



152-156 MILLER DRIVE RESIDENTIAL SUBDIVISION

City of Barrie, County of Simcoe

Preliminary Functional Servicing and Stormwater Management Report

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Rev.1 August 15, 2019

Project No.: 19003

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1 Introduction

The Hewgill Group Ltd. has been retained by Mer-Tech Inc. in association with City Park Inc. to prepare a preliminary Functional Servicing and Stormwater Management Report in support of a 43 lot (1.44 ha) residential subdivision development located at 152-156 Miller Drive in the City of Barrie.

This report will comment on the existing municipal services available in the immediate area of the development as well as the proposed site servicing required to adequately service the proposed residential development. Services will include, potable water supply, sanitary sewage disposal, stormwater management, hydro-electric power distribution, natural gas distribution and telephone, television/fiber optic utilities.

1.1 Report Objectives

The objective of this report is to adequately demonstrate that the 43 single-family residential homes can be constructed with respect to providing site servicing, stormwater management and secondary site servicing to the development. These services will include:

- water distribution and lot servicing;
- sanitary sewer servicing;
- preliminary stormwater management strategies;
- transportation requirements; and
- secondary servicing – Hydroelectric, telephone/cable, natural gas and mail delivery.

1.2 Standards and Guidelines

This report has been prepared recognizing following Government Guidelines, Provincial/Municipal and Conservation Authority publications:

- Water Transmission and Distribution Policies and Design Guidelines, City of Barrie (December 2017);
- Design Guidelines for Drinking Water Systems, Ministry of the Environment (March 2008);
- Sanitary Sewage Collection System Policies and Design Guideline, City of Barrie (October 2017);
- Design Guideline for Sewage Works, Ministry of the Environment (2008);
- Stormwater Management Planning and Design Manual, Ministry of Environment (2003);
- Stormwater Drainage & Stormwater Management Policies & Design Guidelines, City of Barrie (December 2017); and
- NVCA Stormwater Technical Guide, Nottawasaga Valley Conservation Authority (December 2013)

1.3 Site Description

The subject site is 1.44 ha (3.56 ac) located on the westside of Miller Drive, between Edgehill Drive and Ruffet Drive in the City of Barrie. More specifically, the site Municipal Address is 152 & 156 Miller Drive.

The site is legally described as Part Lot 23, Concession 8 - City of Barrie in the County of Simcoe. We have enclosed Figure 1 – Site Location Plan in overleaf for reference.

Figure 1 – Site Location Plan

1.4 Existing Land Use

The existing site consists of a single-family residential dwelling with a detached garage with a mix of deciduous and coniferous trees on the western portion of the site.

Based on the boundary and topographic survey prepared by Dino Astri Surveying Ltd. dated February 7, 2018, the site gradually slopes from east to west at an approximate slope of 2%-4%.

1.5 Site Soil and Geotechnical Information

A geotechnical investigation has been completed by Cambium Inc. The soil stratification on-site is categorized as follows:

- organic material (topsoil) between 150 mm to 450 mm depth;
- native fill soil consisting of reworked native and sand soil 1.7 m to 2.1 m below ground surface; and
- no bedrock was encountered, all boreholes were terminated in native material.

Further review of the on-site soils and comparing it to the Ontario Soil Survey Report No. 29 - Soil Survey of Simcoe County prepared by the Canadian Department of Agriculture and the Ontario Department of Agriculture, the site primarily consists of Tioga Sand Loam.

Tioga Sandy Loam generally is grey calcareous outwash sand and is considered to have good drainage. Aggregate size may be stone free to moderately stony. The hydrological soil classification is A.

2 Water Supply and Distribution

The water supply will be provided by the City of Barrie. Based on drawings provided by the City, there is an existing 150 mm dia. PVC watermain installed on the southwest side of Miller Drive.

The 150 mm dia. PVC watermain will be extended into the site to service the lots and will be commissioned upon successful testing procedures in accordance with City of Barrie Standards.

The proposed watermain has been sized to accommodate fire flow requirements of 76 L/s or 1,000 imp.gal/min in accordance with the Watermain Transmission and Distribution Policies and Design Guidelines Section 4.3.1.

The anticipated water demand calculations are summarized below:

▪ Design Population	135 people
▪ Average Daily Demand	36.45 m ³ /day (0.42 L/s)
▪ Maximum Daily Demand	295.97 m ³ /day (3.43 L/s)
▪ Peak Hour Demand	18.57 m ³ /hour (5.16 L/s)
▪ Maximum Daily incl. Fire Flow	79.43 L/s

We have enclosed preliminary design calculations and Figure 2 – Watermain Layout Plan in Appendix A for reference.

We recommend that the City review the available capacity in the existing distribution system to ensure there is adequate capacity to service this proposed development.

A flow test should be completed on the existing distribution system to ensure adequate flow is available to service the proposed development.

Please note, Lots 1 to Lot 4 that front onto Miller Drive may be serviced from the existing watermain located on Miller Drive and may affect the above demand calculations. Revised water demand calculations will be completed during final design.

Three hydrants and one 50 mm dia. Blow off have been located on the site for fire protection and main flushing purposes. The 50 mm dia. blow off is located on property line at the rear of Lot 17.

3 Sanitary Sewage Collection

The preliminary sanitary sewer system for the proposed development will transport residential human waste and grey water from each unit by gravity to the existing City sewer system approximately 200 m southeast of the site at the intersection of Miller Drive and Ruffet Drive.

To allow the site to be adequately serviced, it is proposed a new 250 mm dia. sewer be installed from existing SAN MH15153 to the proposed site entrance.

3.1 Existing Infrastructure and Capacity

Design information provided by the City including the RG Robinson Tributary Areas of Sanitary Sewer Design (G-7) indicates the proposed development is contained within a sanitary catchment area (A9) allotting a capacity equivalent to 82 residential units. The capacity of proposed development has previously been accounted for within the design capacity of the existing downstream sanitary infrastructure. Further analysis may be completed during detailed design.

3.2 Proposed Infrastructure and Capacity

To allow the site to be adequately serviced, approximated 200 m of 250 mm dia. PVC gravity sewer be installed from existing SAN MH15153 at Ruffett Drive to the proposed site entrance.

A copy of the City's sanitary sewer design sheets will need to be obtained to ensure the confirm the design and installation of the new 250 mm dia. sewer main is in accordance with the City's expectations.

The sewage capacity generated from the site has been calculated based on the City of Barrie Sanitary Sewage Collection System Policies and Design Guideline. Including the follow design criteria:

- Average Daily Flow 225 L/ppl/day;
- Population Density 3.13 ppl/unit;
- Extraneous Flow (Infiltration) 0.10 L/s/Ha; and
- Harmon Peaking Factor ≥ 4.0

Based on the MOECC Guidelines, a minimum of 0.6 m/s full flow velocity is required to adequately flush the system. The proposed system meets and/or exceeds this requirement.

The MOECC Guidelines Section 5.7.6 states:

“In cases where the flow depth in the sewer, under peak flow, will not be 0.3 of the pipe diameter or greater, the actual flow velocity at peak should be calculated using a hydraulic elements chart and the slope increased to achieve adequate flushing velocities.”

A quick analysis for the proposed system has indicated the pipe slopes at the top of the system would need to exceed 3.5% to achieve a peak velocity of 0.6 m/s or greater. A detailed analysis will be completed during final design to confirm pipe slope, required flushing velocities and depth requirements.

Based on the above noted design criteria the proposed sewer will have a Total Peak Flow of 1.579 L/s and a Full Flow Velocity of 1.044 m/s.

The proposed gravity sewer system on site will be comprised of the following:

- 220 m of 200 mm dia. PVC sewer pipe at 0.5% to 1.0 %;
- 4 – 1200 mm dia. concrete maintenance holes complete with internal drop structures where required;

We have enclosed a copy of the following in Appendix B for reference:

- preliminary sanitary sewer design sheet; and
- Figure 3 – Sanitary Sewer Catchment Area Plan;

4 Stormwater Management Plan

To establish a preliminary Stormwater Management Plan for the proposed development, background information has been obtained and reviewed to provide a better understanding the existing stormwater infrastructure in the area, the existing site characteristics and constraints governing the development of the property.

A preliminary stormwater management plan has been established recognizing the criteria established in the following guidelines:

- Stormwater Management Planning and Design Manual, Ministry of Environment (2003);
- Stormwater Drainage & Stormwater Management Policies & Design Guidelines, City of Barrie (December 2017); and
- NVCA Stormwater Technical Guide, Nottawasaga Valley Conservation Authority (December 2013)

4.1 Design Criteria

The preliminary SWM Plan has been developed based on the following:

- the SWM Plan must maintain the stormwater pre-development peak runoff flow rates by controlling the post-development peak runoff flow rates for the 2-year through 100-year design storms;
- provide Level 1 'Enhanced' water quality treatment to Provincial Standards including 80% total suspended solid (TSS) removal and 90% of the Volume treated during the water quality design storm;
- provide opportunities for infiltration and low-impact (LID) enhancements where possible; and
- minimize on-site erosion and sedimentation into the downstream wetland to minimize the future potential negative environmental impacts.

4.2 Pre-development Hydrological Analysis

4.2.1 Historical and Existing Land Use

The existing development is partially contained within the NVCA Regulated area and backs on to a wetland and natural gas transmission corridor. Features of the site include a residential dwelling, garage and several small out buildings.

It is understood that the historical use for the property was agricultural in nature, however, it was developed into two residential lots after the agricultural use. The northwest portion of the site is low-lying and contains a portion of the adjacent wetland.

4.2.2 Pre-development Stormwater Condition

The preliminary pre-development scenario has been modelled using Visual OTTHYMO 5 to determine the pre-development peak runoff flow rates for the 2-Year through 100-Year Design Storms. The Barrie WCPP rainfall data used to model both the 4-Hr Chicago and the 24-Hr SCS Type II storm hydrographs.

We have enclosed Figure 4 – Pre-Development Storm Catchment Area Plan in Appendix C for reference.

4.2.3 Modelling Parameters and Outflow

Currently, the runoff from the site drains uncontrolled in the NVCA regulated wetland southwest of the development site. We have used the following parameters to determine the peak runoff flow rate under pre-development conditions:

- Soil Type: 90% Alliston (Ans) & 10% Muck (M);
- Site Slope = 2-6%;
- Composite CN Number (CN) = 48.46
- Initial Abstraction (IA) = 7.02 mm
- Time of Concentration (Tc) = 16.96 minutes
- Time to Peak (Tp) (Airport Method) = 0.19 hours

The pre-development peak runoff flow rates calculated for the site are noted in Table 1 below.

Table 1: Pre-Development Peak Runoff Flow Rate (m³/s)

Design Storm	Catchment 100	
	4-Hour Chicago	24-Hr SCS Type II
2-Year	0.011	0.026
5-Year	0.023	0.053
10-Year	0.033	0.075
25-Year	0.048	0.106
50-Year	0.060	0.133
100-Year	0.073	0.155

4.3 Post-Development Hydrological Analysis

4.3.1 Proposed Development and Future Land Use

The current proposal is to develop the land into 43 lots each containing a single-family residential unit complete with internal roads, sidewalks and centralized garbage and postal services.

The proposed houses will have a partial inground basement with a two-story main floor and living space complete with a two-car garage.

4.3.2 Post-development Stormwater Management

Preliminary site grading suggests that three post-development catchments will be created. Catchment 200 will contain the majority of the development (1.18 ha), while Catchment 201 & 202 will contain only the grassed area of the rear yards and of the SWM facility.

The preliminary post-development scenario has been modelled using Visual OTTHYMO 5 to determine the post-development peak runoff flow rates for the 2-Year through 100-Year Design Storms. The Barrie WCPP rainfall data used to model both the 4-Hr Chicago and the 24-Hr SCS Type II storm hydrographs.

We have enclosed Figure 5 – Post-Development Storm Catchment Area Plan in Appendix C for reference.

4.3.3 Modelling Parameters and Outflow

The post-development modelling scenario has been split into three separate catchments as noted previously. The runoff from Catchment 200 will be captured by on-site storm sewer networks and directed to an underground storage facility located in the northwest section of the site. We have enclosed a copy of the preliminary storm sewer sizing in Appendix C for reference.

Catchment 201 & 202 contains the SWM facility area and the rear yards. This catchment will flow uncontrolled into the downstream property and wetland as it currently does.

We have used the following parameters to determine the peak runoff flow rate under Post-development conditions:

Catchment 200:

- Total Impervious (TIMP) = 42.0 %
- Total Impervious Directly Connected (XIMP) = 42.0 %
- Slope (SLPP) = 2.0 %
- Pervious Flow Length (LGP) = 32 m
- Slope (SLPI) = 2.0 %
- Impervious Flow Length (LGI) = 3.25 m

Catchment 201:

- Native & Imported Fill Material
- Site Slope = 2.0 %
- Composite CN Number (CN) = 49.0
- Initial Abstraction (IA) = 5.0 mm
- Time of Concentration (Tc) = 10.04 minutes
- Time to Peak (Tp) (Airport Method) = 0.11 hours

Catchment 202:

- Native & Imported Fill Material
- Site Slope = 2.0 %
- Composite CN Number (CN) = 49.0
- Initial Abstraction (IA) = 5.0 mm
- Time of Concentration (Tc) = 10.04 minutes
- Time to Peak (Tp) (Airport Method) = 0.11 hours

Table 2 below summarizes the post-development modelling results:

Table 2: Post-Development Peak Runoff Flow Rate (m³/s)

Design Storm	Catchment 200		Catchment 201		Catchment 202		Total (ADD600)
	CHI	SCS	CHI	SCS	CHI	SCS	
2-Year	0.115	0.099	0.002	0.005	0.001	0.003	0.011(0.011)
5-Year	0.153	0.152	0.004	0.009	0.002	0.005	0.023(0.023)
10-Year	0.181	0.189	0.006	0.013	0.003	0.007	0.030(0.033)
25-Year	0.215	0.248	0.008	0.018	0.004	0.010	0.039(0.048)
50-Year	0.241	0.289	0.010	0.022	0.005	0.012	0.046(0.060)
100-Year	0.279	0.322	0.012	0.026	0.006	0.014	0.053(0.073)

(0.013) – Pre-Development Peak Runoff Flow Rate, m³/s

We have enclosed both the Pre-development and Post-development OTTHYMO summary results in Appendix C for reference.

4.3.4 Conceptual Post-Development Stormwater Storage

For the purposes of modelling the pre-to-post peak runoff flow rate matching, a general Brentwood ST-36 stage-storage chart and a 75 mm diameter orifice has been modelled to determine the required storage volume. It is estimated that approximately 600 cubic metres of storage will be required to adequately address the pre-to-post matching criteria while capturing the 100-Year storm underground.

Detailed Stage-Storage-Discharge calculations and system sizing will be completed for the Brentwood underground storage system once the geotechnical investigation has been completed and during final design when the final site layout is complete.

We have enclosed the Brentwood Design Guide information in Appendix D for reference.

4.4 Water Quality Control

Water quality control objectives are to provide Level 1 'Enhanced' water quality treatment to Provincial Standards including 80% total suspended solid (TSS) removal and 90% of the Volume treated during the water quality design storm.

Preliminary calculations indicated this can be achieved utilizing a Stormceptor STC 750 upstream of the underground storage.

The Brentwood underground storage system has the option adding a 'separator' row into the design of the system. This row acts to remove any additional particles, sediment and oil from entering into the remainder of the system. This additional row may be added during final design.

We have enclosed the preliminary Stormceptor calculation summary in Appendix D for reference.

4.5 Sediment and Erosion Control Measures

Sediment and erosion control measures will be implemented, constructed and maintained during all construction activities including:

- all clearing and grubbing;
- before topsoil stripping and stockpiling;
- material grading and cut/fill activities; and
- service installation and road construction

These control measures shall be maintained during all activities and until the site is stabilized to prevent deleterious materials and debris from entering the downstream wetlands and the natural drainage system.

Typical sedimentation and erosions control devices that may be considered are:

- heavy-duty silt fence erected around the perimeter of the site prior to the start of construction;
- a construction vehicle entrance (stone mud mat) shall be constructed and maintained throughout for the duration of the project; and
- a combination of rock check, straw bale check flow and/or coir silt dams may be considered and installed to prevent the transportation of sediment throughout the site.

4.6 Low Impact Development (LID)

Low Impact Development (LID) practices are key in any development when trying to mimic the natural processes of a site such as infiltration, evapotranspiration and use of stormwater management techniques to protect water quality, the local drainage system and aquatic habitat.

LID techniques that may be considered for this site are:

- lot level controls – roof leaders directed to surface splash pads, overland flow via rear or side yard grass swale;
- infiltration basins, enhanced swale or bio-swales; and
- use of the Brentwood underground for end-of-pipe infiltration

The type of LID techniques for the site will rely heavily on the existing and native soil. Each technique will be reviewed upon completion of the geotechnical study and during final design.

LID techniques in accordance with Low Impact Development Interim Guidance Document, City of Barrie (December 2017) will be reviewed and implemented as deemed suitable for the project site during final design.

5 Transportation

A traffic brief has been completed previously for this site by JD Northcott Engineering Inc. on April 20th, 2018. This report was completed for a higher density development consisting of 71 townhouse units and 4 semi-detached units on the same lands.

The conclusions of the JD Northcott report indicate that providing a single full-movement access to the proposed development will not impact traffic on Miller Drive.

The current development consists of 43 single-family residential units which is anticipated to have a lower population (approximately 135 people). Based on the lower density, it can possibly be inferred that the report prepared by JD Northcott Engineering would still apply to the current development.

It shall be noted however; the developer must discuss all changes to the proposed site plan with JD Northcott and confirm the original findings. It may be the case that a revised report is warranted.

6 Secondary Utility Installations

The following is a complete summary of the existing public utilities available in the immediate area of the development site.

6.1 Hydro-electric Power Supply

Alectra Utilities is the electricity provider/supplier within the City of Barrie. They have confirmed the proposed development can be serviced from the existing pole line on Miller Drive. They note however there may be some work involved on these poles to provide space to connect the proposed development.

As this development will be a private site, they will require a blanket easement over the development lands.

Alectra has requested 4 to 5 transformer locations within the site. The transformers including their grounding grids will each require an area of 3m x 3.5m as well, a clearance zone around the transformers of 2m on each side and 3m on the door side for access.

We have enclosed confirmation correspondence in Appendix E for reference.

6.2 Natural Gas Distribution

Natural gas distribution in the City of Barrie limits is provided by Enbridge Gas Distribution Inc. They have confirmed the presence of a 6-inch Nominal pipe size (NPS) PE distribution main installed on Miller Drive.

We have enclosed the general installation plan provided by Enbridge in Appendix E for reference.

6.3 Telephone, Cable and Fiber Optic

Bell Canada and Rogers Communications have been contacted relating to existing utilities in the area.

Bell Canada has confirmed via telephone that they have fibre optic capacity on Miller Drive.

Rogers Communications has yet to respond to our request at the time of this report.

Further consultation with both companies will be completed during the final design stage.

6.4 Canada Post Mail Delivery

Canada Post requires all new developments to comply with the Canada Post Delivery and Planning Standards Manual for Builders and Developers (August 2016).

Canada Post has been consulted with and has provided confirmation that postal service is available to the development. Further, recommendations on delivery type, location and number of delivery boxes required has been provided. These recommendations include:

- one, three pedestal central delivery location;
- the pedestals must be sidewalk facing;
- preliminary location indicated is adjacent Lot #38.

We have enclosed the Canada Post comments in Appendix E for reference.

7 Conclusions and Recommendations

This Preliminary Functional Servicing and Stormwater Management Report demonstrates the proposed 43-unit residential development (1.44 ha) will meet the criteria established with respect to municipal servicing, stormwater management, transportation and secondary servicing. It has been demonstrated the proposed development can proceed without negatively impacting the existing infrastructure, natural features and the downstream drainage system.

Water quantity control can be achieved to meet the established criteria utilizing on-site storm sewer conveyance systems and underground storage.

Water quality control in the form of 80% total suspended solid (TSS) removal and 90% volume treatment can be achieved utilizing an oil-grit separator in accordance with the MOECC Guidelines.

Sediment and erosion control measures will be implemented before, during and after construction to ensure there are no negative impacts to the adjacent wetland and downstream drainage system.

Low impact development techniques will be implemented to enhance the site in accordance with the relevant guidelines within the City of Barrie.

In conclusion, this preliminary Functional Servicing and Stormwater Management Report supports the development of the subject property from an environmental perspective and will mitigate the potential negative downstream impacts in respect to stormwater management and sediment/erosion control practices.

DRAFT

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APPENDIX A: WATER DISTRIBUTION

APPENDIX B: SANITARY SEWAGE COLLECTION

APPENDIX C: STORMWATER MANAGEMENT

APPENDIX D: STORMWATER QUANTITY/QUALITY

APPENDIX E: SECONDARY UTILITY INFORMATION