City

Baldwin Avenue Subdivision Servicing & Stormwater Management Report

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1. Introduction

1.1 Background

This preliminary servicing and stormwater management report is submitted in support of a Draft Plan application for the Baldwin Avenue Subdivision and for a Ministry of Environment, Conservation and Parks (MECP) application for Environmental Compliance Approval (ECA).

1.2 General Location, Description & Phasing

The Baldwin Avenue Subdivision consists of a small infill development generally located at #304 Baldwin Avenue on the site of the former Whittaker Bros. Flower & Gift Shop in the City of Cornwall on 4,490 m^2 (0.449 ha) of land. The proposed development will consist of six single detached dwellings tailored to retirement living and to be built on slabs-on-grade.

The project will be developed in a single phase.

1.3 Draft Plan

A Draft Plan of Subdivision was prepared for the proposed development and may be found in Appendix "A". This plan was used in developing the design drawings.

1.4 Zoning

The current zoning for the property is Residential 10 (RES10) in the City of Cornwall's Zoning By-Law which allows for the proposed use. Refer to Appendix "B" for an excerpt of the City's GIS zoning map.

2. Servicing

Full municipal services will be provided, including sanitary sewers, storm sewers, watermain, surface drainage (lot grading), asphalt roadways, street lighting and utilities.

2.1 Proposed Sanitary Collection System

A sanitary sewer system is proposed for the development to convey sewage to the City of Cornwall Wastewater Treatment Plant before being discharged into the St. Lawrence River.

The design of the sewer system is consistent with the City of Cornwall's *Subdivision Manual,* the Ministry of the Environment, Conservation and Parks (MECP) *Design Guidelines for Sewage Works* (2008) and based on the following assumptions assumptions and criteria:

- 60 persons per hectare for RES10 zoning,
- Average daily flow of 340 L/person/day,
- Peaking factor as calculated from Harmon formula (minimum of 2, maximum of 4),
- Infiltration & inflow allowance of 0.019 L/s/ha,
- Manning coefficient of 0.013,
- Minimum full flow velocity of 0.6 m/s,
- Maximum velocity of 3.0 m/s.

Minimum cover provided over the sanitary sewer will be marginal since the existing sanitary sewer downstream of the project is shallow. The sewer will however be insulated and gravity drainage of basements is not a factor since houses will be built on slabs-on-grade (basements will not be done).

The proposed sanitary sewer is shown on the design drawings while the sanitary catchment areas may be found on drawing C3.2 – *Sanitary Catchment Areas*.

The sanitary sewer design sheet may be found in Appendix "C". As can be seen, the proposed sanitary sewers have capacity to accommodate the proposed development.

2.2 Proposed Water Supply System

A water distribution system concurrent with City and MECP design standards is proposed for the development and will consist of a pipe network designed to provide potable and firefighting water to the residents of the subdivision.

The theoretical water demands for the entire development (including future phases) were calculated based on the City's design population densities noted above and based on a maximum day demand of 570 L/person/day as per the City's design guidelines. The maximum day demand is therefore 9,180 L/day or 0.11 L/s.

Other scenarios were not evaluated due to the short length of the proposed watermain and minimal impacts from the very low proposed flows.

The required fire flow was taken as 38 L/s as per the smallest population in Table 8-1 of the MECP *Design Guidelines for Drinking-Water Systems* (2008), resulting in a total demand of 38.11 L/s for the maximum day + fire flow scenario.

A simplified spreadsheet calculation was done to evaluate pressure losses in the proposed watermain due to the short length of the system, low demands, and single connection to existing watermains. As can be seen in Appendix "D", the maximum day + fire flow scenario results in a minimal pressure loss of 6 psi (41.5 kPa) through the system. The proposed water supply system will therefore adequately provide adequate domestic and fire flows.

2.3 Asphalt Roadways

Further to previous discussions with the City, a site-specific roadway cross-section and right-of-way is proposed due to the small size of the site and inability to accommodate a typical 20.0 m right-of-way. As can be seen on the design drawings, a 13.0 m wide right-of-way is proposed, along with a 7.0 m wide asphalt roadway with barrier curbs. Sidewalks will not be done as the length of the cul-de-sac is less than 150 m.

The pavement structure is as per the City's Subdivision Manual for local roads and will consist of 40 mm of HL-3 asphalt, 50 mm of HL-8 asphalt, 150 mm of Granular "A" and 300 mm of Granular "B" as shown on the design drawings.

2.4 Utilities & Street Lighting

Again due to the small size of the site and constrained right-of-way, utility trenches are proposed to be accommodated in easements outside the right-of-way in easements as is typically done in rural subdivisions.

Street lighting will be done to the requirements of the City with poles located in the right-of-way.

2.5 Park Land

The developer wishes for the City to consider Block 7 (widening along Baldwin Avenue) as part of the required park land dedication. More specifically, Block 7 has an area of 136.75 m^2, representing approximately 3% of the subdivision's total area of 4,490 m^2.

Since the resulting park land parcel would be too small to be of use, cash-in-lieu of park land will instead be done.

2.6 Lot Grading

The site grading was based on a minimum slope of 0.5% for swales, while minimum and maximum slopes for hard surfaces & grass surfaces were 1% and 4%, respectively. 3H:1V terracing was shown where slopes exceed 4%.

Lot grading will include rear and side yard swales as well as rear-yard catch basins for surface drainage, which will be directed to the storm sewer system.

3. Stormwater Management

The City of Cornwall requires that the quantity and quality of the stormwater from a new development be reduced to acceptable (pre-development) levels. As such, the existing and proposed stormwater drainage patterns were reviewed to analyze the impacts, if any, associated with an increase in stormwater runoff resulting from the construction of the proposed development.

3.1 Design Criteria

The rational method and the following design criteria were used in stormwater management calculations and in sizing the storm sewers.

3.1.1. Rainfall Intensity

The rainfall intensity was derived from the intensity duration frequency (IDF) curves given in the City of Cornwall's Subdivision Manual. These IDF curves were generated with rainfall data obtained from the Environment Canada Station 6101901 from 1957 to 1985.

3.1.2. Runoff Coefficients

The following runoff coefficients were used for calculations, as per the City of Cornwall's *Subdivision Manual* or MECP design guidelines:

- 0.45 for single family dwellings (post-development condition),
- 0.20 for existing grassed areas (neighbouring undeveloped rear yards in post-development condition & grassed areas in pre-development condition)
- 0.90 for existing asphalt areas (pre-development condition)
- 0.95 for existing roof areas (pre-development condition).

Weighted runoff coefficient calculations may be found in Appendix "E". Roof and asphalt areas for the pre-development condition were based on historical aerial imagery.

3.1.3. Time of Concentration

The time of concentration (Tc) represents the longest time that will take for a water droplet to run off the watershed to its discharge point, and at which time peak flow will occur.

As per the City of Cornwall's *Subdivision Manual,* the initial post-development time of concentration was taken as 20 minutes for single family dwellings (RES10).

3.1.4. Stormwater Management

The following design criteria were used in designing the stormwater management system as per current engineering best practices:

- Pre- to post-development for 5-year and 100-year storms,
- 80% total suspended solids (TSS) removal.

3.2 Drainage Patterns

The post-development catchment areas were established based on the proposed grading plan of the site and are shown on drawing C3.3 – *Storm Catchment Areas* which is part of the design drawings. As can be seen, an allowance was made to provide drainage for the rear yards of existing neighbouring properties.

The pre-development catchment area was taken as matching the total area of the post-development catchment areas. Swales, rear-yard catchbasins, roadway catchbasins and storm sewers will be constructed to collect and convey stormwater to the existing storm sewer on Baldwin Avenue, located at the western limits of the subject land.

3.3 Storm Sewer Sizing

The storm sewers were sized based on the peak flow of a storm event with a 5-year return period, the above design criteria and a Manning roughness coefficient of 0.013. The storm sewer design sheets may be found in Appendix "E" and is in accordance with the standards outlined by the MECP and the City of Cornwall's *Subdivision Manual*.

As can be seen, the sewer can accommodate the 5-year storm event without surcharging.

3.4 Stormwater Management - Quantity

As previously mentioned, stormwater management will need to be provided such that the post-development peak flows do not exceed the corresponding pre-development value for storm events with return periods of 5 and 100 years.

The necessary quantity storage will be provided by a clear stone infiltration trench for the 5-year storm event, and by a combination of infiltration trench storage and swale surface storage for the 100-year storm event. An orifice was added directly upstream of the connection to the existing storm sewer to control post-development peak flows to pre-development levels.

Post-development flow calculations were based on orifice flow while the provided storage calculations were based on the water levels in the infiltration trench and swale.

Table 3-1 below summarizes the pre-development and post-development controlled scenarios for the entire subdivision, for both the 5-year and 100-year storm events. Detailed calculations pertaining to weighted runoff coefficient, required storage, provided storage and resulting orifice flow calculations may be found in Appendix "E".

Table 3-1: Stormwater Peak Runoff for Pre and Post Development

Return Period (years)	Pre-Development			Post-Development				Req'd Storage (m^3)	Provided Storage (m^3)	Water Elev. (m)
	Area (ha)	C Factor	Flow (L/s)	Area (ha)	C Factor	Uncont. Flow (L/s)	Controlled Flow (L/s)			
5	0.918	0.28	45.25	0.918	0.34	71.27	45.15	26.61	26.65	56.63
100	0.918	0.28	81.49	0.918	0.34	128.56	60.03	61.68	61.83	57.06

As can be seen, the controlled flows from the site are less than the allowable pre-development peak flows, and the required storage volumes are met for both the 5-year

and 100-year design storms. The proposed stormwater management system therefore meet the stipulated quantitative criterion.

3.5 Stormwater Management – Quality

As previously mentioned, 80% total suspended solids (TSS) removal will be required for the site per current best practices.

Per the water quality calculations in Appendix "F", an overall weighted runoff coefficient of 0.34 is equivalent to an imperviousness level of 33.2%. Extrapolating from Table 3-2 of the MECP *Stormwater Management Planning and Design Manual* (2003) results in a required storage volume of 24.9 m^3/ha to achieve 80% TSS removal for infiltration systems. As such, a total of 22.8 m^3 of storage is needed to achieve the required TSS removal rate for the entire site.

The required storage volume will be achieved in the voids of the clear stone infiltration trench, which was calculated as 26.65 m^3 in Appendix "E" for the 5-year storm event.

TSS removal is also expected to occur in catch basin sumps, in overland sheet flow across grassed areas and grassed swales however was conservatively not accounted for.

3.6 Erosion & Sediment Control Measures

Silt fencing as per OPSD 219.110 and straw bale flow check dams as per OPSD 219.180 will be installed at the start of construction and will be maintained during the project. Sediment control measures will be removed only once sodding is completed and adequate grass cover has been achieved.

Silt fence will be installed at the bottom of slopes as required to intercept sediment-laden runoff, while straw bale flow check dams will be installed in roadside ditches. It is anticipated that these measures outlined above will provide adequate protection to minimize erosion and sediment transport during construction.

The contractor will be required to monitor the sediment control measures weekly and following any significant storm consisting of 13 mm of precipitation or greater. The contractor will also be responsible to repair the sediment control measures as required to ensure their proper operation.

4. Schedule

The Owner intends to proceed with the construction of the Baldwin Avenue subdivision as soon as a subdivision agreement is finalized with the City and once all other approvals are in place.

Respectfully submitted,
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