

Municipality of Clarington

Southwest Courtice Secondary Planning Update

Functional Servicing Report

Date: May 3rd, 2021

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1 Introduction

1.1 Study Area

The study area focuses on one contiguous geographic area in Courtice, Ontario that is comprised of portions from two different planning areas:

- The undeveloped portion of the Southwest Courtice secondary plan area that is referred to as the Southwest Courtice Secondary Plan Update Area and described herein simply as Southwest Courtice; and
- A portion of the adjacent Courtice Employment Lands secondary plan area. Specifically, the portion of the Courtice Employment Lands that are located west of Robinson Creek and may undergo conversion to a residential land use.

Figure 1 Depicts the location of the study area in the context of the large planning areas.

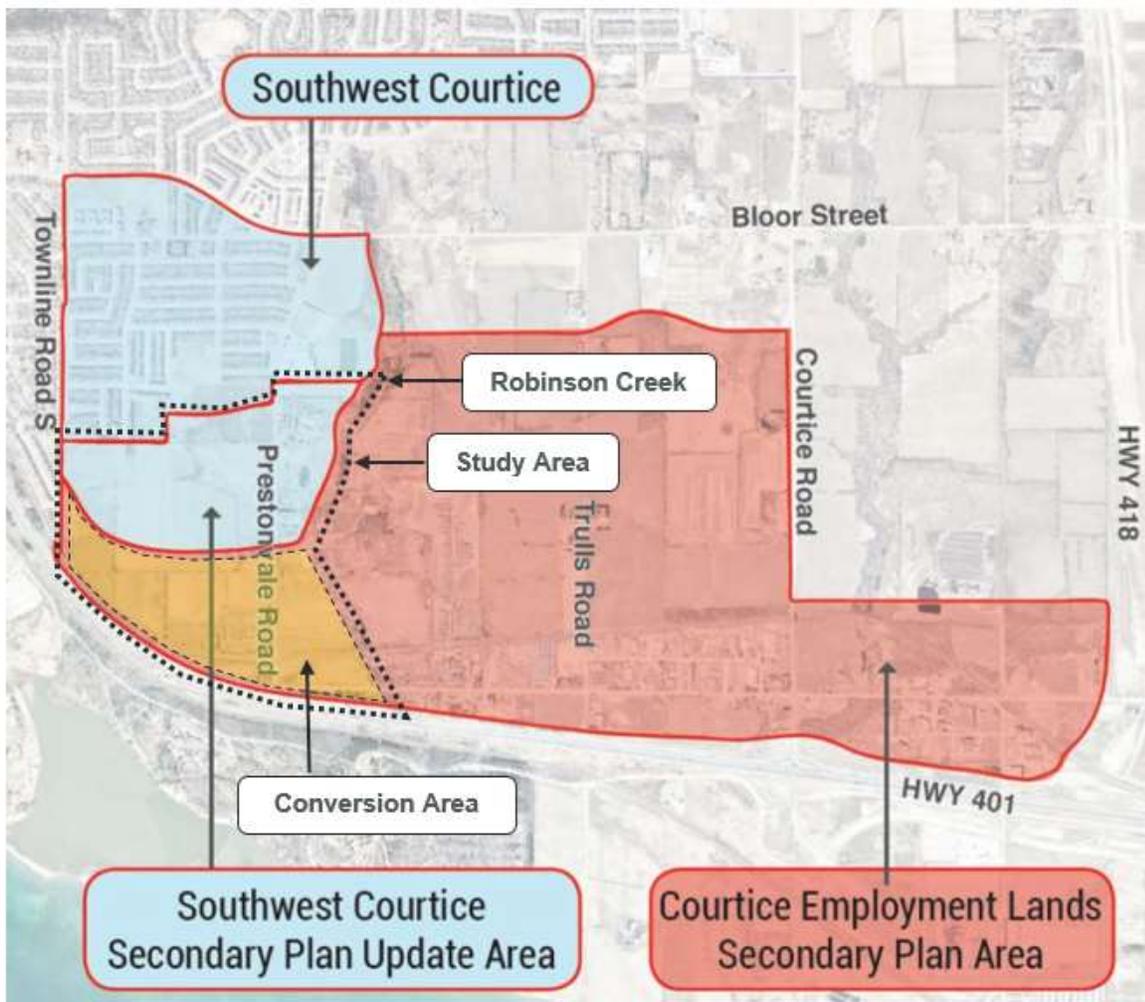


Figure 1: Study Area

1.2 Background and Context

To support the high-level planning that will be advanced through this updated secondary plan for Southwest Courtice, the purpose of this report is to:

- Summarize the existing and previously planned municipal infrastructure that will provide water, wastewater and stormwater management services to support future development within the study area; and
- Provide strategic level guidance that will inform further design of the necessary infrastructure to service future development within the study area as more detailed planning design activities are undertaken.

For purposes of this report, it is assumed that the study area will be developed with entirely residential land uses. In particular, it is assumed that the portion of the Courtice Employment Lands located west of Robinson Creek will ultimately be converted to residential land use and be developed as such. The overall land use plan for Southwest Courtice (Bayview) is illustrated in **Figure 2**.



LEGEND

- | | | |
|----------------------------------|-------------------------------|---|
| Community Park | Utility | Special Study Area |
| Neighbourhood Park | Low Density Residential | Preferred School Site |
| Parkette | Medium Density Residential | Key View Corridors |
| Stormwater Management Facilities | High Density Residential | Prominent Intersections |
| Cemetery | Neighbourhood Commercial | Former Employment Lands
<i>(Area designated PSEZ and proposed for conversion to permit residential uses)</i> |
| Other Green Spaces | Environmental Protection Area | |

Schedule A - Land Use

Bayview (Southwest Courtice) Secondary Plan



May 2021

Figure 2: Bayview (Southwest Courtice) Land Use Plan

The Regional Municipality of Durham (Durham) is responsible for the delivery of municipal water and wastewater services across Durham Region. Through their long-range planning processes, Durham identifies water and wastewater infrastructure required to support growth within urban areas. Infrastructure projects required to support growth are included in the Region's Development Charges (DC) by-law. Stormwater infrastructure is the responsibility of the Municipality of Clarington (Municipality). Stormwater infrastructure to support growth is typically planned and constructed by local developers or groups of developers and subsequently assumed by the Municipality.

2 Water Supply

2.1 Existing System Overview

The Regional Municipality of Durham's (Durham) Whitby-Oshawa-Courtice Drinking Water System (DWS) supplies water to a population of approximately 320,000 people located in the Town of Whitby, City of Oshawa and the Municipality of Clarington. Within the Municipality of Clarington, only the Courtice area is serviced by the Whitby-Oshawa-Courtice DWS; communities further east are serviced by other systems. Treated water is supplied to the Whitby-Oshawa-Courtice DWS from the Whitby Water Supply Plant (WSP) with a rated capacity of 118 ML/d and the Oshawa WSP with a rated capacity of 134 ML/d. The Whitby WSP is currently operating at 109 ML/d and a Class Environmental Assessment has been filed to expand its capacity to an anticipated 218 ML/d. The Oshawa WSP is currently operating at approximately 96 ML/d.

The distribution system is divided into to four (4) pressure zones. Courtice is situated in Zone 1 and Zone 2. Zones 1 and 2 are integrated, with areas below an elevation of 118 m serviced from Zone 1 and areas above 118 m (up to 154 m) serviced from Zone 2. The Southwest Courtice Secondary Plan area is located entirely in Zone 1 at elevations ranging between 96 m and 112 m. In the vicinity of the study area, the Zone 1/Zone 2 boundary generally follows Gord Vinsion Avenue/Bloor Street. The Hortop Reservoir and the Garrard Reservoir both provide floating storage for Zone 1. **Figure 3** illustrates the schematic configuration of the supply, pumping and storage facilities that comprise Zone 1 of the Whitby/Oshawa/Courtice water system.

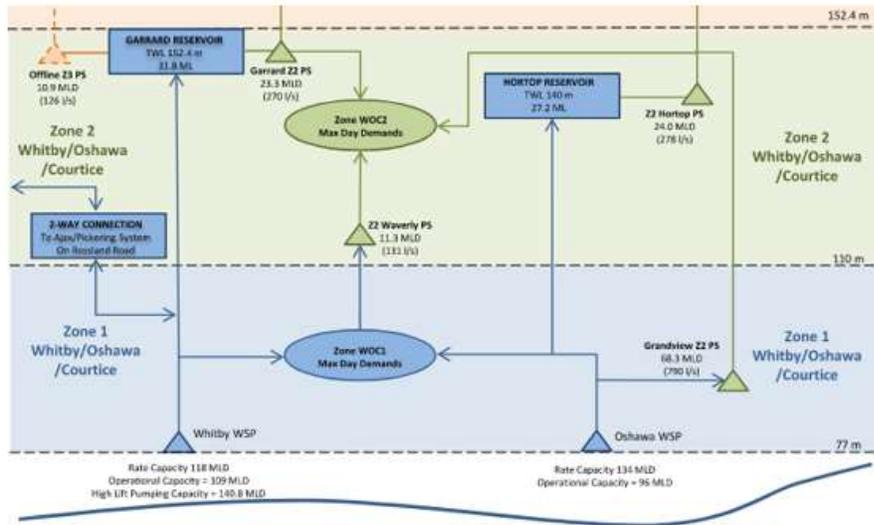


Figure 3: Whitby/Oshawa/Courtice Water System Zone 1

2.2 Planned Upgrades

Durham’s Development Charge (DC) background study identifies a number of projects to provide a network of feeder mains to support the development within the study area. Generally, the existing WSPs, booster pumping stations and storage facilities in Zones 1 and 2 have been planned to support growth. The planned projects described below will provide a water distribution system capable of providing water to a network of local water mains in the study area to support the development. The overall program of upgrades planned for the water distribution system servicing the study area and surrounding lands is illustrated on **Figure 4** and described in the following sections.

2.2.1 Zone 1 Upgrades

The existing development in the northern portion of Southwest Courtice is serviced by an existing network of Zone 1 water mains. However, there is limited water distribution infrastructure south of the currently developed area, including within the potential conversion lands.

An existing 300 mm dia. watermain along Townline Road connects to an existing 400 mm dia. watermain on the north side of Highway 401 that crosses the highway and connects to a 300 mm dia. watermain on the south side of Highway 401 on Colonel Sam Drive. This 300 mm dia. watermain continues easterly to the Courtice Water Pollution Control Plant (WPCP) located east of Courtice Road for purposes of providing water service to the WPCP and creating a watermain loop south of Highway 401.

To service the undeveloped portion of Southwest Courtice and the employment lands that may potentially be converted to residential, new Zone 1 water mains are planned. The new water mains will consist of a 400 mm dia. watermain extended north from the Courtice WPCP site under highway 401 to Baseline Road and west along Baseline Road to Courtice Road. This

portion of the watermain has been constructed in conjunction with and generally parallel to the Courtice Trunk Sanitary Sewer (CTSS) project. The next phase of the CTSS project will extend the 400 mm watermain further west along Baseline Road to Trulls Road. From here future works will be required to extend the new 400 mm dia. watermain further west along Baseline Road to Prestonvale Road where it will run north towards the future Type B Arterial Road and turn west to connect back to the existing 300 mm dia. watermain on Townline Road.

2.2.2 Zone 2 Upgrades

To service the Courtice Employment Lands east of Robinson Creek a new Zone 2 feedermain is proposed. The new 600 mm dia. watermain will run east-west along Bloor Street from Townline Road to Trulls Road. A new 400 mm dia. Zone 1/Zone 2 watermain will run south on Trulls Road to connect to the new 400 mm dia. Zone 1 watermain at Baseline Road. A closed valve on Trulls Road will isolate the two zones at the Zone 1/Zone 2 boundary. The Zone 2 upgrades are generally not required to facilitate development within the study area.

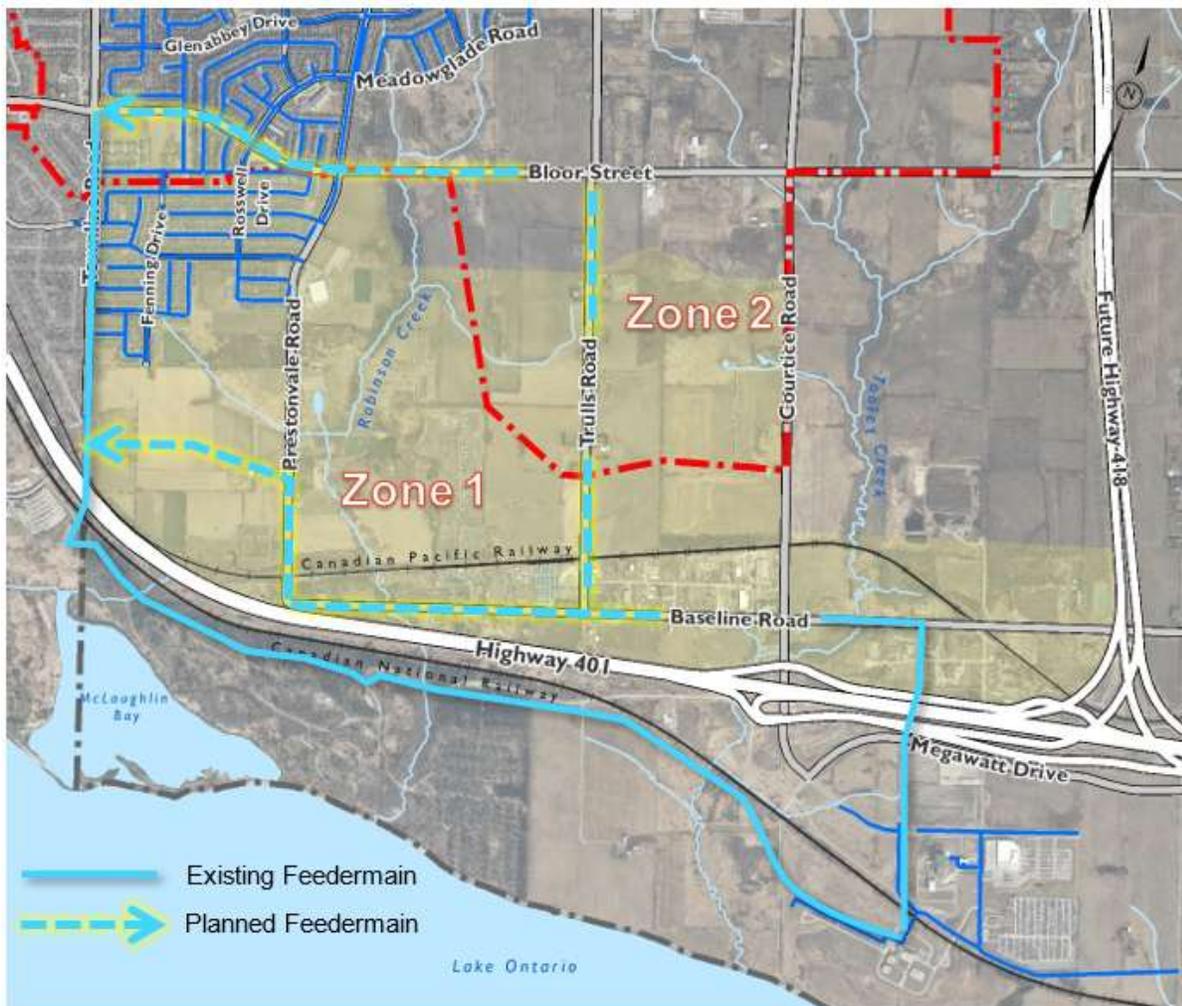


Figure 4: Local Water Distribution System

To service the lands west of Robinson Creek, including Southwest Courtice and the potential employment land conversion area, the planned 400 mm dia. Zone 1 watermain (as described above) will be required. A portion of this watermain along Prestonvale Road and the future east-west arterial road will be internal to the development area. Given that the preferred land use concept aligns the east-west collector road in the extreme southern portion of the study area, which is further south than prior planning, consideration may be given to aligning the 400 mm dia. watermain further north on a collector or local road that is more central to the proposed development. Most of the proposed 400 mm dia. watermain on Baseline Road will be external to the development area but should nonetheless be emplaced to support development in Southwest Courtice.

Internal to the development area, 300 mm dia. watermains on Fenning Drive and Prestonvale Road should be extended south to connect to the aforementioned 400 mm dia. watermain. The proposed 300 mm and 400 mm dia. watermains in the study area are illustrated on **Figure 5**. An interconnected network of 150 mm to 200 mm dia. watermains will be required on local roads to supply water to the remainder of the development and should be configured and sized to provide required fire flows based on the nature of the proposed development.

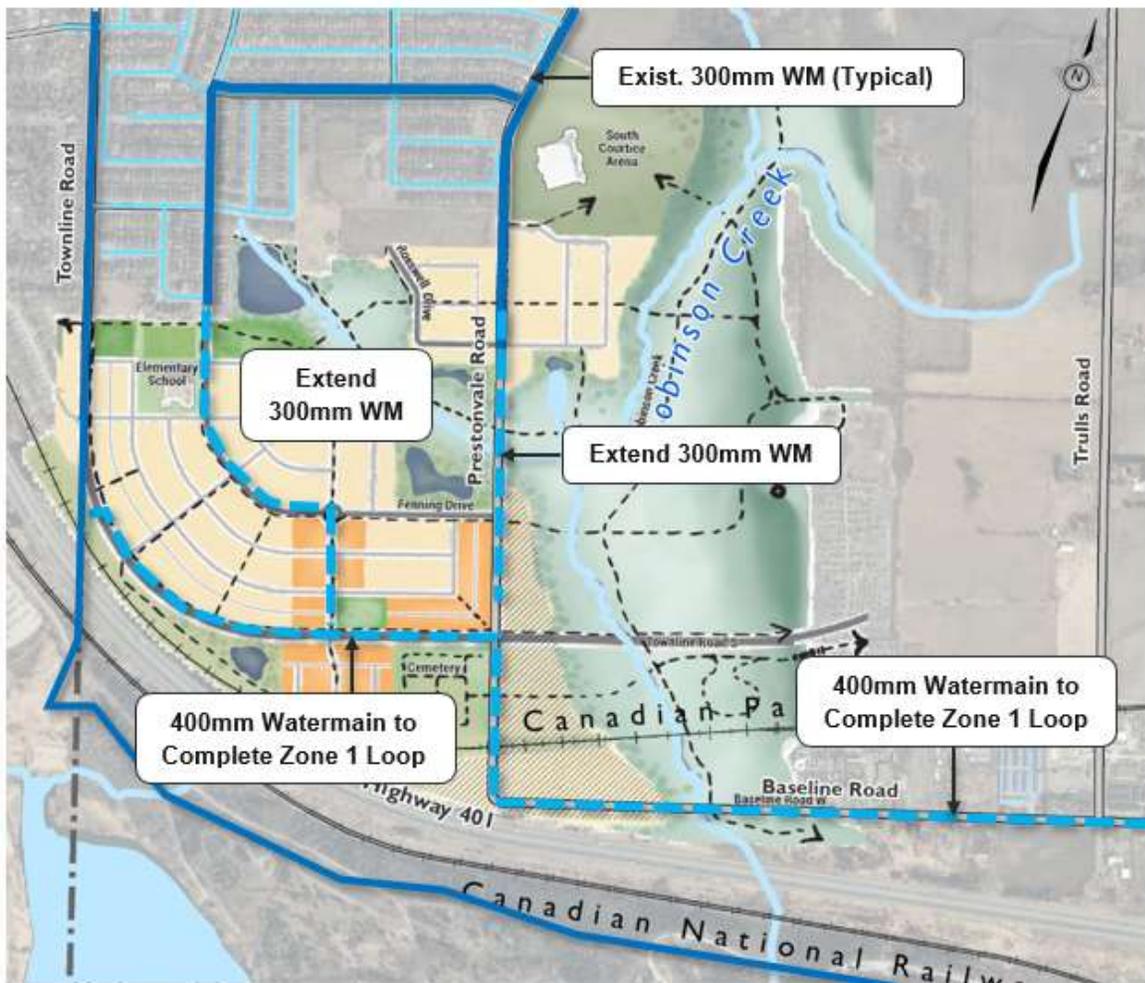


Figure 5: Planned Water Distribution Upgrades

3 Wastewater

3.1 Existing System Overview

Courtice is within the sanitary sewage catchment area that is shared between the Harmony Creek Water Pollution Control Plant (WPCP) and the Courtice WPCP. The existing developed urban area in Southwest Courtice is limited to the land that can be drained by gravity to the Harmony Creek Sanitary Sewage Pumping Station (SSPS) and from there pumped to the Courtice WPCP for treatment. The undeveloped lands in Southwest Courtice and the Courtice Employment Lands are all within a catchment area that will eventually flow directly to the Courtice WPCP by a combination of gravity sewers and a localized pumping station.

3.2 Planned Upgrades

The Region of Durham's Development Charge (DC) background study identifies a number of projects to provide new trunk and sub-trunk sanitary sewers in the Courtice area. These new sanitary sewers will support development in the study area and beyond.

3.2.1 Courtice Trunk Sanitary Sewer

The Courtice Trunk Sanitary Sewer (CTSS) is currently being extended north from the Courtice WPCP under Highway 401 and into Courtice Employment Lands. The northward extension of the CTSS will allow for servicing of the adjacent lands in south Courtice and will ultimately allow flows from north Oshawa to be diverted to the Courtice WPCP.

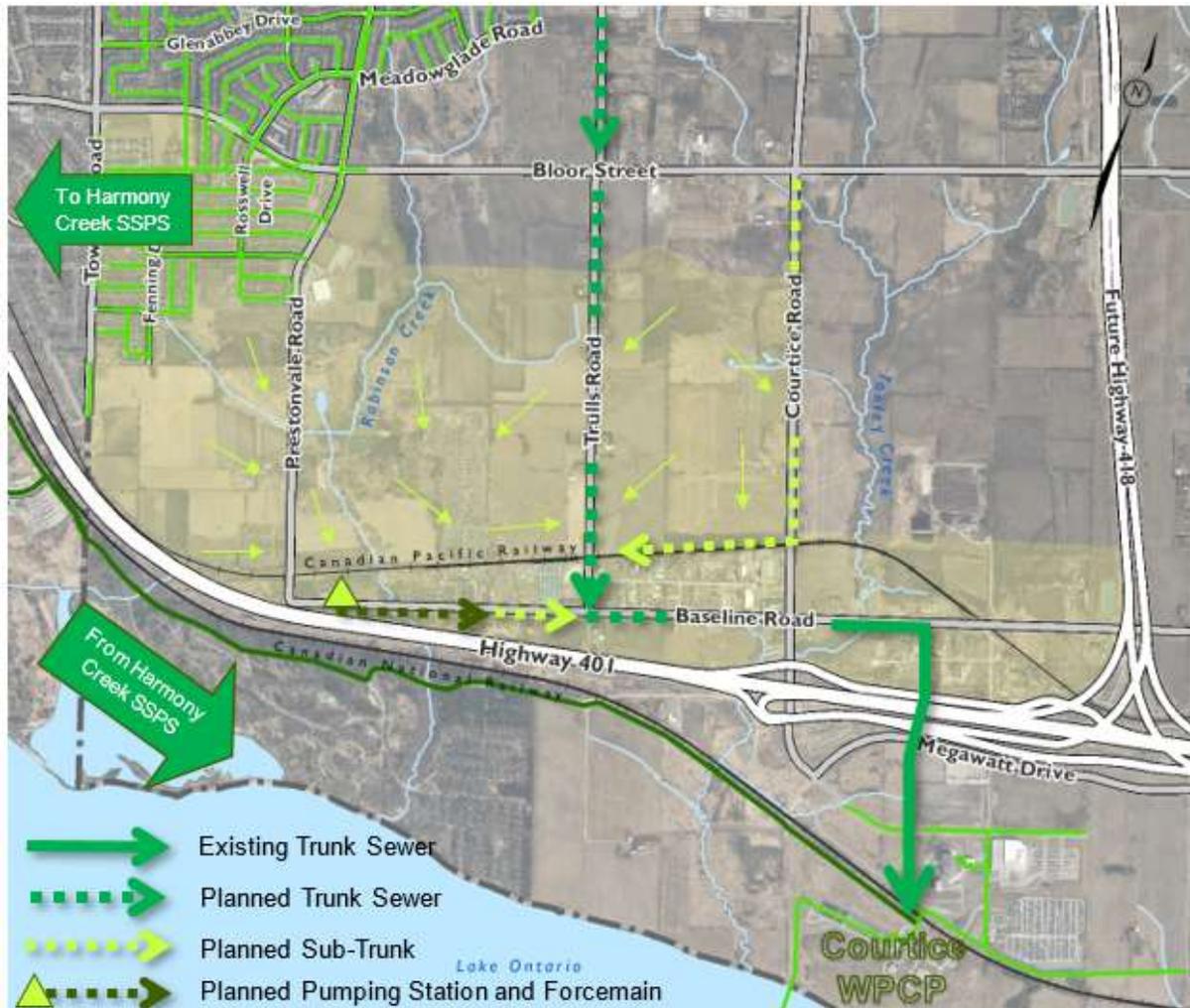


Figure 6: Planned Wastewater Upgrades included in Durham’s Development Charge By-Law

Several phases of the CTSS have been completed extending a 2100 mm dia. sewer from the Courtice WPCP north under Highway 401 to Baseline Road and west along Baseline Road to Courtice Road. The next phase of the project that is anticipated for construction in 2020 will extend the 2100 mm dia. trunk sanitary sewer further west along Baseline Road to Trulls Road and extend an 1800 mm dia. sewer north on Trulls Road to Bloor Street. **Figure 6** illustrates the location of CTSS within the study area along with other planned improvements that are discussed in more detail in the following sections.

3.2.2 Baseline Road Sanitary Sewage Pumping Station (SSPS)

A new sewage pumping station referred to as the Baseline Road SSPS will be required to convey flows from the undeveloped lands in Southwest Courtice that are located west of Robison Creek. As identified in the CTSS Municipal Class Environmental Assessment (MCEA), the new pumping station will potentially be located on Baseline Road near the crossing

over Robinson Creek. A forcemain discharging under the creek to a new sanitary sewer on Baseline Road will convey flows from the pumping station east towards the CTSS.

It is possible that the Baseline Road SSPS could be located further north along Prestonvale Road with a longer forcemain connecting back to the sewer on Baseline Road. This change would be subject to an amendment of the CTSS MCEA.

3.2.3 Baseline Road Sub-Trunk Sewer & Forcemain

The Region of Durham Development Charge By-law includes a new sub-trunk sanitary sewer on Baseline Road flowing east towards the CTSS. This new sub-trunk is identified as being approximately 650 m in length. Based on the preferred SSPS location from the CTSS MCEA, the future forcemain discharging from the Baseline Road SSPS is planned to convey east flows under Robinson Creek to the east along Baseline Road and discharge to the planned sub-trunk sanitary sewer.

However, east of Robinson Creek the profile of Baseline Road rises from an elevation of ± 94.0 m at the creek crossing to an elevation of ± 97.0 m approximately 300 m east of the creek. East of this inflection point, the profile of Baseline Road levels-out at 97.0 – 97.5 m for a further 460 m east to Trulls Road. At Trulls Road the 2,100 mm diameter CTSS has a proposed invert elevation of 92.62 m (obvert 94.72 m) and cover of ± 2.5 m.

The profile of Baseline Road between Robinson Creek and Trulls Road limits the opportunity to establish a new sub-trunk sanitary sewer flowing east towards the CTSS at Trulls Road. A sewer with 2.0 m of cover at the inflection point flowing east for 460 m to match the obvert of the CTSS (at Trulls Road) would be essentially flat, with a slope of less than 0.1%. A sewer flowing east with a slope of 0.5% and its obvert matching to that of the CTSS can be extended only ± 100 m west of Trulls Road while maintaining adequate cover. Given these limitations it is likely that:

- The forcemain discharging from the Baseline Road SSPS will have to be extended to within ± 100 m of Trulls Road before it can be discharged to a gravity sanitary sewer that will connect to the CTSS.
- A sanitary sewer flowing west (towards Robinson Creek) will be required to service the 21 ha of employment land situated along Baseline Road between Robinson Creek and Trulls Road and this sewer will have to outlet to the Baseline Road SSPS.

Figure 7 illustrates the profile of Baseline Road and provides a schematic illustration of viable future sanitary sewer profiles. Two potential options for crossing Robinson Creek are also illustrated.

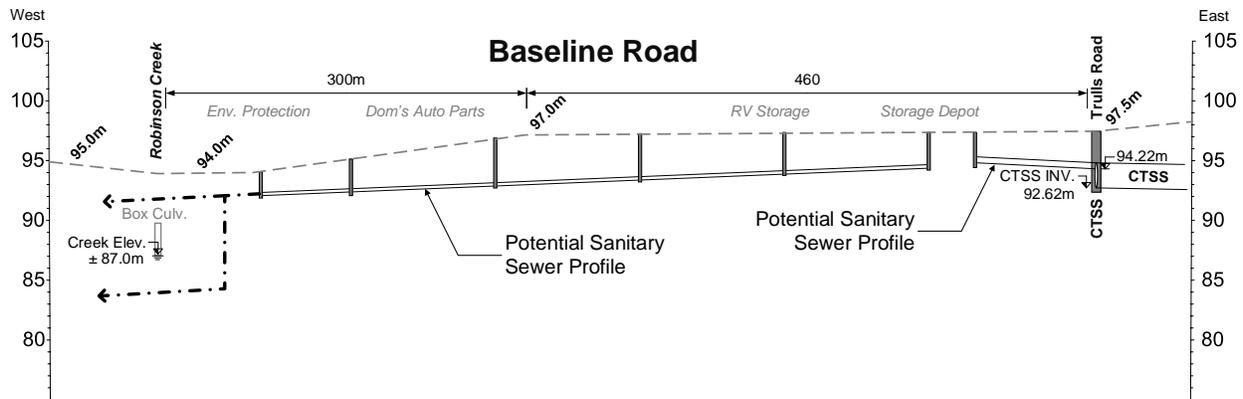


Figure 7: Profile of Baseline Road

More broadly, it does not appear that the employment lands on the east side of Robinson Creek that are located north of the CPR will need to drain to the Baseline Road SSPS. The natural topography rises significantly north of the CPR while the CTSS remains at a relatively low elevation after crossing under the railway corridor. As a result, a gravity sewer paralleling the north side of the railway with cover of 2.5 m or greater can flow east towards Trulls Road at 0.5% and match the obvert of the CTSS at 96.56 m.

Alternative locations that can be considered for the Baseline Road SSPS include:

1. The preferred location in the CTSS MCEA on Baseline Road west of Robinson Creek
2. A location on Baseline Road east of Robinson Creek, which was considered as an option in the CTSS MCEA, but determined not to be preferred at that time.
3. A location further north on Prestonvale Road within the Southwest Courtice area.

The alternative pumping station locations are illustrated in the context of the proposed land use concept for Southwest Courtice on **Figure 8**. The following sections describe the potential alternatives with respect to the tributary sanitary sewers conveying flows from Southwest Courtice as well as, the Baseline Road employments lands, the pumping station itself and the discharge forcemain.

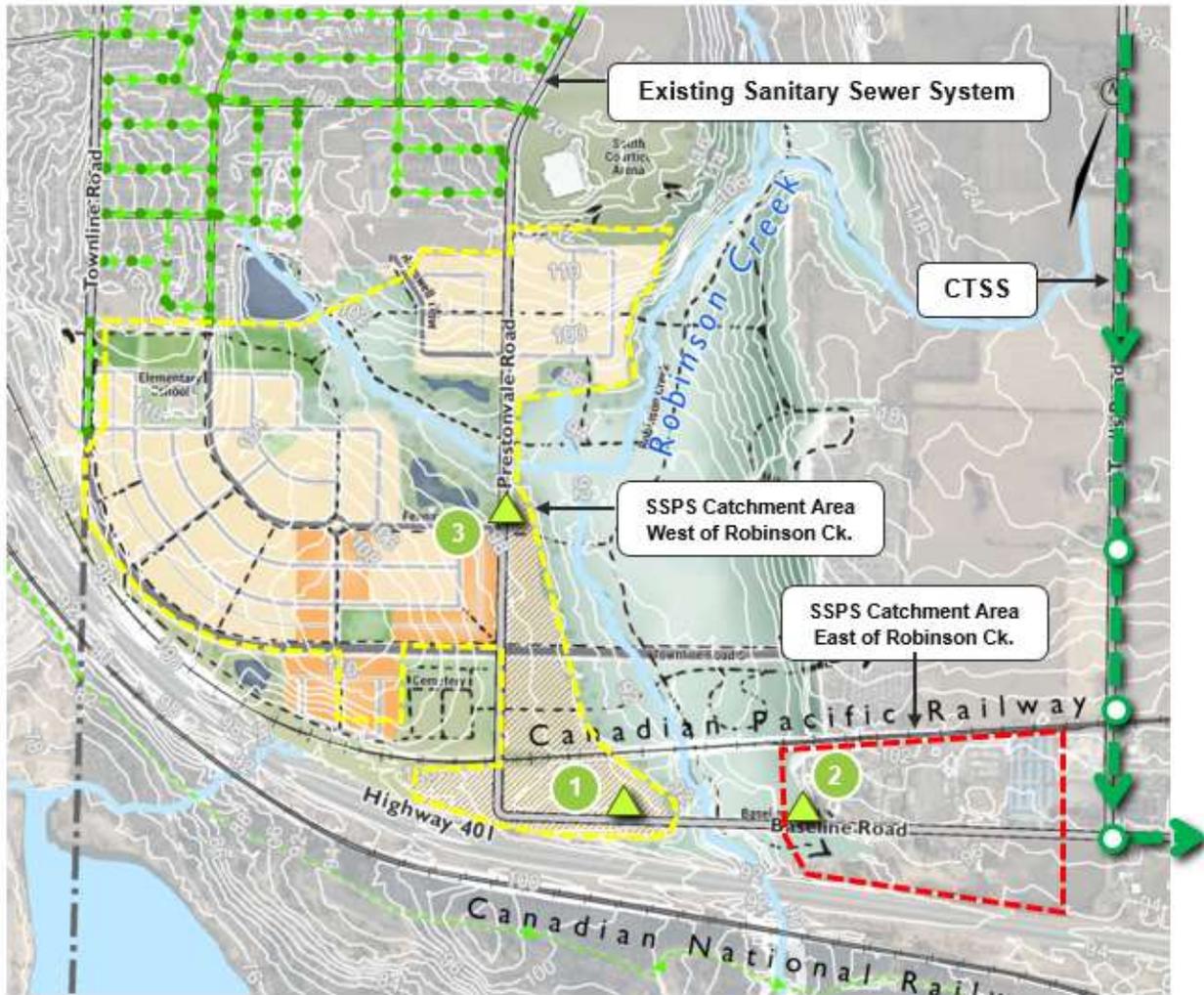


Figure 8: Alternative Pumping Station Locations

3.2.4 Alternative Location 1 – West Side of Robinson Creek

If the Baseline Road SSPS is located on the west side of Robinson Creek at Alternative Location 1 the pumping station itself will most likely be situated north of Baseline Road at an elevation of approximately 95 m. The land at this location is currently an agricultural field and is designated as employment land. The secondary plan recommends that this location be converted from employment to residential.

The general sanitary sewer servicing scheme for Southwest Courtice based on a pumping station located at Alternative Location 1 is shown at the end of this section on **Figure 9**. Profiles for the linear infrastructure described in this section are included in **Appendix A**.

Flows from Southwest Courtice

Sanitary sewage flows from the South West Courtice area would be conveyed to the SSPS via a sanitary sewer paralleling the west side of the Robinson Creek Valley.

This sanitary sewer would originate at Prestonvale Road just south of the Robinson Creek tributary. A depth of 4.5 – 5.0 m would be required at Prestonvale Road to allow a sanitary sewer flowing south on Prestonvale Road to connect and convey flows from further north under the tributary. From Prestonvale Road the sanitary sewer would flow 600 m in a southeasterly direction towards the SSPS. At a grade of 0.5% and an average depth of 3.5 – 4.0 m, this sewer will allow for the potential servicing of residential lands on the east side of Prestonvale Road. At the crossing under the CPR the depth of the sewer would increase to more than 4.0 m before ultimately connecting to the pumping station at a depth of ± 7.5 m.

Flows from Baseline Road Employment Lands

Sanitary sewage flows from the employment lands on Baseline Road east of Robinson Creek would be conveyed west towards the creek by a sanitary sewer on Baseline Road originating approximately 100 m west of Trulls Road. The sewer flowing west on Baseline Road could be connected to the SSPS on the west side of the creek in one of two ways:

- With a relatively shallow sanitary sewer crossing over the creek in the fill above the box culvert with a clearance of approximately 1.8 m and cover of approximately 2.0 m below road grade. Presumably the entire length of this sewer would be installed by open cut methods, although trenchless methods may be considered as well.

Overtopping of the road during a flood event may cause the sewer to become exposed. Given that it will be a local it is anticipated that this would represent an acceptable risk as local flows could be pumped while repairs are made. To prevent leakage during the flood event a pipe with fully restrained joints could be used.

- With several drop structures and a relatively deep sanitary sewer crossing below the creek at an invert elevation of approximately 82.7 m (3.0m below the culvert). Presumably the creek crossing portion of this sewer would be installed by trenchless methods.

Pumping Station

For a location on the west side of the creek the total depth of the Baseline Road SSPS will be a function of how the Baseline Road sanitary sewer crosses Robinson Creek.

A sanitary sewer crossing over the creek (in the fill above the culvert) would enter the SSPS at an elevation of ± 90.9 m, approximately 4.0 m higher than the sewer entering from Southwest Courtice. Under these conditions the pumping station would have a total depth of approximately 10.8 m inclusive of a 3.0 m depth of storage in the wet well.

Alternatively, if the sanitary sewer on Baseline Road crosses under Robinson Creek it will enter the SSPS at an elevation of ± 83.1 m, approximately 4.0 m lower than the sewer entering from Southwest Courtice. Under these conditions a drop structure would be required to transition the grade of the inlet sewer from Southwest Courtice and the pumping station itself would have a depth of approximately 14.9 m inclusive of a 3.0 m depth of storage in the wet well.

Forcemain

Regardless of the vertical alignment of the inlet sanitary sewers, the forcemain discharging from an SSPS location on the west side of Robinson Creek will do so at an elevation of ± 93.0 m and drop to a depth of ± 83.0 m to cross below the culvert. A forcemain crossing in the fill above the box culvert is not considered favourable due to the volume of flows that would potentially have to be by-passed during any future culvert works.

On the east side of the creek the forcemain will rise ± 9.0 m and follow grade at minimum cover before discharging to a gravity sanitary sewer 100 m west of Trulls Road at an elevation of approximately 95.3 m.

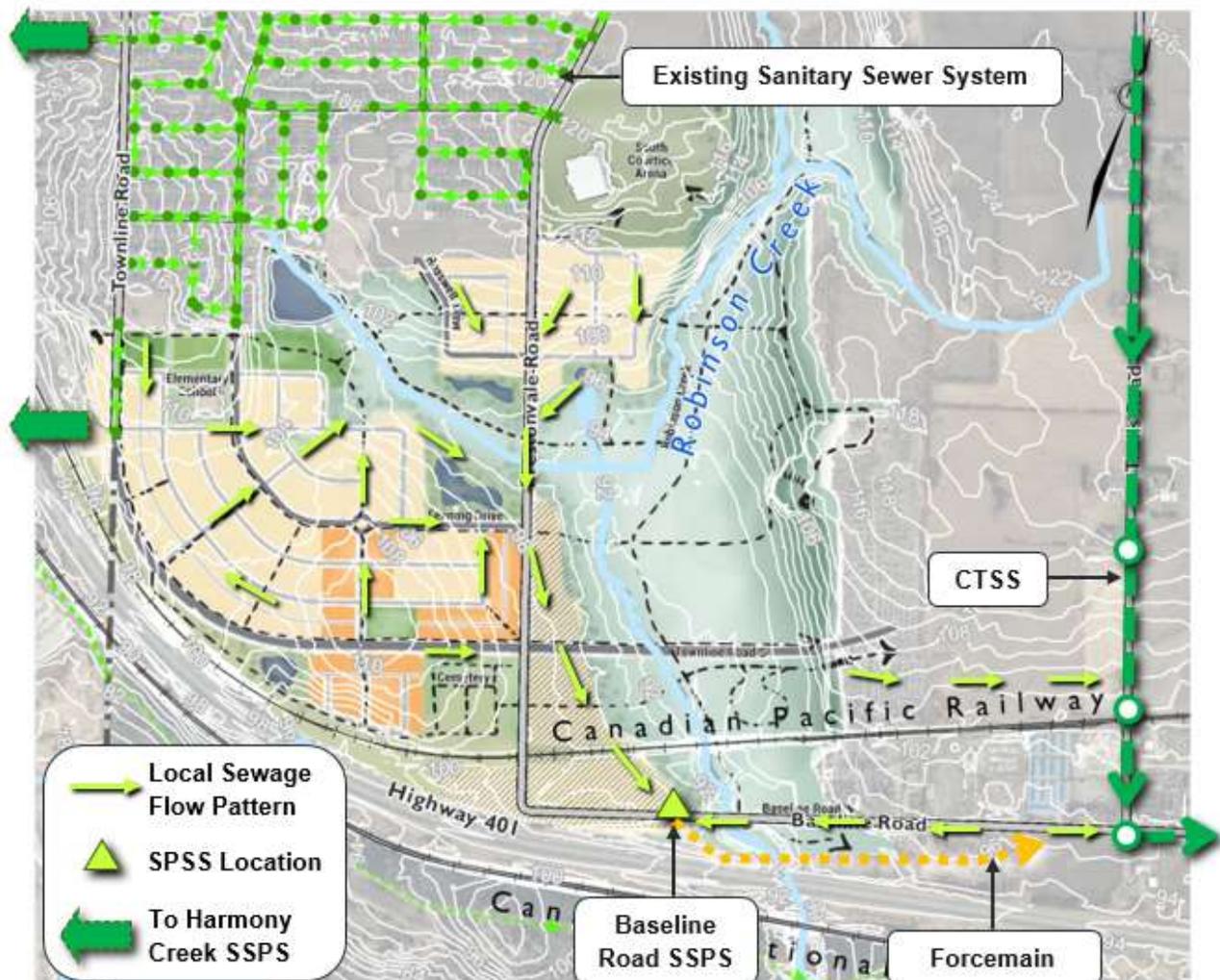


Figure 9: Sanitary Servicing Scheme for Pumping Station Alternative 1

3.2.5 Alternative Location 2 – East Side of Robinson Creek

If the Baseline Road SSPS is located on the east side of Robinson Creek at Alternative Location 2 the pumping station itself will most likely be situated north of Baseline Road at a

ground elevation between 93 and 95 m. The land at this location is designated as environmental protection.

The general sanitary sewer servicing scheme for Southwest Courtice based on a pumping station located at Alternative Location 2 is shown at the end of this section on **Figure 10**. Profiles for the linear infrastructure described in this section are included in **Appendix B**.

Flows from Southwest Courtice

Similar to Alternative 1, sanitary sewage flows from the southwest Courtice Area would be conveyed to the SSPS via a sanitary sewer paralleling the west side of the Robinson Creek Valley.

This sanitary sewer would originate at Prestonvale Road just south of the Robinson Creek tributary. A depth of 4.5 – 5.0 m would be required at Prestonvale Road to allow a sanitary sewer flowing south on Prestonvale Road to connect. This connecting sewer would convey flows from further north under the tributary. From Prestonvale Road the sanitary sewer would flow 600 m in a southeasterly direction towards Baseline Road. At a grade of 0.5% and an average depth of 3.5 – 4.0 m this sewer will allow for the potential servicing of residential lands on the east side of Prestonvale Road. At the crossing under the CPR the depth of sewer would increase to more than 4.0 m before ultimately dropping to a depth of 11.5 m to cross under Robinson Creek at an elevation of ± 83.0 m.

A crossing over the creek in the fill above the culvert is generally not possible due to grades and is considered undesirable due to the potential need to by-pass significant flows during future culvert maintenance or rehabilitation works.

Flows from Baseline Road Employment Lands

Sanitary sewage flows from the employment lands on Baseline Road east of Robinson Creek would be conveyed west towards the SSPS by a sanitary sewer on Baseline Road originating approximately 100 m west of Trulls Road. The sewer flowing west on Baseline Road would drop as it approached the SSPS to join with the sewer flowing under Robinson Creek to enter the station at an elevation of ± 82.8 m

Pumping Station

For a location on the east side of the creek the total depth of the Baseline Road SSPS will be dictated by the depth of the inlet sewer from Southwest Courtice at the crossing under Robinson Creek. To facilitate a crossing 3.0 m below the box culvert (at ± 83.0 m) the sewer will enter the pumping station at an elevation of ± 82.8 m. This will result in a pumping station that is 14 – 15 m deep inclusive of a 3.0 m depth of storage in the wet well.

Forcemain

The forcemain for a pumping station located on the east side of Robinson Creek will be relatively straightforward. The forcemain will discharge from the station at an elevation of 90 – 91 m and follow grade (at minimum cover) before discharging to a gravity sanitary sewer 100 m west of Trulls Road at an elevation of approximately 95.3 m.

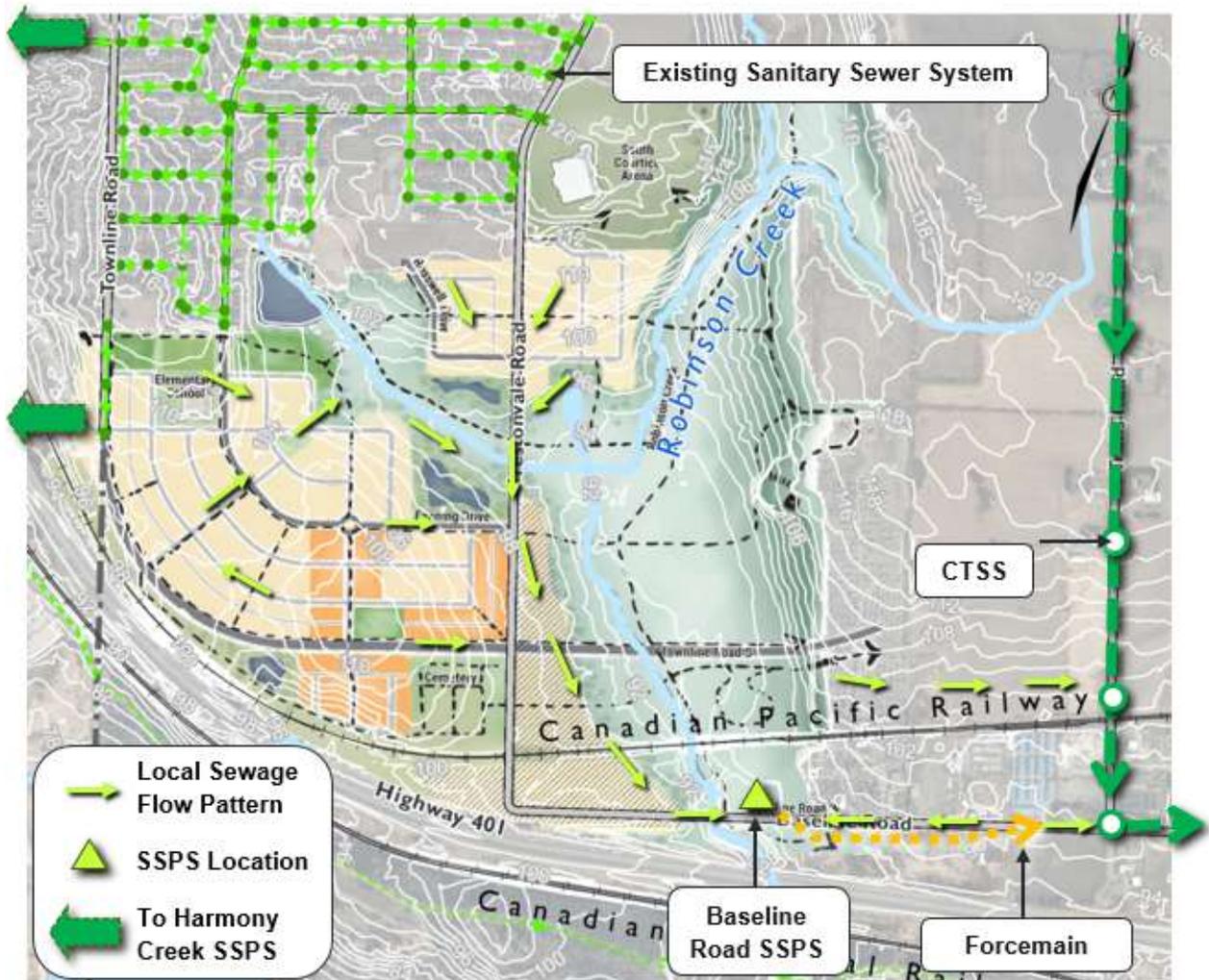


Figure 10: Sanitary Servicing Scheme for Pumping Station Alternative 2

3.2.6 Alternative Location 3 – Prestonvale Road

If the Baseline Road SSPS is relocated away from Baseline Road and into the Southwest Courtice area the most logical location would be on either the east or west side of Prestonvale Road immediately south of the Robinson Creek tributary. Depending on the exact location of the SSPS it would be situated on land designated as residential in the proposed secondary plan land use concept at an elevation of 94 – 96 m.

The general sanitary sewer servicing scheme for Southwest Courtice based on a pumping station located at Alternative Location 3 is shown at the end of this section on **Figure 11**. Profiles for the linear infrastructure described in this section are included in **Appendix C**.

Flows from Southwest Courtice

Sanitary sewage flows from the Southwest Courtice area would be conveyed to the SSPS by a network of local sanitary sewers. The natural topography is generally favourable for the conveyance of flows from the following areas to a pumping station at Alternative Location 3:

- The area north of the Robinson Creek tributary on both sides of Prestonvale Road, which can be conveyed directly to the SSPS by a sanitary sewer flowing south along Prestonvale Road.
- The area south of the Robinson Creek tributary on the east side of Prestonvale Road, which can be conveyed to the SSPS by a network of sewers flowing in a northwesterly direction towards the tributary.

The area south of the Robinson Creek tributary on the east side of Prestonvale Road will generally be located at elevations below that of the SSPS and will be more difficult to service. To facilitate a gravity sanitary sewer system in this area the depth of the pumping station will have to be increased to allow sewers to flow towards the SSPS against the grade of the natural topography.

Flows from Baseline Road Employment Lands

Conveying sanitary sewage flows from the employment lands on Baseline Road to a pumping station located in Southwest Courtice will be a significant undertaking. Similar to Alternative 1, this will require either:

- A relatively shallow sanitary sewer crossing over the creek in the fill above the box culvert with a clearance of approximately 1.8 m and cover of approximately 2.0 m below road grade.

Overtopping of the road during a flood event may cause the sewer to become exposed. Given that it will be a local it is anticipated that this would represent an acceptable risk as local flows could be pumped while repairs are made. To prevent leakage during the flood event a pipe with fully restrained joints could be used.
- A relatively deep sanitary sewer (with several drop structures) crossing below the creek at an invert elevation of approximately 82.7 m (3.0m below the culvert).

A deep sewer crossing under Robinson Creek is generally considered unfeasible as even a sewer running at 0.3% grade between the creek and the SSPS would have to be installed entirely at depths in excess of 8.0 m and would result in a pumping station depth of at least 17.0 m.

A shallow crossing in the fill above the culvert is more feasible. If the slope of the sewer is flattened to 0.3% between the creek and the SSPS the majority of the sewer will be situated at depths less than 5.0 m and will provide opportunities to service the lands on the east side of Prestonvale Road, should they develop in the future.

Pumping Station

A pumping station located in Southwest Courtice could be situated on either east or west side of Prestonvale Road, immediately south of the tributary that flows through Southwest Courtice towards Robinson Creek. From a topography perspective, the lands east of Prestonvale Road are lower and generally more favourable.

As noted above, a pumping station at this location that can service the employment lands on Baseline Road via a sanitary sewer crossing under Robinson Creek would be very deep at over 17.0 m. A pumping station at this location servicing the employment lands on Baseline Road via a sanitary sewer crossing over Robinson Creek is more practical as it would only have to be approximately 10.3 m deep inclusive of a 3.0 m depth of storage in the wet well.

Forcemain

Approximately 1,800 m of forcemain will be required to connect a pumping station in Southwest Courtice back to the CTSS. The forcemain could potentially be aligned along Prestonvale Road/Baseline Road and be installed using trenchless methods. Given the length of the forcemain and the fact that the first 1,100 m will be flowing down-hill towards Robinson Creek, it is anticipated that a series of combination air/vacuum valves will be required to ensure effective operation of the forcemain. Similar to the other alternatives, the forcemain will cross under Robinson Creek at an elevation of ±83.0 m and then rise to discharge to the gravity sanitary sewer 100 m west of Trulls Road.

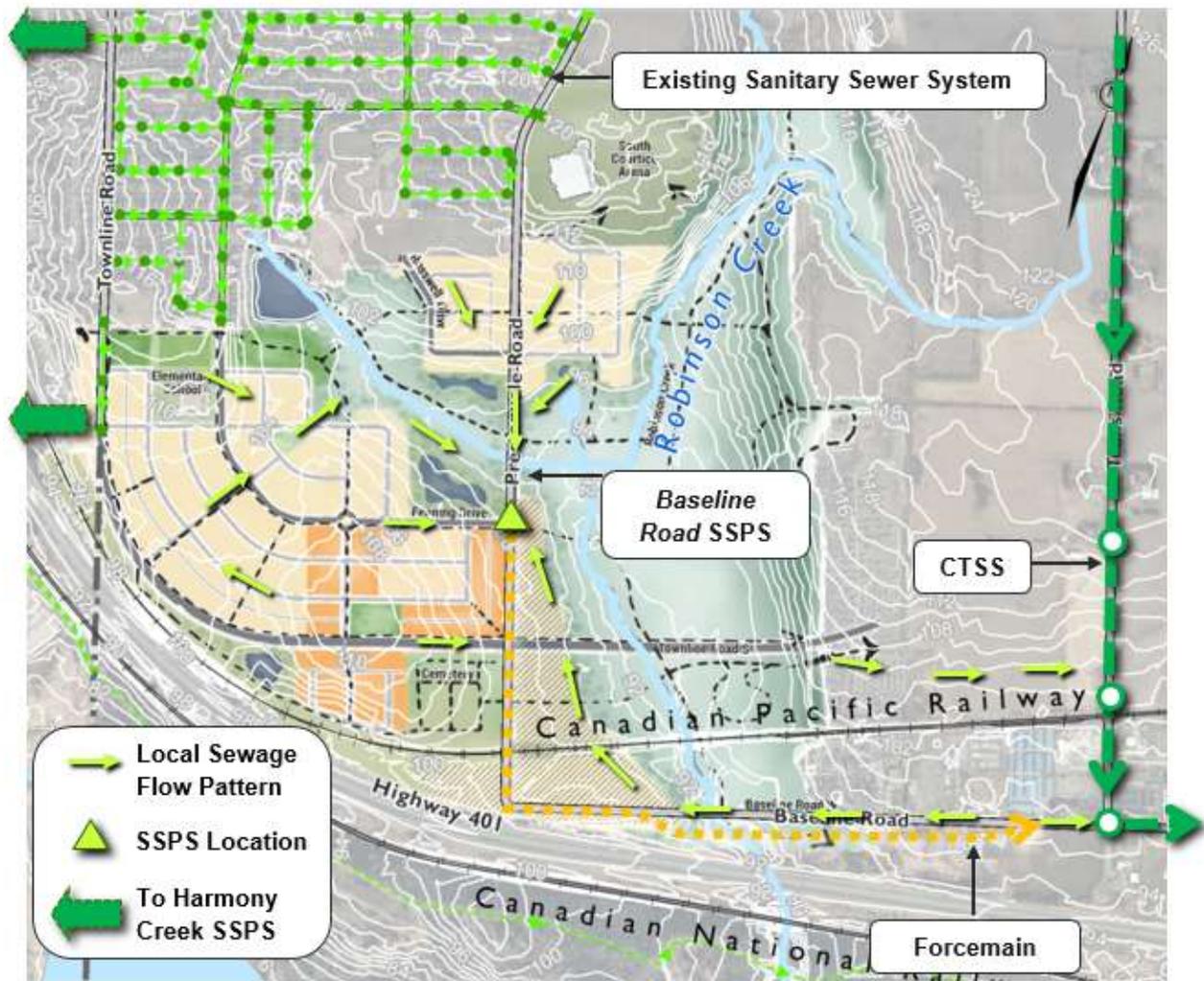


Figure 11: Sanitary Servicing Scheme for Pumping Station Alternative 3

3.2.7 Comparison of Alternatives

Table 1 and **Table 2** provide a comparative summary of the alternative pumping station locations.

Table 1: Comparison of Alternatives – Infrastructure Metrics

Metric	Alt 1A	Alt 1B	Alt 2A	Alt 3A
Pumping Station Depth	10.8 m	14.9 m	15.2 m	10.3 m
Length of Sewer				
• 3–5 m Deep	1,420 m	1,185 m	1,120 m	1,380m
• 5–7m Deep	150 m	165 m	115 m	185m
• 7m + Deep	0 m	215 m	330 m	0 m
Total Sanitary Sewer	1,505 m	1,565 m	1,565 m	1,565 m
Length of Forcemain	825 m	825 m	540 m	1,800 m
Total Linear Infrastructure	2,390 m	2,390 m	2,105 m	3,365 m
No. of Creek Crossings	2x	2x	1x	2x
No. of Railway Crossings	1x	1x	1x	2x

Table 2: Comparison of Alternatives

Alternative	Advantages	Disadvantages
1A	<ul style="list-style-type: none"> • Shallower pumping station at ±10.8 m, compared to other alternatives. • Only one crossing under Robinson Creek (forcemain). • Pumping Station outside of Environmental Protection area. • Sewer through lands on east side of Prestonvale Road at ideal depth to service that area. 	<ul style="list-style-type: none"> • Local sewer on Baseline Road in fill above may complicate future culvert work. • Two crossings of Robinson Creek, although one is above the creek. • Local sewer on Baseline Road limited to 3.0m depth. • Requires gravity sewer between Southwest Courtice and SSPS to service initial development.
1B	<ul style="list-style-type: none"> • Pumping Station outside of Environmental Protection area. • Sewer through lands on east side of Prestonvale Road at ideal depth to service that area. 	<ul style="list-style-type: none"> • Deep pumping station at ±14.9 m. • Two crossings under Robinson Creek • Requires gravity sewer between Southwest Courtice and SSPS to

Alternative	Advantages	Disadvantages
	<ul style="list-style-type: none"> Any depth of sewer is possible on Baseline Road east of Robinson Creek. 	<ul style="list-style-type: none"> service initial development in Southwest Courtice.
2A	<ul style="list-style-type: none"> Sewer through lands on east side of Prestonvale Road at ideal depth to service that area. Only one crossing of Robinson Creek (forcemain). Any depth of sewer is possible on Baseline Road east of Robinson Creek. 	<ul style="list-style-type: none"> Deep pumping station at ±15.2 m Pumping Station in Environmental Protection Area/Regulated Area of Robinson Creek, which is not supported by CLOCA. Requires gravity sewer between Southwest Courtice and SSPS to service initial development in Southwest Courtice.
3A	<ul style="list-style-type: none"> Pumping Station outside of Environmental Protection area. Shallower pumping station at ±10.3 m, compared to other alternatives. Gravity sewer on west side of Robinson Creek not required to service initial development in Southwest Courtice. 	<ul style="list-style-type: none"> Significant length of gravity sewer required to service Baseline Road employment lands. Two crossings of Robinson Creek, although one is above the creek. 630 m of sanitary sewer flowing against grade on west side of Robinson Creek must be at slope of 0.3% to avoid excessive depth. Longest forcemain at 1,800 m.

3.2.8 Recommended Alternative

If its acceptable to both the Municipality and Region to place the local sewer crossing Robinson Creek (on Baseline Road) in the fill above the existing box culvert than Alternative 1A and 3A provide the advantage of limiting depth of the pumping station to less than 11 m. This will provide opportunities mitigate both the cost and complexity of pumping station when compared other alternatives that require a pumping station approximately 15 m deep.

Comparing options Alternatives 1A and 3A, Alternative 1A is considered favourable for the following reasons:

- At 2,390 m Alternative 1A requires less total linear infrastructure than Alternative 3A at 3,365 m.

- Alternative 1A includes a shorter and simpler forcemain that is 825 m long. In comparison, the alternative 3A forcemain will be over 1,800 m long, will require multiple combination valves for air and vacuum relief and it may be complex to achieve the required velocities in the forcemain without pressure issues.
- The deepest portion of the sanitary sewer running along the west side of the Robinson Creek valley for Alternative 1A will begin at the railway crossing where trenchless construction will be necessary regardless of depth and the additional depth will help to mitigate potential impacts on the railway this deep section will also be located in the area where the need for service connections to the sanitary sewer is least likely. Conversely, for Alternative 3A the deepest section of sanitary sewer will be located near Prestonvale Road.
- For Alternative 1A no sanitary has a slope flatter than 0.5%, whereas for Alternative 3A all of the sewer north of the railway crossing must run at 0.3% to avoid a pumping station depth of over 11 m.
- Alternative 1A requires only one (1) trenchless crossing under the railway, where as Alternative 3A requires two (2) crossings, one for each of the sanitary sewer and the forcemain.

Given the foregoing Alternative 1A is considered the preferred option for the provision of a sanitary sewer system that services both South West Courtice and the Baseline Road employment lands. The feasibility of the crossing in the fill above the culvert should be validated through a detailed topographic survey to confirm that both adequate cover and clearance can be achieved.

If a shallow crossing of Robinson Creek in the fill above the box culvert is not possible than option 2A should be considered in comparison to Alternative 1B.

For all alternatives the detailed design of the pumping station, forcemains and gravity sewers crossing watercourses shall include due consideration for dewatering excavations, managing groundwater as well as erosion and sediment control.

3.3 Pumping Station Capacity and Design

3.3.1 Southwest Courtice Flows for Fully Residential Scenario

The land use budget for the undeveloped area in Southwest Courtice includes a mix of low, medium and high-density development achieving a total of 50 people and jobs per hectare. The number of units to be developed varies based on whether the employment lands west of Robinson Creek undergo a conversion to a residential land use designation. It is currently anticipated that these lands will undergo a conversion in the future and planning for Southwest Courtice is proceeding based on that assumption. **Table 3** summarizes the anticipated number of development units in the undeveloped residential lands and the potential employment land conversion area.

Table 3: Anticipated Development Units

Area	Gross Developable Area (ha)	Low Density	Medium Density	High Density
Undeveloped Residential	40.63	439	162	131
Employment Land Conversion	29.56	320	118	96
Total	70.19	759	280	227

The population per unit (PPU) values anticipated for Southwest Courtice as part of the land use budget are outlined in **Table 4**. These values are less than the PPU values provided in the Region of Durham’s Design Specifications for Sanitary Sewers, which are also shown in **Table 4**.

Table 4: Population and Flow Parameters

Parameter	Land Use Budget	ROD Standard
PPU Low Density	3.14	3.50
PPU Medium Density	2.43	3.00
PPU High Density	1.50	1.50
Domestic Sewage Flow (L/c/d)	364	
Infiltration (L/s/ha)	0.26	

For the purposes of determining the preliminary capacity requirements of the Baseline Road SSPS, the higher Region of Durham Design Standard PPU values have been used to determine the total population in the catchment area. The total estimated population for Southwest Courtice based on these PPU values is summarized in **Table 5**, including an allowance for an equivalent population to account for a minor amount of employment in neighbourhood commercial areas within the residential development.

Table 5: Anticipated Development Population

Area	Low Density	Medium Density	High Density	Jobs Equiv Pop.	Total
Undeveloped Residential	1,537	486	196	61	2,280
Employment Land Conversion	1,120	354	144	44	1,662
Total	2,657	840	340	105	3,942

If the employment lands west of Robinson Creek are converted to residential the Baseline Road SSPS service entirely residential development and the catchment area will have potential total population of 3,942 people. **Table 6** summarizes anticipated sewage flows for this population.

Table 6: Estimated Sanitary Sewage Flow – Scenario 1 Entirely Residential

Domestic Flow				Infiltration Flow			Total Flow Q_{TOT} (L/s)
Total Pop.	Flow Per Capita (L/s)	Peaking Factor	Flow Q_{DOM} (L/s)	Gross Area (ha)	Infil. Rate (L/s/ha)	Flow Q_{INF} (L/s)	
3,928	0.0042	3.34	55.45	86.30	0.26	22.44	77.89

Under a fully residential scenario, the total peak flow to the Baseline Road SSPS from the Southwest Courtice residential area is anticipated to be in the order of 77.89 L/s.

3.3.2 Southwest Courtice Flows for Partially Residential Scenario

If the employment lands do not undergo a conversion to residential, the total population in the undeveloped residential portion of the Baseline SSPS catchment area will be 2,280 and resultant residential flows will be as shown in **Table 7**.

Table 7: Estimated Sanitary Sewage Flow – Scenario 2 Partially Residential

Domestic Flow				Infiltration Flow			Total Flow Q_{TOT} (L/s)
Total Pop.	Flow Per Capita (L/s)	Peaking Factor	Flow Q_{DOM} (L/s)	Gross Area (ha)	Infil. Rate (L/s/ha)	Flow Q_{INF} (L/s)	
2,280	0.0042	3.54	55.45	56.74	0.26	14.75	48.77

In addition to the residential flow noted in **Table 7** the remaining 29.56 ha employment land will generate an estimated peak flow of 61.58 L/s based on a flow rate of 180 m³/ha/d that includes infiltration and a peaking factor. This results in an anticipated total peak flow in the order of 110.35 L/s from the Southwest Courtice residential area combined with the employment lands on the west side of Robinson Creek.

3.3.3 Baseline Road Flows

As noted above approximately 21 ha of employment land along Baseline Road on the east side of Robinson Creek will also have to be serviced by the future pumping station. This 21 ha of employment land will generate an estimated peak flow of 41.75 L/s based on a flow rate of 180 m³/ha/d that includes infiltration and a peaking factor.

3.3.4 Pumping Station Design

Based on the foregoing, it is anticipated that the Baseline Road SSPS will require a firm rated capacity of between 121 L/s and 151 L/s. Future preliminary and detailed design for the pumping station should revisit capacity calculations in greater detail based on the proposed sanitary sewer system layout and additional detail related to the configuration and composition of proposed development as it evolves.

Its is anticipated that a submersible type station will be the most practical configuration for any of the alternative pumping station locations described above.

Given that there will be limited sanitary sewage flows to the Baseline Road SSPS, initially it will be important that number and sizing of individual pumps be determined with consideration for preventing the pumps from short cycling balanced against the need to manage the time sewage is resident in the wet well to prevent a septic condition from developing and causing odour issues at the pumping station or the forcemain discharge. This may involve staging the installation of pumps to achieve an ultimate capacity at build-out of the catchment area.

4 Stormwater Management

4.1 Existing Conditions

The study area is located almost entirely within the watersheds of Robinson Creek and Tooley Creek. Southwest Courtice is located primarily within the Robinson Creek watershed. The Courtice Employment Lands are divided between the between the Robinson Creek and Tooley Creek watersheds. Approximately 18.3 ha in the most southwesterly portion of Southwest Courtice and the employments lands drains towards McLaughlin Bay via a small tributary that crosses under the CPR, Highway 401 and Canadian National Railway (CNR) corridors. The locations of watershed boundaries and existing stormwater management facilities are shown on **Figure 12**.



Figure 12: Existing Watershed Boundaries and SWM Facilities

Most of the study area is rural in nature and consists of agricultural and rural residential lands that do not have formalized stormwater management systems. These rural lands generally drain towards Robinson and Tooley Creeks via roadside ditches and drainage courses that follow the natural topography of the area.

Existing employment-type development along Baseline Road is primarily located within the Tooley Creek watershed. These existing developed sites have minimal existing Stormwater Management (SWM) infrastructure and are generally graded to drain towards roadside ditches that convey flows towards Tooley Creek.

Existing urban residential development in Southwest Courtice is generally supported by roadways and storm sewers that respectively convey major and minor flows to the existing Robinson Ridge SWM Pond, which provides quantity and quality control.

4.2 Objectives

Stormwater Management (SWM) objectives for the study area are currently being confirmed through the completion of a sub-watershed study for the Robinson Creek and Tooley Creek catchment areas. It is anticipated that stormwater management facilities providing enhanced level stormwater quality control and post-development to pre-development stormwater quantity control will be required within the study area. For large scale development areas these facilities typically take the form of wet or wetland type stormwater management ponds. These types of ponds may be potentially combined with Low Impact Development (LID) site level quality control measures to create a treatment train approach and/or dry pond facilities for quantity control purposes. Typically, centralized SWM facilities that ultimately become public infrastructure are established to service multiple residential developments. SWM facilities for employment-type development often take the form of onsite facilities that remain private infrastructure.

4.3 Opportunities and Constraints

As noted, most of the lands within Southwest Courtice and of the study area (62.6 ha) drain towards Robinson Creek via several smaller tributary drainage courses. However, approximately 18.3 ha in the most southwesterly part of Southwest Courtice and the Courtice Employment lands (west of Presontvale Road) drain towards McLaughlin Bay via a small tributary that crosses under the CPR, Highway 401 and CNR corridors. This tributary discharges to the north end of McLaughlin Bay just west of the Clarington boundary. Maintaining the balance of run-off that is discharged towards Robinson Creek and McLaughlin Bay has been identified by the Central Lake Ontario Conservation Authority (CLOCA) as a priority. As a result, it is anticipated that the proposed development in Southwest Courtice will be required to maintain the existing drainage divide between the two watersheds with separate SWM facilities to provide water quality and quantity control for each. Furthermore, given existing topography and drainage courses it is anticipated that multiple SWM facilities will be required to control flows being discharged to Robinson Creek.

4.4 Southwest Courtice Stormwater Management Facilities

It is expected that three (3) SWM Facilities will be required to provide control for flows to Robinson Creek. It is anticipated that this will include a facility for:

- The area west of Prestonvale Road and south of the tributary that originates at the existing Robinson Ridge SWM Facility;
- The area west of Prestonvale Road and north of the tributary that originates at the existing Robinson Ridge SWM Facility; and
- The area east of Prestonvale Road and north of the of the tributary that originates at the existing Robinson Ridge SWM Facility.

Depending on the detailed development grading plans and the ultimate development of a grade separated crossing of Prestonvale Road over the CPR there may also be a requirement for a SWM facility to control flows from the area east of Prestonvale Road immediately north of the CPR. An additional SWM facility is anticipated to be required to provide control for drainage that will continue to be directed towards McLaughlin Bay. This SWM facility will most likely be located outside the Southwest Courtice residential lands and within port of the Courtice Employment lands that may undergo conversion to residential. The conceptual location of these facilities is shown in **Figure 13**

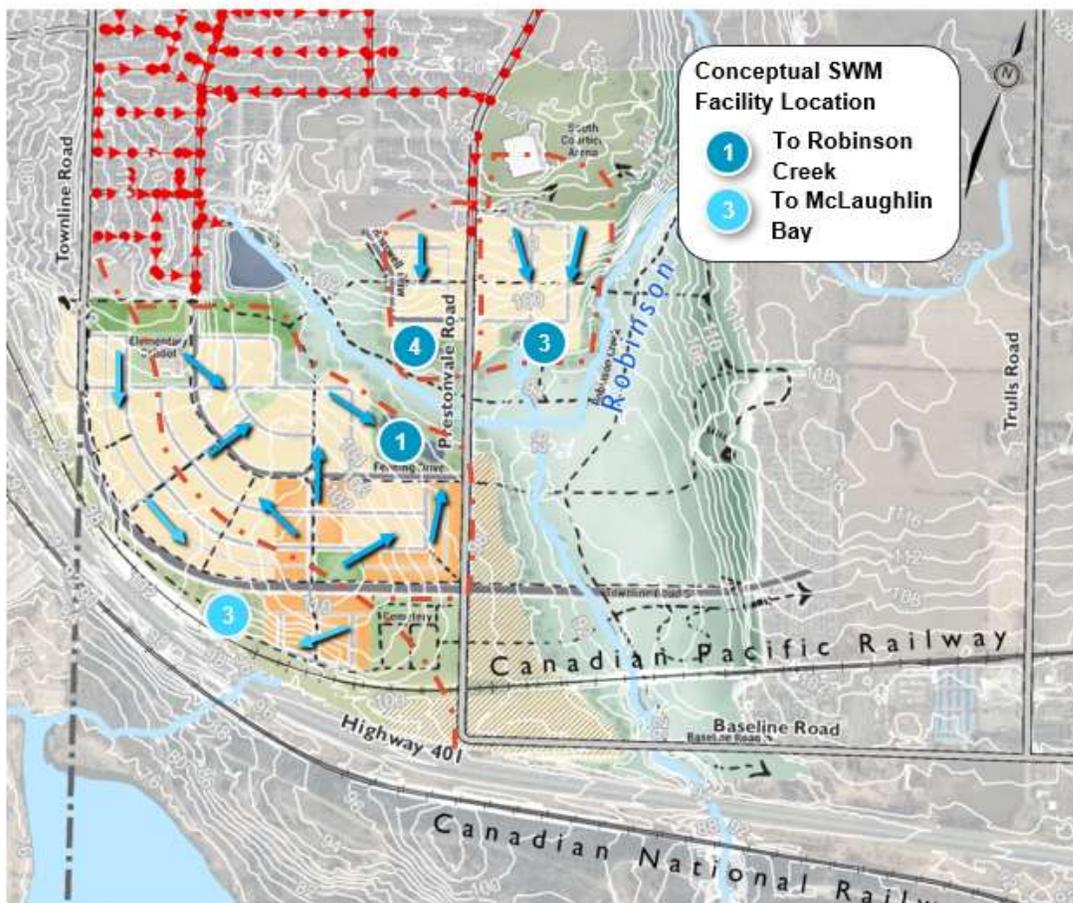


Figure 13: Anticipated Southwest Courtice SWM Facilities

It may be necessary to over control post-development flows from the SWM facility draining to McLaughlin Bay due to the capacity of existing culverts under the CPR, Highway 401 and CNR. Preliminary design activities for this facility should confirm the existing capacity of the railway and highway under-crossings and consider those constraints in establishing design release rates. Over control would generally be considered warranted if unacceptable overtopping of the highway or railways would occur as a result of existing flows.

A review of existing stormwater facilities serving residential developments in Clarington indicates that the SWM facility including all of its components typically occupies a site approximately 5% the size of its contributing drainage area. It is noted that many of the pond sites have proven to be somewhat undersized due to the lack of adequate space on site for stockpiling and drying sediment removed from wet facilities during stormwater facility maintenance. For purposes of preparing land use concepts and budgets for Southwest Courtice and the conversion area it is recommended that space be allocated based on the figures included in **Table 8**.

Table 8: Stormwater Management Facility Site Requirements

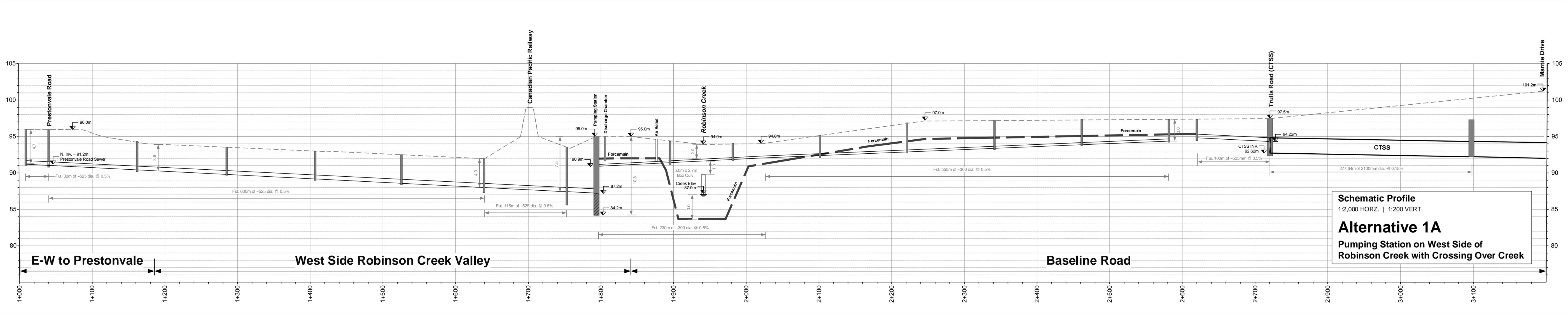
Potential SWMF	Drainage Area	5% of Drainage Area (ha)	Allowance for Sediment Drying (ha)	Recommended Size of SWMF Site (ha)
#1	34.6	1.73	0.25	1.98
#2	19.1	0.96	0.25	1.21
#3	18.3	0.92	0.25	1.17
#4	8.9	0.45	0.25	0.70

The next stage of design should examine opportunities to combine SWMF #3 and SWMF #4 into a single facility located on the east side of Prestonvale Road. Discharge from a single facility on the east side of the road would maintain flows to the headwaters feature in that location. Additionally, elevations on the east side of Prestonvale Road are generally 1.0 to 1.5 m lower than elevations on the west side as such it is anticipated that minor flows can likely be conveyed from the west side of the road to the east in a future storm sewer. However, given the grade/profile of Prestonvale Road it may not be possible to convey major flows across Prestonvale Road from west-to-east using the future road network. As a result, a channel and culvert may be required to convey major flows or a separate (smaller) quantity control facility on the west side may still be required. If the sequence of development is such that development on the west side of the road proceeds first than a temporary SWMF will be required on the west side of the road.

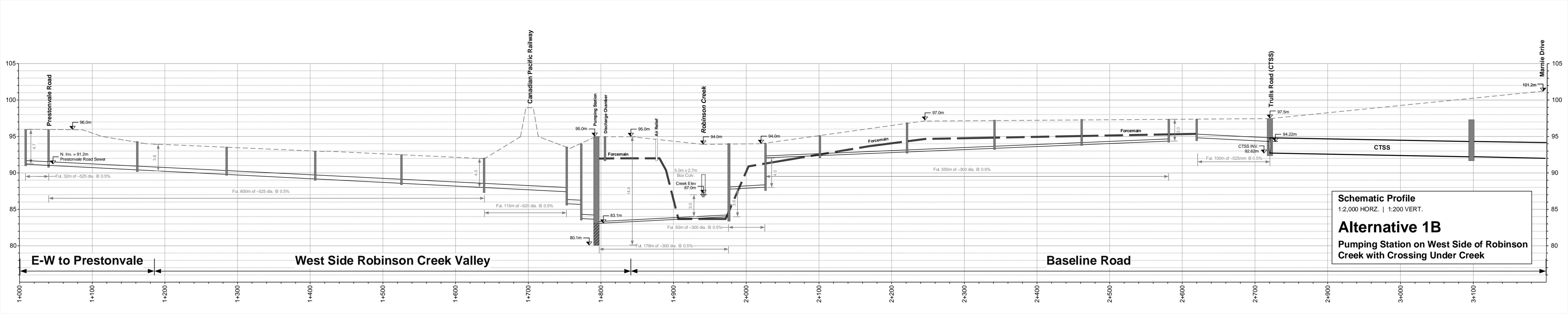
A

Appendix A: Schematic Profiles for Alternative 1

If you require this information to be in an accessible format, please contact the Municipality's Accessibility Coordinator at 905-623-3379 ext. 2131.



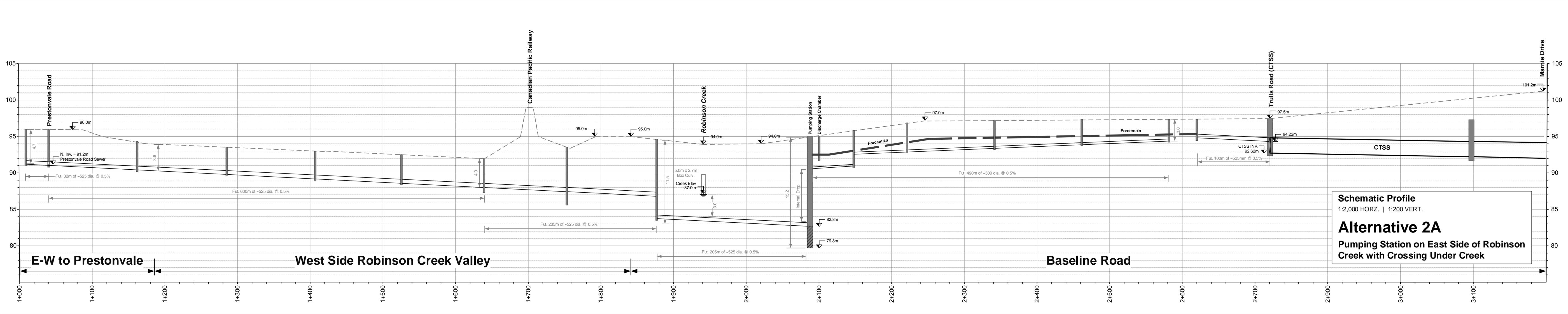
Schematic Profile
 1:2,000 HORZ. | 1:200 VERT.
Alternative 1A
 Pumping Station on West Side of
 Robinson Creek with Crossing Over Creek



B

Appendix B: Schematic Profiles for Alternative 2

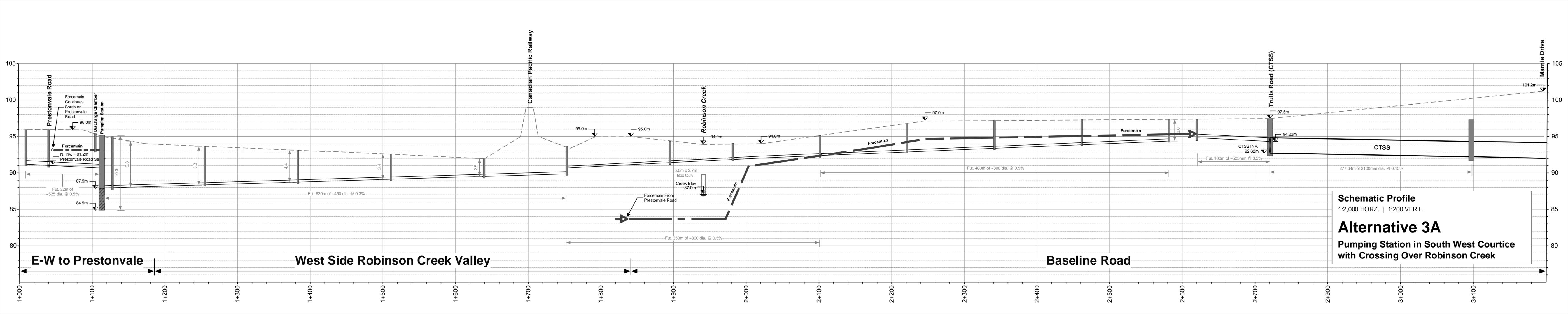
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C

Appendix C: Schematic Profiles for Alternative 3

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