td>
<td>m²</td>
<td>6,900</td>
<td>$13.00</td>
<td>$89,700</td>
</tr>
<tr>
<td>1.02</td>
<td>Excavation and Grading</td>
<td>m³</td>
<td>17,626</td>
<td>$24.00</td>
<td>$423,024</td>
</tr>
<tr>
<td>1.03</td>
<td>Geotechnical Sampling for Off-site Disposal</td>
<td>m³</td>
<td>17,626</td>
<td>$1.00</td>
<td>$17,626</td>
</tr>
<tr>
<td>1.04</td>
<td>Remove and Dispose of Excess Material</td>
<td>m³</td>
<td>16,426</td>
<td>$30.00</td>
<td>$492,780</td>
</tr>
<tr>
<td>1.05</td>
<td>Construction Access Mud Mat</td>
<td>ea</td>
<td>2</td>
<td>$6,000.00</td>
<td>$12,000</td>
</tr>
<tr>
<td>1.06</td>
<td>Heavy Duty Silt Fence</td>
<td>m</td>
<td>620</td>
<td>$23.00</td>
<td>$14,260</td>
</tr>
<tr>
<td>1.07</td>
<td>1200 x 1200 mm Conc. Box Culvert</td>
<td>m</td>
<td>80</td>
<td>$3,180.00</td>
<td>$254,400</td>
</tr>
<tr>
<td>1.08</td>
<td>Place Topsoil and Hydroseed</td>
<td>m²</td>
<td>100</td>
<td>$2,000.00</td>
<td>$200,000</td>
</tr>
<tr>
<td>1.09</td>
<td>Watercourse Improvements</td>
<td>m²</td>
<td>915</td>
<td>$9.00</td>
<td>$8,235</td>
</tr>
<tr>
<td>1.10</td>
<td>Remove Granular Road Base</td>
<td>m²</td>
<td>915</td>
<td>$7.00</td>
<td>$6,405</td>
</tr>
<tr>
<td>1.11</td>
<td>Remove Existing Buildings</td>
<td>ea</td>
<td>6</td>
<td>$25,000.00</td>
<td>$150,000</td>
</tr>
<tr>
<td>1.12</td>
<td>Granular ‘B’ (450 mm)</td>
<td>m²</td>
<td>700</td>
<td>$20.00</td>
<td>$14,000</td>
</tr>
<tr>
<td>1.13</td>
<td>Granular ‘A’ (150 mm)</td>
<td>m²</td>
<td>700</td>
<td>$11.00</td>
<td>$7,700</td>
</tr>
<tr>
<td>1.14</td>
<td>100 mm HL8 Base Course Asphalt</td>
<td>m²</td>
<td>700</td>
<td>$39.50</td>
<td>$27,650</td>
</tr>
<tr>
<td>1.15</td>
<td>40 mm HL3 Surface Course Asphalt</td>
<td>m²</td>
<td>700</td>
<td>$17.00</td>
<td>$11,900</td>
</tr>
<tr>
<td></td>
<td><strong>Subtotal: SWMF Retrofit</strong></td>
<td></td>
<td></td>
<td></td>
<td><strong>$1,733,680</strong></td>
</tr>
</tbody>
</table>

**Construction Contingency:** 30%  
**Engineering Design Fee:** 20%  
**Contract Administration / Construction Inspection:** 10%  
**Utilities / Services Relocation Cost:** 15%

**Environmental Assessment Costs:** $0

**Construction Cost Estimate (2018 Unit Prices):** **$3,033,940**

**Construction Index:** 5.2%  
**HST:** 1.76%  
**Total Construction Cost (2019 Unit Prices):** **$3,247,879**

| 2 | Property Acquisition | | **$955,000** |
| 2.01 | 132 Henry St. | | **$258,000** |
| 2.02 | 134 Henry St. | | **$311,000** |
| 2.03 | 129 Henry St. | | **$185,000** |
| 2.04 | 127 Henry St. | | **$201,000** |

**Adjusted Value:** 165%  
**Acquisition Contingency:** 30%  
**Property Acquisition:** **$2,048,475**

**Total Estimated Project Cost:** **$5,296,354**
## Barrie Drainage Master Plan
### Final Preferred Alternative Solution
#### Project Cost Estimate
##### February 2019

**Project No. 53**
*Culvert Improvement No. 31 (Highway 400 and Dunlop St. E/W-S and N-E/W Ramps)*
*Dyments Creek Watershed*

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td>m</td>
<td>52</td>
<td>$23,135.00</td>
<td>$1,203,020</td>
</tr>
</tbody>
</table>

**Subtotal: Culvert Improvement**
$1,203,020

- **Construction Contingency:** 30%  
  $360,906
- **Engineering Design Fee:** 20%  
  $240,604
- **Contract Administration / Construction Inspection:** 10%  
  $120,302
- **Utilities / Services Relocation Cost:** 15%  
  $180,453
- **Environmental Assessment Costs:**  
  $0

**Construction Cost Estimate (2018 Unit Prices):**
$2,105,285

- **Construction Index:** 5.2%  
  $109,475
- **HST:** 1.76%  
  $38,980

**Total Construction Cost (2019 Unit Prices):**
$2,253,740

**Total Estimated Project Cost**
$2,253,740
## Barrie Drainage Master Plan
### Final Preferred Alternative Solution
#### Project Cost Estimate
February 2019

**Project No. 54**
Culvert Improvement No. 33 (Highway 400)
Dyments Creek Watershed

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td>m</td>
<td>135</td>
<td>$23,135.00</td>
<td>$3,123,225</td>
</tr>
</tbody>
</table>

**Subtotal: Culvert Improvement** $3,123,225

- Construction Contingency: 30% $936,968
- Engineering Design Fee: 20% $624,645
- Contract Administration / Construction Inspection: 10% $312,323
- Utilities / Services Relocation Cost: 15% $468,484
- Environmental Assessment Costs: 0%

**Construction Cost Estimate (2018 Unit Prices):** $5,465,644
- Construction Index: 5.2% $284,213
- HST: 1.76% $101,197

**Total Construction Cost (2019 Unit Prices):** $5,581,055

**Total Estimated Project Cost** $5,581,055
Barrie Drainage Master Plan  
Final Preferred Alternative Solution  
Project Cost Estimate  
February 2019

Project No. 16  
(Transportation Master Plan Project ID 1217)  
Culvert Improvement No. 44 (Essa Rd.)  
Hotchkiss Creek Watershed

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.01</td>
<td>Remove Existing Culvert</td>
<td>m</td>
<td>57</td>
<td>$85.00</td>
<td>$4,845</td>
</tr>
<tr>
<td>1.02</td>
<td>Remove Existing Headwalls</td>
<td>LS</td>
<td>1</td>
<td>$2,500.00</td>
<td>$2,500</td>
</tr>
<tr>
<td>1.03</td>
<td>3048 mm x 914 mm Conc. Box Culvert</td>
<td>m</td>
<td>81</td>
<td>$7,010.00</td>
<td>$567,810</td>
</tr>
<tr>
<td>1.04</td>
<td>Concrete Headwall / Wingwalls</td>
<td>ea</td>
<td>2</td>
<td>$25,000.00</td>
<td>$50,000</td>
</tr>
<tr>
<td>1.05</td>
<td>Flow Diversion</td>
<td>wks</td>
<td>4</td>
<td>$20,000.00</td>
<td>$80,000</td>
</tr>
</tbody>
</table>

Subtotal: Culvert Improvement $705,155

Construction Contingency: 30% $211,547
Engineering Design Fee: 20% $141,031
Contract Administration / Construction Inspection: 10% $70,516
Utilities / Services Relocation Cost: 15% $105,773
Environmental Assessment Costs: $0

Construction Cost Estimate (2018 Unit Prices): $1,234,021
Construction Index: 5.2% $64,169
HST: 1.76% $22,848
Total Construction Cost (2019 Unit Prices): $1,321,039

Total Estimated Project Cost $1,321,039

Note: Construction cost estimate reflects cost of culvert installation as part of road renewal/reconstruction projects.
## Barrie Drainage Master Plan
### Final Preferred Alternative Solution
#### Project Cost Estimate
February 2019

**Project No. 86**  
**Culvert Improvement No.138 (Metrolink Railway)**  
**Whiskey Creek Watershed**

<table>
<thead>
<tr>
<th>Item No.</th>
<th>Description</th>
<th>Unit</th>
<th>Estimated Quantity</th>
<th>Estimated Unit Price</th>
<th>Estimated Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Culvert Improvement</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.01</td>
<td>Remove Existing Culvert</td>
<td>m</td>
<td>60</td>
<td>$85.00</td>
<td>$5,100</td>
</tr>
<tr>
<td>1.02</td>
<td>Excavation and Grading</td>
<td>m³</td>
<td>800</td>
<td>$24.00</td>
<td>$19,200</td>
</tr>
<tr>
<td>1.03</td>
<td>Remove and Dispose of Excess Material</td>
<td>m³</td>
<td>800</td>
<td>$30.00</td>
<td>$24,000</td>
</tr>
<tr>
<td>1.04</td>
<td>Geotechnical Sampling for Off-site Disposal</td>
<td>m³</td>
<td>800</td>
<td>$1.00</td>
<td>$800</td>
</tr>
<tr>
<td>1.05</td>
<td>Strip and Stockpile Topsoil</td>
<td>m²</td>
<td>1,600</td>
<td>$13.00</td>
<td>$20,800</td>
</tr>
<tr>
<td>1.06</td>
<td>Place Topsoil and Hydroseed</td>
<td>m²</td>
<td>1,600</td>
<td>$10.00</td>
<td>$16,000</td>
</tr>
<tr>
<td>1.07</td>
<td>3000 mm Dia. Storm Sewer</td>
<td>m</td>
<td>30</td>
<td>$5,545.00</td>
<td>$166,350</td>
</tr>
<tr>
<td>1.08</td>
<td>Concrete Headwall / Wingwalls</td>
<td>ea</td>
<td>2</td>
<td>$25,000.00</td>
<td>$50,000</td>
</tr>
<tr>
<td>1.09</td>
<td>Watercourse Improvements</td>
<td>m</td>
<td>30</td>
<td>$2,000.00</td>
<td>$60,000</td>
</tr>
<tr>
<td>1.10</td>
<td>Flow Diversion</td>
<td>wks</td>
<td>10</td>
<td>$20,000.00</td>
<td>$200,000</td>
</tr>
<tr>
<td>1.11</td>
<td>Railway Reinstatement</td>
<td>m</td>
<td>20</td>
<td>$1,500.00</td>
<td>$30,000</td>
</tr>
</tbody>
</table>

**Subtotal: Culvert Improvement**  
$592,250

**Construction Contingency:** 30%  
$177,675

**Engineering Design Fee:** 20%  
$118,450

**Contract Administration / Construction Inspection:** 10%  
$59,225

**Utilities / Services Relocation Cost:** 15%  
$88,838

**Environmental Assessment Costs:**  
$0

**Construction Cost Estimate (2018 Unit Prices):**  
$1,036,438

**HST:** 1.76%  
$19,190

**Total Construction Cost (2019 Unit Prices):**  
$1,109,522

**Total Estimated Project Cost**  
$1,109,522