Preliminary Design Report:

Prices Subdivision – Drainage Improvements & Wastewater Servicing

--Greenland Consulting Engineers--
Study Location

- The Study Location (Prices Subdivision) consists of the lots fronting onto Claire Glen, Patricia Drive, and Martin Grove as well as four lots on Grey Road 19.

- Prices Subdivision, located at the base of Blue Mountain is bound by forested area to the south and east, Grey Road 19 to the North and Scenic Caves Road to the west.
Reason for Preliminary Design Study

1. Concerns from local residents about localized flooding, specifically during spring snow melt, precipitation events, and inadequate road drainage.

2. Lots are currently serviced by private septic systems. The Town stated goal, within the Official Plan, is to provide municipal servicing to existing un-serviced residential areas as deemed necessary and affordable.
Drainage Improvement Options
Removal of culvert SCB has the potential to reduce flows to culvert GE by 50%.

- A portion of the stormwater runoff upstream of the subdivision is routed under Scenic Caves Road via culvert “SCB” toward the subdivision lands. The remainder of the stormwater flows north to a triple culvert configuration at Orchard Parking area which crosses Grey Road 19.

<table>
<thead>
<tr>
<th>Return Period (yr)</th>
<th>South culvert (SCB)</th>
<th>Scenic Caves Rd at Orchard Parking (triple culverts)</th>
<th>Grey Rd No19 east culvert (GE)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>w/o south flow</td>
<td>w/ south flow</td>
<td>w/o south flow</td>
</tr>
<tr>
<td>2</td>
<td>0.22</td>
<td>1.24</td>
<td>1.45</td>
</tr>
<tr>
<td>5</td>
<td>0.43</td>
<td>2.48</td>
<td>2.90</td>
</tr>
<tr>
<td>25</td>
<td>0.81</td>
<td>3.60</td>
<td>4.42</td>
</tr>
<tr>
<td>100</td>
<td>1.16</td>
<td>4.52</td>
<td>5.68</td>
</tr>
</tbody>
</table>
Drainage Improvement Options

Alternative A – Do nothing

- This option would maintain the status quo of existing conditions.
- No capital costs for property owners or Town.
- No construction disruption.
- Localized flooding issues not resolved.
- Localized flooding issues could potentially become worse over time.
- Continued on-going maintenance costs to Town.
- Potential significant flooding remediation costs maybe incurred by property owners.
Alternative B-A -- Peripheral Subdivision Drainage Improvements

B-A Municipal Ditch Diversion Channel South of Subdivision

- Construct a new municipal ditch system behind Prices Subdivision and outlet to Grey Road 19.
- Ditch would intercept stormwater prior to entering subdivision and divert flows around the subdivision.

Alternative B-A was not considered further due to significant challenges and costs associated with land acquisition, as well as prohibitive construction costs.
Alternative B-B -- Peripheral Subdivision Improvements

B-B Flow Storage South of Subdivision

- Construct a Storage Pond behind Prices Subdivision and release controlled amounts through the three (3) streets.
- Pond would collect flows and hold in existing low lying area behind subdivision.
- Street ditches would still require improvement to facilitate flows.

Alternative B-B was not considered further due to significant challenges and costs associated with land acquisition, as well as prohibitive construction costs.
Alternative C – Improvements to Peripheral Municipal / County Drainage Infrastructure

- Remove Culvert SCB and divert all external flows from Blue Mountain north along Scenic Caves Rd.
- Replace Triple CSP culverts at Blue Mountain Road with 900mm x 3000mm Box Culvert.
- Install 1830mm x 2500mm CSPA culvert under Grey Road 19, and connect with peripheral drain around Windfall Subdivision.
- Eliminates peripheral (external) flows from entering Prices Subdivision.
Alternative D – Internal Drainage System Improvements

Alternatives D-A through D-C all involve improving the road side ditches within Prices Subdivision using various ditch improvements (i.e. slope, sub-drain, 500mm driveway culverts).

Alternative D-A

- Conforms to Town Standards, 0.5% road side ditches at depth below road surface.

- Due to existing topography, deep ditches (>2m) would be required near the end of each of the three streets and would encroach onto Private Property near north at Blue Mountain Rd.
Alternative D - Continued

Alternatives D-A through D-C all have potential to provide the greatest amount of drainage improvement.

Alternative D-B

- Shallower Ditch Slope 0.3% allows entire ditch to be contained within Right-of-way.

- Shallow ditch requires stone trench and weeping tile to properly drain road subgrade.

- Additional costs to install stone trench & weeping tile under ditch for full length of road.
Alternative D - Continued

Alternative D (A-C) would all require the upgrade of culverts along the south side of Grey Road 19, and the replacement of Culvert GE under Grey Road 19.

Alternative D-C

- 0.5% ditch slope with higher elevation at south end.
- Additional cost for stone trench and weeping tile for 100m to drain at south end.
- Higher starting elevation at south end allows shallower ditches at north end and no property encroachment.
# Drainage Improvement Alternative Costs

<table>
<thead>
<tr>
<th>Option Description</th>
<th>Breakdown of OPC¹</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Alternative A – Do Nothing</strong></td>
<td><strong>On-Going Maintenance Costs</strong></td>
</tr>
<tr>
<td><strong>External Storm Improvements</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Alternative B – Peripheral Municipal Drain or Peripheral Storage System</strong></td>
<td>Alternative Eliminated</td>
</tr>
<tr>
<td><strong>Alternative C – Upgrades to Scenic Caves Road West Side Ditch</strong></td>
<td></td>
</tr>
<tr>
<td>Culvert SCB Removal</td>
<td>$11,000</td>
</tr>
<tr>
<td>Remove Existing Triple Culverts &amp; Install Box Culvert and Restoration</td>
<td>$62,000</td>
</tr>
<tr>
<td>Install Culvert GW CSPA at Grey Road 19.</td>
<td>$60,000</td>
</tr>
<tr>
<td><strong>Alternative C</strong></td>
<td><strong>$166,000</strong></td>
</tr>
<tr>
<td><strong>Internal Price’s Subdivision Storm Drainage Improvements</strong></td>
<td></td>
</tr>
<tr>
<td><strong>Alternative D-A</strong></td>
<td></td>
</tr>
<tr>
<td>25 Year Design Storm for Downstream Culverts</td>
<td><strong>$680,000</strong></td>
</tr>
<tr>
<td>100 Year Design Storm for Downstream Culverts</td>
<td><strong>$724,000</strong></td>
</tr>
<tr>
<td><strong>Alternative D-B</strong></td>
<td></td>
</tr>
<tr>
<td>25 Year Design Storm for Downstream Culverts</td>
<td><strong>$714,000</strong></td>
</tr>
<tr>
<td>100 Year Design Storm for Downstream Culverts</td>
<td><strong>$739,000</strong></td>
</tr>
<tr>
<td><strong>Alternative D-C</strong></td>
<td></td>
</tr>
<tr>
<td>25 Year Design Storm for Downstream Culverts</td>
<td><strong>$716,000</strong></td>
</tr>
<tr>
<td>100 Year Design Storm for Downstream Culverts</td>
<td><strong>$733,000</strong></td>
</tr>
</tbody>
</table>

Note: All Subtotals include 25% provision for Engineering and Contingency. Does not include land acquisition costs, if applicable. Subtotals have been rounded to nearest $1,000 for presentation purposes.
Drainage Improvement Recommendations

- Alternative C – Peripheral Drainage Improvements – Funded by the Town and County subject to budget approvals.
  - Block flows from culvert SCB via culvert removal or other.
  - Improve drainage works on west side of Grey Road 19.
  - Install 900mm x 3000mm box culvert at location of existing Triple Culverts.
  - Install 1830mm x 2500mm CSPA under Grey Road 19.
  - Total estimated cost of $166,000

- Alternative C eliminates additional runoff from outside subdivision lands. Any stormwater accumulation within Prices Subdivision is solely the result of precipitation events.

- Any of the Alternative D Alternatives would proceed as a resident funded local improvement charge.

- Town will maintain existing drainage systems within subdivision.
Wastewater Servicing Options
Existing Conditions – Wastewater Servicing

- Prices Subdivision currently has no communal wastewater servicing, however, a stub for future connection to the existing municipal system has recently been installed north of Grey Road 19.

- All lots utilize private septic systems which are at various stages in their life cycle (i.e. some are new and others may be in need of replacement).

- Imperfect lot grading results in wet conditions at some septic systems.

- Geotechnical investigation identified relatively high groundwater table and shallow bedrock at a depth of 2.3m below grade as design considerations for future servicing.
Wastewater Servicing Improvements

Option 1a – Do Nothing

▪ Option 1a maintains the status quo of existing conditions. No municipal wastewater servicing system is installed.

▪ All lots would continue to be serviced by private septic systems where all ongoing maintenance and replacement costs are borne by the homeowner

▪ No capital costs are incurred by property owner outside of regular operation, maintenance and end of life replacement.

▪ Over a twenty (20) year life cycle analysis – it is assumed that half of the existing septic tanks will require replacement.
Wastewater Servicing Improvements

Option 1b – Mandatory Septic System Inspection Program

▪ Option 1b also maintains the status quo of existing conditions, however, a mandatory septic system inspection would be required for all systems.

▪ All lots would continue to be serviced by private septic systems where all ongoing maintenance and replacement costs, as well as the inspection costs are borne by the homeowner.

▪ It is assumed that the inspection program would identify more systems requiring replacement over a twenty (20) year life cycle analysis than without an inspection program.
Wastewater Servicing Improvements

Option 2- Conventional Gravity Servicing

- Option 2 would involve installing a trunk sanitary sewer in the Municipal Right-of-Way (ROW) where flow is conveyed via gravity to the existing stub north of Grey Road 19.

- All infrastructure required for sanitary servicing would be installed in the ROW up to each property line. It would be the responsibility of the homeowner to install piping from the residence to the connection point at the property line.

- Deep excavation and rock removal are required for this option.

- There are no expected ongoing (O&M, energy etc.) charges to the homeowner after installation, beyond municipal wastewater user rates.

- This option represents the lowest overall 20 year life cycle cost (municipal and private).
Option 2 Gravity Sewer Configuration
Wastewater Servicing Improvements

Option 3 – Modified Gravity System

- Option 3 utilizes a low slope gravity system with lot level primary treatment.

- Lot level primary treatment includes the continued use of a retro-fitted septic tank to discharge to a small diameter trunk sewer within the ROW.

- Trunk sewer can be installed at lower slopes and shallower depths to avoid costly rock removal.

- This options represents the highest combined municipal and private 20-year life cycle costs.
Wastewater Servicing Improvements

Option 4a/4c – Low Pressure System (LPS) with Lot Level Grinder Pumps

- Option 4a consists of installing grinder pumps at each property and a low pressure forcemain in the ROW.

- The homeowner would be responsible for purchasing, installing, operating and maintaining the grinder pumps.

- The small diameter low pressure forcemain would be installed in the ROW similar to the gravity and modified gravity but at a much shallower depth to reduce rock excavation.

- Forcemain can be installed at shallow depth and does not require positive slope to operate. Installation would reduce rock excavation.

- Option 4c has the second lowest 20 year life-cycle costs and although lower front capital costs are expected, there are greater operation and maintenance costs to the homeowner on an annual basis.
Grinder Pump Configuration
# 20 Year Life Cycle Costs

## 20 - YEAR LIFE CYCLE COST\(^1\)

<table>
<thead>
<tr>
<th>SANITARY OPTION</th>
<th>CAPITAL COSTS</th>
<th>OPERATION &amp; MAINTENANCE COSTS</th>
<th>REPLACEMENT COSTS</th>
<th>WWTP CONNECTION FEE(^2)</th>
<th>COMBINED 20-YEAR LIFE CYCLE COST</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>MUNICIPAL(^2)</td>
<td>PRIVATE(^3)</td>
<td>MUNICIPAL</td>
<td>PRIVATE</td>
<td>MUNICIPAL</td>
</tr>
<tr>
<td>Option 1a: Do Nothing</td>
<td>$0</td>
<td>$0</td>
<td>$0</td>
<td>$121,170</td>
<td>$0</td>
</tr>
<tr>
<td>Option 1b: Mandatory Septic System Inspection Program</td>
<td>$0</td>
<td>$29,000</td>
<td>$0</td>
<td>$121,170</td>
<td>$0</td>
</tr>
<tr>
<td>Option 2: Full Gravity Sewer System</td>
<td>$1,390,141</td>
<td>$435,000</td>
<td>$16,955</td>
<td>$0</td>
<td>$0</td>
</tr>
<tr>
<td>Option 3: Modified Gravity System</td>
<td>$889,297</td>
<td>$870,000</td>
<td>$16,955</td>
<td>$120,341</td>
<td>$0</td>
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<tr>
<td>Option 4a: Low Pressure System (Forcemain with Grinder Pumps)</td>
<td>$758,984</td>
<td>$957,000</td>
<td>$16,955</td>
<td>$6,140</td>
<td>$0</td>
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<tr>
<td>Option 4c: Low Pressure System (Grinder Pumps &amp; Horizontal Directional Drill)</td>
<td>$686,377</td>
<td>$957,000</td>
<td>$16,955</td>
<td>$6,140</td>
<td>$0</td>
</tr>
</tbody>
</table>

Notes:
1. All costs presented are in equivalent 2017 dollar amounts accounting for 58 lots of the Prices Subdivision.
3. Private Capital Costs include works on private property only i.e. installation of Service from Property Line to House, de-commissioning of Septic systems (if applicable).
4. It is assumed 50% of the septic systems will be replaced in the next 20 years at $25,000 per unit.
5. Under a mandatory inspection program, it is assumed 70% of septic systems will be replaced in the next 20 years at a cost of $25,000 per unit.
6. The WWTP connection fee is a one (1) time connection fee to the WWTP of $2,142 per residential lot.
## Estimated Costs per Lot

<table>
<thead>
<tr>
<th>Lowest 20-Year Life Cycle Cost Option</th>
<th>Municipal Capital Cost</th>
<th>No. of Residential Units</th>
<th>Estimated Cost per Lot&lt;sup&gt;1&lt;/sup&gt;</th>
<th>WWTP Connection Fee</th>
<th>Total Estimated Cost per lot</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option 2: Conventional Gravity Sewer</td>
<td>$1,390,141</td>
<td>58</td>
<td>$23,968</td>
<td>$2,142</td>
<td>$26,110*</td>
</tr>
</tbody>
</table>

Note:

*Private Costs are not considered in Affordability Criteria (i.e. de-commission septic system, installation of sanitary line, etc.)

**Average Private Costs are estimated at +/- $7,500 per lot, however individual lot costs are highly dependent on lot conditions.

- Option 2: Conventional Gravity Sewer has the lowest overall 20-year Life Cycle cost at $1,966,332 for both Municipal and Private Costs.

- Town Affordability Criteria only considers Municipal Capital Costs and WWTP connection fee.

- Total Estimated Cost per Lot of $26,110 slightly exceeds the Town Affordability Policy of $24,500<sup>1</sup>

1. Town Affordability Criteria is $1,690/year at a interest rate of 3.5% for 20 years. The exact amount to be calculated at the time of project construction.
Recommendations – Municipal Wastewater Servicing

Installation of Option 2: Conventional Gravity Sewer

- Wastewater Servicing Option 2 represents the lowest 20-year life cycle cost for Municipal Sanitary Servicing.

- Provides servicing to residential lots at the Town standard of municipal servicing within the urban area.

- Sanitary Option 2 at $26,110 /lot slightly exceeds the Town Affordability Criteria for Municipal Capital Costs of $24,500/lot.

- Proceed to final design, mature costs and confirm project funding with the residents and Town Council prior to issuing the construction tender.
## Prices Subdivision Improvement Scenarios

<table>
<thead>
<tr>
<th>Construction Component</th>
<th>Est. Construction Cost</th>
<th>Engineering &amp; Contingency</th>
<th>Total</th>
<th>Cost Per Lot*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Scenario 1 – Sanitary Sewer Servicing, No Road Improvement, No Drainage Improvements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Gravity Sanitary System</td>
<td>$1,211,500</td>
<td>$302,900</td>
<td>$1,514,400</td>
<td>$26,100</td>
</tr>
<tr>
<td>Total Scenario 1</td>
<td></td>
<td></td>
<td>$26,100</td>
<td></td>
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<tr>
<td><strong>Scenario 2 – Sanitary Sewer Servicing, with Drainage Improvements, No Road Improvements</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full Gravity Sanitary System</td>
<td>$1,211,500</td>
<td>$302,900</td>
<td>$1,514,400</td>
<td>$26,100</td>
</tr>
<tr>
<td>Internal Drainage Improvements (Alternative D-B 100 Year Storm)</td>
<td>$590,800</td>
<td>$147,700</td>
<td>$738,500</td>
<td>$12,700</td>
</tr>
<tr>
<td>Total Scenario 2</td>
<td></td>
<td></td>
<td>$38,800</td>
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<tr>
<td><strong>Scenario 3 – Sanitary Sewer Servicing, Drainage Improvements, Paved Road (Rural Section), Street Lights</strong></td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>Full Gravity Sanitary System</td>
<td>$1,211,500</td>
<td>$302,900</td>
<td>$1,514,400</td>
<td>$26,100</td>
</tr>
<tr>
<td>Full Road Restoration (after costs of Sanitary Sewer)*</td>
<td>$1,213,900</td>
<td>$303,500</td>
<td>$1,517,400</td>
<td>$26,200</td>
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<tr>
<td>Street Lighting Costs</td>
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<td>$33,625</td>
<td>$168,125</td>
<td>$2,900</td>
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<td>Total Scenario 3</td>
<td>$2,559,900</td>
<td>$640,100</td>
<td>$3,200,000</td>
<td>$55,200</td>
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</tbody>
</table>

**Notes:**
* Costs per lot are split evenly among 58 lots but the final costs will be based on the Local Improvement Regulation O.Reg 586/06
Questions

--Greenland Consulting Engineers--