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September 29, 2022

Project Number 1512-005-22

Functional Servicing Report

Regarding:

Proposed Residential/Commercial Development
138 Robert Street East,
Town of Penetanguishene, County of Simcoe, Ontario

Prepared on behalf of:

Sakmet Developments

By:

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1. Introduction

Gerrits Engineering Ltd. (GEL) has been retained by Sakmet Developments (Client) to provide engineering services for a new residential/commercial development located at 138 Robert Street East in the Township of Penetanguishene, County of Simcoe, Ontario.

This Functional Servicing Report (FSR) has been prepared in support of the Draft Plan prepared by Innovative Planning Solutions to demonstrate how the proposed development can be serviced by the surrounding existing municipal infrastructure. In particular this FSR will examine the property's conceptual servicing with relation to:

- Water Supply
- Sanitary Sewerage
- Storm Sewerage
- Stormwater Management
- Utilities

1.1. Supporting & Reference Documents

The following documents have been referenced in the preparation of this report:

- Ministry of the Environment, Guidelines for the Design of Sanitary Sewage Works and Water Works – 2008
- Ministry of the Environment, Design Guidelines for Drinking-Water Systems, 2008
- Ministry of the Environment, Stormwater Management Planning and Design Manual, March 2003
- Ontario Building Code 2012 (O.B.C.)

1.2. Subject Property

The site is located south of the intersection of Robert Street East and Thompson Road in Penetanguishene, Ontario. It is approximately 31.63 Ha in area and generally rectangular in shape. The 31 hectare site is currently undeveloped and the majority is occupied by woodlands. It is legally described as Part of Lots 1, 2, 3 and all of Lots 4 to 25 Inclusive Block E and all of Lots 1 to 24 Inclusive Block G and all of Lots 1 to 25 inclusive Block H and all of Lots 1 to 25 inclusive Block I and all of Lots 1 to 25 inclusive Block K and Part of Lots 1, 4, 5, 8, 9, 12, 13, 16, 17, 20, 21 and 24 Block L and all of Lots 1 and 2, Part of Lots 3, 7, 8, 11, 12, 15, 16, 19, 20, 23 and 24 Block M and Part of Jeffery Street, Edward Street, Hall Street and Barr Street, all of Miller Street and Patton Street, Registered Plan 101 and Part of Lot 114, Concession 1 in the Geographic Township of Tay, Town of Penetanguishene, County of Simcoe, Ontario. The site, in its existing state, is currently vacant and slopes predominantly to the southwest corner of the property spilling on to Thomson Road and Gauthier Drive and ultimately discharging into the underground storm infrastructure along both Right of Ways. The topographical information is based on a survey completed by KRCMAR, dated May 19, 2022 as well as an aerial map from Google Imagery.

Figure 1 - Subject Property (Red)

1.3. Proposed Land Use

The residential development lands are proposed to comprise of 283 Detached Dwellings, 126 Townhouse Units, 155 Condominium Units, a Block designated for Parklands and a SWM Facility Block. The commercial development lands are proposed to comprise of 12 Blocks designated as "Employment" with one SWM Facility Block. The development will include eight new internal Right of Ways labelled as Street "A" to Street "I" and three existing road extensions labelled as Edward Drive Extension, Gauthier Drive Extension and Dunlop Street Extension. The development will be located at the southeast corner of Robert Street East and Thompson Road.

2. Servicing

2.1. Overview

Servicing of the Development will involve the connection to the Town's existing water and sanitary distribution and collection system. The Development's internal collection and distribution system will be constructed as per the Town and Ministry of

Environment (MOE) design guidelines. The site's internal water distribution system will be designed to account for domestic and fire protection requirements.

2.2. Design Criteria

A summary of the water and wastewater design criteria is as follows:

Residential Serviced Population

- Density (Detached Building) – 283 Units = 2.4 ppu
- Density (Townhouse Building) – 126 Units = 2.16 ppu
- Density (Condominium Building) – 155 Units = 2.0 ppu
- Total Development Residential Population – (283 units x 2.4 ppu) + (126 Units x 2.16 ppu) + (155 Units x 2.0 ppu) = 1,262 pers
- Total Development Residential Area = 20.69 ha

Commercial Service Information

- Number of Commercial Blocks = 11
- Commercial Development Area = 10.93 ha

Wastewater Criteria

- Average Day Flow (ADF) Residential = 350 L/c/d
- Average Day Flow (ADF) Commercial = 28 m^3/d/ha
- Extraneous flows (peak per developable ha) = 0.23 L/s/ha
- Peak Factor (Residential and Commercial) Harmon and

  $M = 1 + \frac{14}{4+P^{0.5}} = 4.35 = 4.0$ (Maximum)

Water Criteria

- Average Day Demand (ADD) Residential = 350 L/c/d
- Average Day Demand (ADD) Commercial = 28 m^3/d/ha
- Max Day Factor (MDD) = 2.0
- Peak Hour factor (PH) = 4.5
- Minimum pressure in system at MDD = 350 kPa
- Maximum pressure in system at MDD = 700 kPa
- Minimum pressure in system at Peak Hour demand = 275 kPa
- Minimum pressure in system at Fire + MDD = 140 kPa

3. Sanitary Servicing

The projected daily average and peak sewage flows from the subject property are summarized in the table below.

Table 1 – Design Wastewater Flows

Average Daily Demand (Design)	748.1	m^3/d
	8.66	L/s

Peak Hour Flow (Design)	3,380.4	m^3/d
	39.12	L/s

3.1. Proposed Sanitary Connection Point

Serviceability to the subject site can be provided from Thompson Road for Catchment Area 201 and Robert Street for Catchment Area 202. Flows from the development (Catchment Area 202) will be collected and then conveyed by gravity, which will flow north towards the existing maintenance hole structure located on Robert Street (Ex. SAN MH), which currently services the surrounding adjacent external residential properties. Flows from the development (Catchment Area 201) will be collected and then conveyed by gravity, which will flow south towards the existing maintenance hole structure located on Thompson Road (Ex. SAN MH), which currently services the surrounding adjacent external residential properties. A preliminary review of the proposed sewers indicate that sufficient capacity should be present for the addition of the proposed development and that capacity within the existing sewer main is not anticipated to be an issue. Calculations are provided in Appendix A.

3.2. Internal Sanitary Collection System

It is proposed that the sanitary sewers be constructed in accordance with the Town's Engineering Standards and the MOE guidelines to service the Development. The proposed sewers will consist of PVC SDR 35 pipe with pipe diameters of 200mm and designed to meet minimum (0.6 m/s) and maximum (3.0 m/s) velocities under full flow conditions.

The spacing interval of the manhole structures will be as per MOE and Town guidelines. The minimum manhole diameter will be 1200mm, with larger structures being incorporated as required in accordance with Ontario Provincial Standard Specifications (OPSS).

Adequately sized service connections will be provided to each proposed dwelling/commercial lot as specified by Town Standards. See attached Sanitary Servicing Plan in Appendix C for reference.

4. Water Supply and Distribution

4.1. Existing Water System Analysis

A *Water Systems Analysis* has yet to be completed by Gerrits Engineering Ltd. for the proposed development. We suggest that the Town review the watermain design requirements for this development with respect to the Town's water treatment and supply capacities and confirm that capacity allocation is available for this development.

The projected daily average, maximum day, and peak hourly flows from the subject property are summarized in the table below.

Table 2 – Design Water Flows

Average Daily Demand (Design)	748.4	m^3/d
	8.66	L/s
Maximum Day Demand (Design)	1,496.7	m^3/d
	17.32	L/s
Peak Hour Flow (Design)	3,367.7	m^3/d
	38.98	L/s

4.2. Internal Domestic Water Distribution System

The development will provide water service connections to each of the residential units via a new watermain. The new system will consist of multiple loops throughout the site and connect to the existing external 200mm diameter PVC watermain on Robert Street and 150mm diameter PVC watermain on Thompson Road. Please refer to the SS-1 drawing in Appendix C.

The residential units will have individual 25mm diameter services for each unit. New fire hydrants will be installed throughout the site in accordance with the required maximum spacing of 140m. Watermains will be installed at the minimum 1.8m depth below finished grade. All systems will be constructed and tested in accordance with the Town of Penetanguishene and MOE Guidelines. Refer to the WAT-1 and WAT-2 Plans, attached in Appendix C, for the location and sizing of the watermain connections.

We recommend that the Township review the available capacity in the existing distribution system to ensure there is adequate capacity to service this proposed development. Detailed water distribution system modelling and analysis will be completed in conjunction with the final design of the development to determine the sizing of the watermains and confirm available flows and pressures. A new fire flow test(s) will be completed on the existing distribution system as part of this process.

4.3. Fire Flow Requirement

The Fire and Domestic flow requirements for this development will require a review during the detailed design. Pressure tests will need to be completed on the municipal system as part of the assessment. Existing hydrants are located near the entrance of the residential/commercial development. These hydrants in addition to the numerous hydrants being proposed internally will provide coverage to the entire development and will meet Town and MOE standards.

5. Storm Drainage and Stormwater Management

A key component of the Development is the need to address environmental and related Stormwater Management (SWM) issues. These are examined in a framework aimed at meeting the Town of Penetanguishene and MOE requirements. SWM parameters have evolved from an understanding of the location and sensitivity of the site's natural systems.

It is understood that the objectives of the SWM plan are to:

- Protect life and property from flooding and erosion.
- Maintain water quality for ecological integrity, recreational opportunities etc.
- Protect and maintain groundwater flow regime(s).
- Protect aquatic and fishery communities and habitats.
- Maintain and protect significant natural features.
- Protect and provide diverse recreational opportunities that are in harmony with the environment.

In the pre-development condition, the subject site consists of Unimproved Land, with a small treed area to the northeast. According to the *Soil Survey of Simcoe County, Report No.29 of the Ontario Soil Survey, Ministry of Agriculture and Food*, surface soils are generally characterized as Tioga Sandy Loam, hydrologic soil group type A, having good drainage properties. According to the MECP Source Protection Atlas, the site is located within a Highly Vulnerable Aquifer (HVA). The site's existing grades can be classified between 0 and 5%.

5.1. Hydrology

Post-development flows were developed using the hydrologic computer model Visual OTTHYMO version 2.3.2 to assess the impact of the development. The Time to Peak (T_p) used in the OTTHYMO model is estimated as two thirds (2/3) of the Time of Concentration. The Time of Concentration (T_c) as per the MOE guidelines is calculated using the greater of the Airport Method or the Bransby-Williams Equation and the Upland Method. For subject sites with a runoff coefficient (c) of less than 0.4, the Airport Method should be calculated, otherwise the Bransby-Williams Equation should be applied. The Upland Method for calculating T_c is defined by the following:

$$T_c = L / v$$

Where:

- T_c is the Time of Concentration for the hydrograph (s)
- L is the overland flow distance (m)
- v is the overland flow velocity estimated using the SCS Slope/Velocity relationship.

As the subject catchment areas have runoff coefficients less than 0.40, the Airport method for calculating Time of Concentration should be evaluated. This equation is defined as:

$$T_c = 3.26 \times L^{0.5} \times S_w^{-0.33} \times (1.1 - C)$$

Where:

- T_c is the Time of Concentration for the hydrograph (min)
- L is the watershed length (m)
- C is the watershed area runoff coefficient
- S_w is the watershed slope (%)

5.2. Pre-Development Drainage Conditions

Drainage Areas 101-103 represent the catchment areas in the existing condition. Due to the rural nature of these drainage areas and their total impervious ratios of less than 0.2, the "NASHYD" routine has been used to model these areas. A detailed hydrologic parameter sheet has been included in Appendix B. A summary of the hydrologic parameters utilized in the pre-development analysis is provided in Table 3 and the resultant peak flows leaving the site are summarized in Table 4. Detailed hydrologic model output for the pre-development condition is provided in Appendix B.

Table 3 – Pre-Development NASHYD Hydrologic Model Input

Area (ID)	Area (ha)	CN	Ia (mm)	Tp (hr)
101	12.042	46.8	9.7	1.07
102	9.660	52.5	7.5	0.70
103	9.927	46	10	0.87

Table 4 – Model Results: Pre-Development Condition

Storm Distribution	Area (ha)	Return Period					
		2	5	10	25	50	100
Pre-Development Condition – Gauthier Drive – Catchment Areas 102 and 103							
24Hr SCS Storm	19.59	80	140	190	270	330	400
4Hr Chicago Storm		50	100	140	200	260	320
25mm Chicago Storm		20					
Timmins Event		770					
Pre-Development Condition – Thompson Road – Catchment Area 101							
24Hr SCS Storm	12.04	30	60	80	120	140	170
4Hr Chicago Storm		20	40	60	90	110	140
25mm Chicago Storm		10					
Timmins Event		390					

Note: Release rates provided are in "L/s"

5.3. Post Development Drainage Conditions

Once completed, the proposed development will encompass approximately 31.70 ha and include 281 detached dwellings, 126 townhouse dwellings, a condominium building with 52 units, 12 commercial building and two stormwater management facilities. The purpose of this stormwater management section is to provide the total required water quality and water quantity volumes for the proposed stormwater management (SWM) facilities, located at the southwest and northeast corners of the development adjacent to Thompson Road. Both of the SWM facilities will consist of two individual ponds equipped with a wet cell and forebay, which will provide quality and quantity control for an area of about 31.70 ha. Drainage Area 201 will flow into a SWM Facility located at the northeast corner of the property while Drainage Area 202 will flow into a SWM Facility located at the southwest corner of the property. Internal drainage areas 201 and 202 are "urban" in nature and have been modelled as "STANDHYD" commands.

A number of hydrologic parameters were required as input into Visual Otthymo in order to develop peak design flows and release rates for the proposed development. The area and slope parameters are based on the proposed site configuration. Various parameters were considered such as; Curve Number (CN), initial abstraction (Ia), time-to-peak (Tp), Manning's, total impervious area (TIMP) and directly connected impervious area (XIMP). A summary of the hydrologic parameters utilized in the post-development analysis is provided in Table 5 and the resultant peak flows and runoff rates for the post development condition are summarized in Table 6 below. Detailed output summary is provided in Appendix A.

Table 5 – Post Development Hydrologic Model Input

Area (ID)	Area (ha)	CN	Ia (mm)	Tp (hr)	XIMP (%)	TIMP (%)	DPSI (mm)	SLPP (%)	SLPI (%)	LGI (m)
201	13.08	59	5		72	72	2	5	2.5	295
202	18.62	59	5		52	52	2	5	2.5	352

Table 6 – Model Results: Post-Development Condition (without Attenuation)

Storm Distribution	Area (ha)	Return Period					
		2	5	10	25	50	100
Pre-Development Condition – Gauthier Drive – Catchment Areas 102 and 103							
24Hr SCS Storm	13.08	1980	2670	3140	3730	4170	4630
4Hr Chicago Storm		1970	2640	3100	3680	4120	4570
25mm Chicago Storm		1200					
Timmins Event		1380					
Pre-Development Condition – Thompson Road – Catchment Area 101							
24Hr SCS Storm	18.62	1510	2120	2520	3050	3790	4280
4Hr Chicago Storm		1480	2050	2430	2930	3600	4050
25mm Chicago Storm		890					
Timmins Event		1750					

Note: Release rates provided are in "L/s"

5.4 Quantity Control

The development of the contributing area to the Stormwater Management Facility will increase the stormwater runoff rate above that of the allowable release rate. Therefore, quantity controls have been designed to closely approximate the above determined allowable release rates. The stormwater quantity runoff will be controlled by storage within both of the SWM Facilities. The release rate from the pond will be controlled by pipe outlets, which will be sized during the detailed design phase of this development. The total required quantity control volume is approximately 17,749m³, with 8,475m³ required for the Pond #1 (Catchment Area 201) and 9,274m³ for Pond #2 (Catchment Area 202). Detailed calculations are included in Appendix A.

5.5 Quality Control

The Township of Penetanguishene and MOE Guidelines and Technical Standards require Enhanced Level quality protection. In order to establish the required volume for quality control, the MOE guidelines for Enhanced control (80% long-term total suspended solid removal) was applied. There are several treatment methods identified by the MOE and other agencies which provide the potential to achieve the Enhanced Level of treatment required for the development. Table 4.1 of the "Stormwater Management Planning and Design Manual", prepared by the Ministry of the Environment in March 2003 outlines physical constraints which limit the effectiveness of the water quality treatment potential of these alternatives under specific site conditions. This section provides a brief assessment of the potential of end-of-pipe SWM facilities to achieve the stormwater control objectives for this location and outlines the reasoning for the selection of a wet pond type stormwater treatment facility.

5.5.1 Wet Ponds

Wet ponds are the most commonly used end-of-pipe facility in the province. Given that the proposed site provides an ideal condition to achieve a majority of the preferred criteria, a wet pond configuration was selected as the preferred alternative to achieve the stormwater management control objectives for the Development.

Extended detention sizing rules applying the runoff volume generated from the 25mm storm event have also been examined. The erosion control sizing of 40 m^3/ha results in a required volume of 1,268m^3, which is lesser than the alternative 25mm 4-hour Chicago Storm generated volume of 4,160m^3. Utilizing MOE Manual Table 3.2 (Water Quality Storage Requirements based on Receiving Waters) and a site imperviousness level of 72% (Catchment Area 201) and 52% (Catchment Area 202), the SWM Pond permanent pool volume required is approximately 2,463m^3 (Pond #1) and 2,653m^3 (Pond #2). Therefore, the total required SWM quality control volume is:

	Total:	**Pond #1:**	**Pond #2:**
Quality Control (80% TSS Removal):	5,117m^3	2,463m^3	2,653m^3
25mm 4-hour Chicago Storm Runoff:	4,160m^3	2,222m^3	1,939m^3
Total:	9,277m^3	4,685m^3	4,592m^3

5.6 Proposed Storm System Design

As per the Township of Penetanguishene Engineering Design Criteria, the minor system has been designed to convey runoff resulting from the 5-year design storm. Design calculations for the storm sewer system will be provided at the detailed design stage.

5.6.1 Minor Storm System Outlet

The storm sewer outlets to the sediment forebay(s) of the proposed stormwater management facility. As per the Township of Penetanguishene Design Criteria, the invert of the storm sewer outlet to the pond is at the normal water level.

5.6.2 Major Storm System Outlet

During storm events where runoff rates from the Development area exceed the 5-year design capacity of the storm sewer system, drainage shall be conveyed within the public road allowance and directed to the stormwater management facility.

5.7 Stormwater Quality Control During Construction

To ensure stormwater quality control during construction, it is imperative that effective environmental and sedimentation controls be in place throughout the entire area subject to construction activities. With the requirement of earth grading, there will be a potential of soil erosion. It is therefore recommended that the following be implemented to assist in achieving acceptable stormwater runoff quality:

- Restoration of exposed surfaces with vegetation and non-vegetative material as soon as construction schedules permit;
- Installation of temporary sediment ponds, filter strips, silt fences and rock check dams or other similar facilities throughout the site, and specifically during all construction activities;
- Reduce stormwater drainage velocities where possible;
- Ensure that disturbed areas that are left inactive for more than 30 days shall be vegetated and stabilized as instructed by the Engineer;
- Minimize the amount of existing vegetation removed.

5.8 Erosion and Sediment Control

To ensure Stormwater runoff quality is controlled during construction, an erosion and sediment control strategy will be implemented to mitigate transportation of silt off-site to the existing roads and sewers. It is imperative that effective controls be put in place and maintained until all areas are stabilized with surface cover. All erosion and sediment control BMPs shall be designed, constructed and maintained in accordance with the Township of Penetanguishene's erosion control requirements.

Items that will be addressed for both temporary and permanent erosion and sediment controls are based on the following:

- Site location description and area;
- Existing and proposed land use;
- Vegetative cover;
- Existing drainage routes;
- Proposed site works;
- Proposed outlets;
- Permits required;
- Sediment filters and barriers - silt fences;
- Construction entrance location;
- Protection to catch basins and ditch inlets;

To prevent construction generated sediments from entering the storm sewers or leaving the site by overland flow, the following measures should be implemented during the construction phase:

- Temporary sediment control fencing should be erected around the perimeter of the grading activities.
- Temporary sediment fabric and stone filters should be installed on existing and proposed catch basins until surface cover and vegetation has been stabilized.
- A temporary construction access mud mat should be implemented to reduce the amount of materials that may be transported off site.
- Construction during drier months should be monitored for wind-borne transport of sediments. At the direction of the engineer, the contractor may be directed to water down exposed earth areas with an aqueous solution of calcium chloride.
- All disturbed areas not under immediate construction for 30 days, or not intended for building activities within a 3-month time period, should be stabilized with seeding.
- Built up sediment should be removed and disposed off-site at least once a month, or more frequently as directed by the engineer.

6 Grading

All lot grading for the site will be designed in conformance to the Township's Engineering Standards. Lots will be graded to promote infiltration by reducing internal lot grading and sloping. This BMP in turn will help reduce run-off volumes and aids in fulfilling water balance initiatives.

7 Secondary Utilities

It is anticipated that the design of the electrical distribution and streetlight design will be completed at the detailed design stage to the satisfaction of the appropriate regulatory agencies. Design of the gas, cable and telephone utilities is not included in the municipal engineering services and will be completed by the respective utility companies at the detailed design stage.

8 Conclusions

A summary of the servicing recommendations is as follows:

- **Water Servicing** – a new municipal water system is proposed to be constructed within the proposed development Lands. The subject property is proposed to tie into the existing system located along Thompson Road and Robert Street East and loop throughout the proposed development. A review of the Municipal Water Infrastructure via hydrant flow test(s) is required during the detailed design phase to confirm that the existing capacity of the system is sufficient to service the proposed development.
- **Sanitary Servicing** – The subject property's internal collection system will flow by gravity and tie into the existing system located along Thompson Road and Robert Street East. A review of the Municipal Sanitary Infrastructure is required during the detailed design phase to confirm that the existing capacity of the system is sufficient to service the proposed development.
- **Stormwater Drainage and Management** – The proposed storm sewer system will discharge to the proposed stormwater management facilities located in the "SWM" blocks. The SWM facilities have been preliminarily sized to provide enhanced protection in the wet cells and be of sufficient size to allow for the storage of 1:100 year and Regional design storm events. A review of the preliminary stormwater management pond modeling indicates that the proposed development meets design standards and that sufficient volumes are present. The detailed information will be confirmed at the design phase with a stormwater management report being provided.

The preliminary analysis and conceptual design outlined in this report demonstrates that the servicing of this proposed Development is feasible and, if based on sound engineering principles, the development will become a cohesive part of the Community of the Township of Penetanguishene.

All of which is respectfully submitted,
Gerrits Engineering Ltd.

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Appendix A

Design Calculations

Appendix B

OTTHYMO

Appendix C

OGS Unit Sizing

Appendix D

Geotechnical Report