FUNCTIONAL SERVICING REPORT

6TH CONCESSION DEVELOPMENT,

WINDSOR, ONTARIO

PROJECT NO. 21 - 150

DATE: SEPTEMBER 08, 2022

REVISION 1: FEBRUARY 20, 2024

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1. Introduction

Baird AE was retained to prepare a Functional servicing report to review the storage requirements, sanitary capacity and water servicing for the 6th Concession Development in Windsor, Ontario. The property is bounded by 6th Concession Road to the West and existing residential to the north, south and east. The total area of the subject property is 0.8422 ha; this report deals with the stormwater management assessment of the entire site.

2. Pre-Development Conditions

As shown in Figure 1, the existing site consists of a gravel parking lot with catch basins. The soil maps provided by ERCA suggest that the soil in the site area is Brookston Clay Loam.

Figure 1: Existing Conditions

The hydrological soil group is considered to be in the 'D' group. A hydrograph for the 2-year event was created with the following assumptions.

- 2-year event using Windsor Ontario IDF Rainfall Data
- Gravel Area – 0.14 ha, Existing Building Area – 0.06 ha, Existing Grass Area – 0.64 ha, Average Curve number – 78 using Hydrologic Soil Group D.

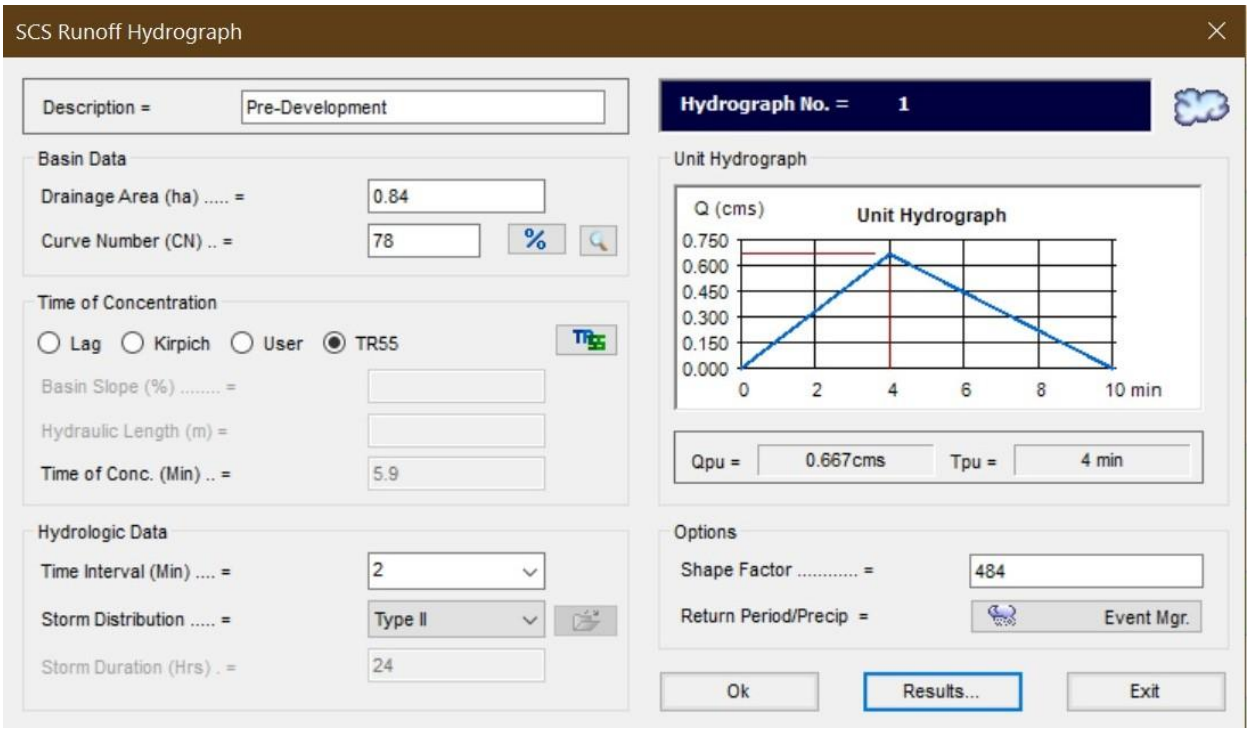

Figure 2: Allowable Release rate calculation

The time of concentration was determined using the TR-55 method and was calculatedto be 5.9 minutes

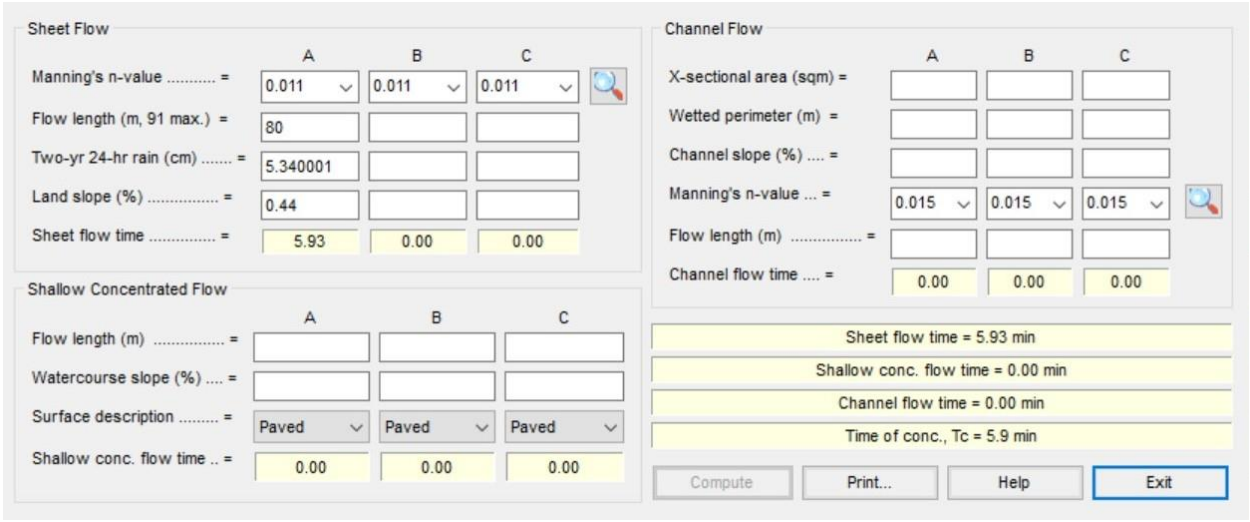

Figure 3: TR-55 Tc calculation

Inputting the above parameters into the Hydraflow Hydrographs Extension for AutoCAD Civil 3D, the 2-year pre-development release rate was found to be 53 L/s using the SCS runoff method. Hence, we will restrict the storm flow to 53 L/s and the pump will be designed accordingly. Sanitary analysis is discussed in section 6 of this report.

3. Post Development Conditions

During post-developed conditions, the site will have 27 duplex dwellings with a 20m road right-of-way as per the City of Windsor urban standard cross section, an asphalt or concrete driveway for each dwelling, landscape area and a proposed SWM block for underground chambers. The post-development model will be calculated with an 80% impervious area for the duplex dwellings as stated in the Windsor Essex SWM manual. The Horton infiltration method will compute infiltration loss into the soil. As mentioned in section 2, the soil is in group D; the maximum Infiltration will be 75 mm/hr and minimum infiltration of 0.5mm/hr with a decay constant of 4 (1/hr). PCSWMM modelling was used to compute the post-development flows and the attenuation of peak flows using pumped and gravity system discharge.

4. Stormwater Management

The stormwater management criteria for this development are based on the City of Windsor and ERCA requirements. The requirement includes:

- Stormwater quantity controls are required for the site to control the proposed conditions peak flows, up to the 100-year storm, to the allowable release rate.
- Water quality control is to be provided to a “Normal Protection level’ as per MOE (2003) guidelines.
- Erosion and sediment control measures are to be provided.

4.1. Storm Quantity Control

According to new ERCA guidelines for the Minor System, Chicago 5-year 4-hour storm will be used to check the capacity of storm sewers. The resulting Hydraulic Grade Line (HGL) will be maintained below the ground elevations. For storm quantity control, the Chicago 4-hour storm and SCS type II storm were taken into consideration and storage was provided for the most

conservative event. Also, stormwater infrastructure was evaluated with a stress test defined as 150mm rainfall to include the impact of climate change. This event shall be contained within the site and maintained below the lowest building opening elevation.

Table 1: Rainfall Intensities used for PCSWMM Modelling

Storm Event	Storm Duration	Rainfall Depth
Chicago 5-year	4 hours	49.50 mm
100-year (SCS TYPE II)	24 hours	108.00 mm
100-year Chicago	4 hours	81.6 mm
Urban Stress Test	24 hours	150 mm

4.2. Design Release Rate and Site Storage Requirements

Storage during major storm events will be provided through underground storage chambers. The outfall for all the storm distributions was modelled with a fixed tail water condition at the existing combined sewer connection to account for the drain's back water conditions.

Table 2: Peak Discharges using Pumped discharge

	Peak Inflow (L/s)	Total Design Flow (L/s)	Allowable Flow (L/s)	Tail Water Elevation (m)
Chicago 5-year 4hr	175	53	53	189.400
100 year (SCS TYPE II)	61	53	53	189.700
100-year Chicago 4hr	324	53	53	189.700
Urban Stress Test	335	53	53	190.150

Table 3: Peak Discharges using Gravity discharge (Pump Failure)

	Peak Inflow (L/s)	Total Design Flow (L/s)	Allowable Flow (L/s)	Tail Water Elevation (m)
Chicago 5-year 4hr	175	0	53	189.400
100-year Chicago 4hr	324	36	53	189.700

As mentioned in section 4.2, the design flow will be restricted to the allowable release rate mentioned in Section 2 of this report. The development will have a pumped discharge to the

receiver. However, in the event of pump failure, a 200mm outlet pipe is located downstream of the underground chambers.

Table 4: Chambers Stage Storage Calculations

Stage (m)	Elevation (m)	Contour Area (m^2)	Incremental Storage (m^3)	Total Storage (m^3)	Levels	Required Storage for storm events (m^3)
0.00	189.680	142	3.60	3.60	**Top of Chambers**	
0.23	189.450	142	36.28	39.88		
0.84	188.840	272	176.17	212.45		
1.45	188.230	272	149.17	361.62		
2.06	187.620	160	91.12	452.74	**Bottom of Chambers**	

Table 5: Storage Volume in Chambers

	Required Storage (m^3)
Chicago 5-year 4hr (Pumped)	153
100 year (SCS TYPE II) (Pumped)	100
100-year Chicago 4hr (Pumped)	319
Urban Stress Test (Pumped)	353
Chicago 5-year 4hr (Gravity)	322
100-year Chicago 4hr (Gravity)	445

4.3. SWM Findings

- The underground Chambers can provide storage of 452.74m^3. The chamber storage calculation is attached in Appendix B of this submission.
- During the pumped discharge, the required storage for the urban stress test event is 353m^3 and will be stored within the chambers.

- In the event of pump failure, the required storage for the 100-year Chicago event is 445m^3, while the urban stress test will spill over to the receiver.
- 100-year SCS Type -2 and 100-Year Chicago storm was considered for critical storage events. The 100-year Chicago required more storage and storage has been provided for the most conservative event.
- During major events, there is no more than 0.30m of surface ponding in the right-of-way. The Hydraulic Grade line for the road is attached in Appendix B.

4.4. SWM Quality Control

Water quality is addressed through a quality unit FD-4HC. The quality unit was sized with the rainfall intensity stated in table 3.4.1.5 of WERSMSM and with fine particle size distribution. The quality unit treats 98.90% total runoff volume, while maintaining an overall removal efficiency of 78.70% and it satisfies the MECP and WERSMSM manuals. The details of the OGS quality unit are attached in Appendix B.

The erosion and sediment control measures for the site will be included in tender documents, and will include the following:

• Silt fence is to be erected before grading begins on the property to protect downstream areas from migration of sediment in overland flow;

• Filter fabric will be placed over the drainage grates; and

• All disturbed areas will be stabilized by restoration of vegetative ground cover as soon as possible.

5. Sanitary Sewer

5.1. Existing Conditions

- The current land use is two existing residential houses with a gravel driveway and landscape area. An existing 250mm Sanitary sewer is located on the south corner of the property at Spago Crescent and no sanitary connection is currently provided for the development.

5.2. Proposed Conditions

- The duplex dwelling development will have a total of 27 units with a projected post development equivalent population of 95 people per the standards.
- Based on population density and infiltration allowance, the proposed peak sanitary discharge flow is estimated at 2.21 l/s.
- Each duplex dwelling unit will have a separate 150mm service connection at a 2% slope which will connect to a 250mm sanitary sewer. The sanitary system will be tied into the existing 250mm Sanitary sewer on Spago crescent.

5.3. Sanitary Study Area

In discussion with the City of Windsor, a master sanitary study was undertaken to find if the existing sanitary sewers from Spago Crescent to the 900mm Trunk sewer on Morand Street have enough capacity to accommodate the proposed development of 27 units with an estimated peak flow of 2.21 L/s.

1. The overall study area includes both residential and commercial developments.
2. Residential was considered 50 persons/ ha, while the commercial was 74 persons/ha. The overall study area was calculated to be at 350.618 ha with a population of 21315.
3. The existing 900mm sanitary trunk sewer on Morand street and the existing sanitary sewers from the proposed development to the trunk sewer have enough capacity to handle the 2.21L/s flow from the proposed development
4. The sanitary design sheet and drainage area breakdowns are attached in appendix C of this report.

6. Watermain

6.1. Existing Conditions

- There is an existing 150mm PVC watermain located on the south of the property at Spago crescent.
- There is one existing water service connection from the development which ties-into the existing watermain on Spago Crescent. This existing connection will be abandoned.

6.2. Existing Conditions

- There will be a proposed 150mm watermain which will tee into the existing 150mm watermain on Spago crescent to provide domestic water supply for the subject development.
- The 27-unit duplex dwelling will each have a 25mm copper service connection tied into the proposed 150mm watermain for water service.
- The subject development also consists of a 150mm proposed fire hydrant to service all the duplex dwellings in the event of a fire. The hydrant service radius is 75m.

7. Conclusion

This functional servicing report is to be read in conjunction with the submission material. The report presents municipal servicing details, proposed servicing and stormwater management plan for the duplex dwelling in the City of Windsor. Furthermore, the report demonstrates that approximate stormwater management measures will be provided to satisfy water quality treatment and quantity attenuation criteria. The sanitary service and water supply for the proposed development are through existing infrastructure along Spago Crescent. If you have any questions or require additional information, please do not hesitate to contact the undersigned at your convenience.

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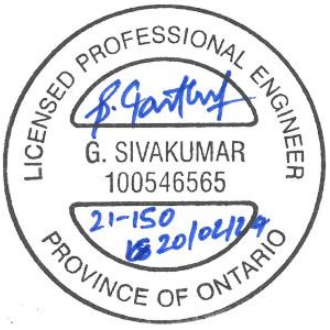

Appendix B

PCSWMM Modelling – Input, Output files,

Minor and Major System Profiles

Appendix C

Sanitary Study