Wilmot Woods Subdivision

Functional Servicing Report

Project Location:
New Hamburg

Prepared for:
Wilmot Woods Developments Inc.
310 Fairway Road South
Kitchener, ON N2C 2R6

Prepared by:
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

April 2022

MTE File No.: 35056-104

Engineers, Scientists, Surveyors.

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1.0 Introduction

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Wilmot Woods Developments Inc. to complete a Functional Servicing Report (FSR) in support of a Plan of Subdivision application for a proposed residential subdivision in the Township of Wilmot (Township).

The Wilmot Woods subdivision lands, herein referred to as the 'subject lands', are located in the Town of New Hamburg. The lands are generally bounded by Waterloo Street to the north, agricultural lands to the east, the Canadian National (CN) railway corridor to the south, and the Forest Glen residential subdivision to the west. Refer to the Location Plan in **Figure 1.1**.

The subject lands comprise a total area of approximately 37.19ha. Development plans include the construction of street-oriented residential units, multiple residential blocks, park block, open space block and stormwater management facilities with the required roads and municipal services (storm, sanitary, and water). Portions of the lands are undevelopable, as they are within the floodplain limits of the Ivan Gingerich Municipal Drain (IGMD). A Draft Plan of Subdivision (dated January 25, 2022) for the proposed development has been prepared by MHBC Planning and forms the basis for this report. The Draft Plan has been included in **Appendix A**. The plan of subdivision was designed in an iterative fashion and with input from MTE. The design approach ensured that the land use planning and design of the subdivision were coordinated with infrastructure required by the proposed plan of subdivision. Early input identified the servicing outlets and a servicing corridor, the delineation of drainage divides and the preliminary location and sizing of two stormwater management facilities. The servicing design evolved together with the plan of subdivision leading to a preferred subdivision concept and servicing strategy.

The purpose of this FSR is to prepare a servicing strategy for the proposed subdivision which outlines how the subdivision can be developed on full municipal services, including sanitary sewage collection, domestic water, storm drainage, and utilities. This report should be read in conjunction with the Wilmot Woods Subdivision – *Preliminary Stormwater Management Report* (April 2022) and Wilmot Woods Subdivision – *Hydrogeological Assessment Report* (April 2022) prepared by MTE.

1.2 Background Information

1.2.1 List of Background Studies

- *Wastewater Treatment Master Plan Study,* 2007, Region of Waterloo (Region)
- *Baden and New Hamburg Water and Wastewater Master Plan Update,* 2011
- *Enhanced Master Drainage Plan* (EMDP), 2012 - MTE Consultants (Surface Water)
- *Wastewater Servicing Study for New Growth Areas – Baden and New Hamburg* (WSS), 2014, Conestoga Rovers & Associates
- *Baden/New Hamburg Wastewater Servicing Strategy, 2019,* MTE Consultants
- *Baden/New Hamburg Water & Wastewater Servicing Review, 2021/2022,* Stantec*. (B/NH-W/WW-SR)*
- *Morningside Trunk Sanitary Sewer Class EA, 2021/2022,* GM Blue Plan (MT-SS-EA)

The preliminary design strategies for sanitary servicing, stormwater management and water distribution have been developed to be in accordance with the recommended within the WSS, MTE's wastewater servicing technical memorandum, EMDP and MTE's preliminary design submissions for the WEL; all of which are described within this FSR.

1.2.2 Baden - New Hamburg Wastewater Servicing Strategy

The WSS (2014) documented the Township's approved preferred sanitary servicing strategy as Alternative D. The WSS also identifies downstream constraints within the existing sanitary sewer system and recommends proposed upgrades which would alleviate downstream capacity constraints. Alternative D requires the construction of a sanitary sewer crossing of the CN railway which would drain to new gravity sanitary sewers within the Wilmot Employment Lands (WEL) which would outlet to the Morningside sanitary sewer on the south side of Highway 7/8. The Morningside sanitary sewer was identified by the WSS to be upsized from a 450mm to a 525mm (or larger) to accommodate flows from growth and development. Flows from the Morningside trunk sewer ultimately drain to the Morningside Wastewater Pump Station (MWWPS) and then pumped via a forcemain to New Hamburg Wastewater Treatment Plant(NHWWTP).

Subsequent to the work completed for the WSS, MTE has prepared a technical memorandum entitled *Baden – New Hamburg Wastewater Servicing Strategy*, dated November 22, 2019. This technical memo document discusses changes to the servicing strategy from the preferred Alternative D within the WSS; for the wastewater servicing Baden and New Hamburg, which resulted from consultation with the Township and Region. The changes include redirecting sanitary areas (flows) from future growth areas between three sanitary outlets being; the Forest Glen Wastewater Pumping Station (FGWWPS), the Baden Wastewater Pumping Station (BWWPS), and future sanitary trunk sewers through the WEL.

The WEL are located directly south of the subject lands; between the CN railway and Highway 7/8. MTE completed and submitted an FSR and Preliminary Stormwater Management (SWM) Report in support of Two Draft Plan of Subdivision applications for the WEL, dated November 22, 2019. The Draft Plans were approved on March 17, 2021.

Through discussions and correspondence with the Township, the final overall sanitary servicing strategy is generally agreed to yet under review and subject to further studies being the B/NH-W/WW-SR and the MT-SS-EA. These studies are schedule to be completed in Spring/Summer of 2022 and will further clarify the methodology and schedule for freeing up capacity in the Morningside trunk sewer. The B/NH-W/WW-SR presents alternatives whereby the Morningside Trunk sewer is either upgrade to a 600mm or flows from the Baden bypassing the Morningside trunk sewer and the forcemain from the Baden WWPS which currently flow to the trunk is diverted to the NHWWTP.

The overall sanitary servicing strategy (**Appendix D)** as outlined in MTE technical memo will form the basis for sanitary flows directed toward the New Hamburg WWTP.

1.2.3 Enhanced Master Drainage Plan (EMDP)

In addition to the background sanitary studies described above, an *Enhanced Master Drainage Plan* (EMDP) was undertaken for the WEL by the Township. The EMDP was completed in May 2012 and approved by the Township, the Region, the Grand River Conservation Authority (GRCA), and the Ministry of Transportation of Ontario (MTO). Prior to the EMDP, a holding provision on the zoning was implemented by the Township and the GRCA due to floodplain constraints within the WEL. The purpose of the EMDP was to release a "Holding Provision" and prepare a comprehensive SWM strategy for the contributing upstream subwatershed.

As part of the final design considerations presented in MTE's 2019 WEL reports, storm servicing outlets were proposed for the subject lands through the WEL property. Furthermore, a communal quantity and quality control SWM facility adjacent to Highway 7/8 is proposed to provide quality control for a portion of the subject lands draining towards the south.

1.2.4 Previous Water Servicing Studies

As part of many servicing studies undertaken for the Baden and New Hamburg areas, watermain and water distribution improvements have been studied to develop an understanding of existing operating conditions between the two pressure zones and forecast necessary upgrades to accommodate growing interest and development plans in these communities.

A transmission watermain project was first identified in the 2011 *Baden and New Hamburg Water and Wastewater Master Plan Update* and further defined in the 2011 *Baden Tank Optimization Study*. The Region has initiated the final design in 2021 with construction work of a 450mm diameter transmission watermain to occur in 2022 to supply additional water from the New Hamburg Water Treatment Plant to the Baden elevated tower and water distribution network.

Water servicing redundancy will help the overall pressure and flow availability throughout the two pressure zones, especially during emergency situations. The proposed water distribution plan herein discussed will involve connections to the existing New Hamburg distribution network and pressure zone.

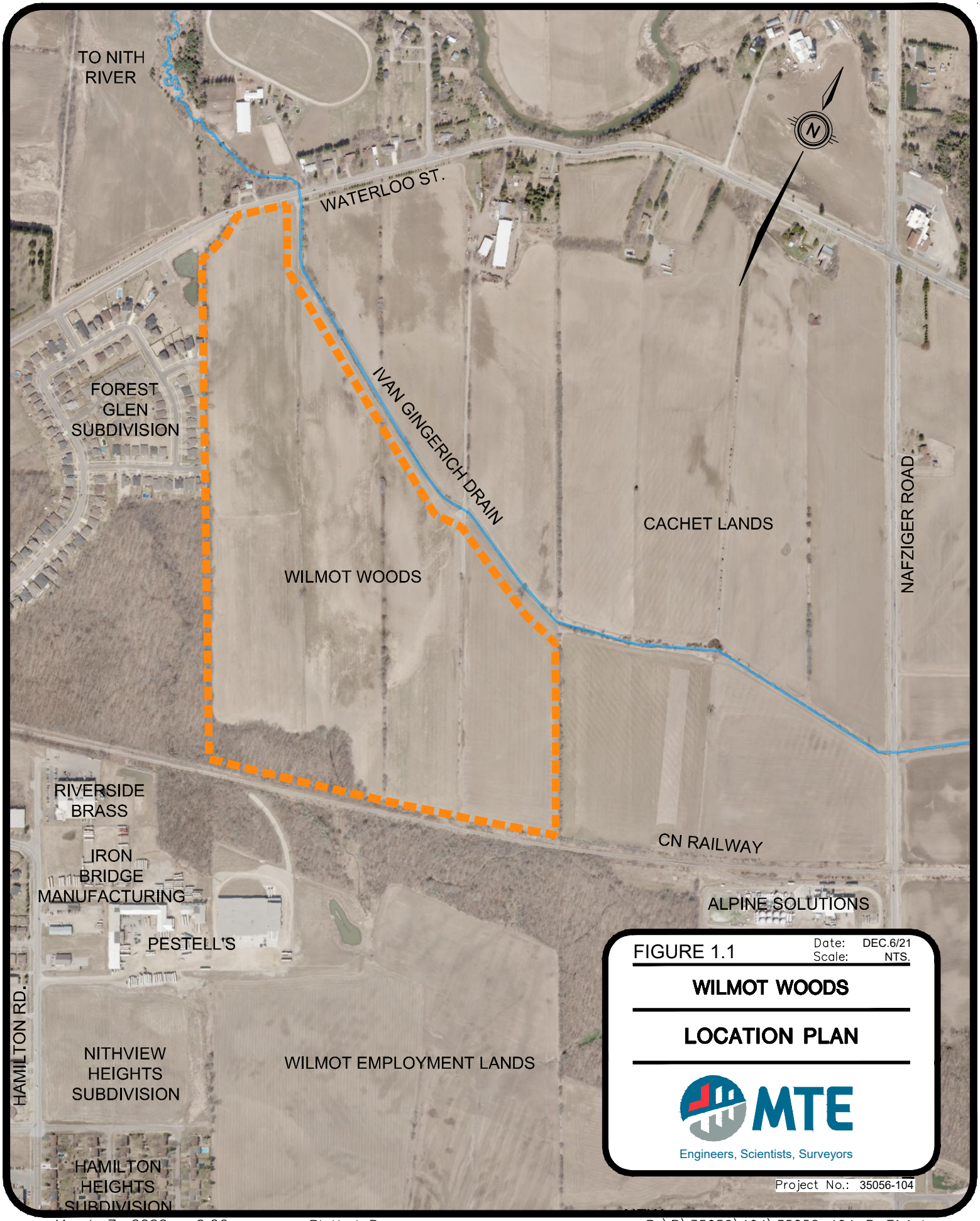


FIGURE 1.1

Date: DEC.6/21
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WILMOT WOODS

LOCATION PLAN

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March 7, 2022 — 9:26 a.m. — Plotted By: acressman

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2.0 Existing Conditions

2.1 Topographical Information

As previously discussed, the subject lands consist of approximately 37.19ha, of which portions of the lands are undevelopable within the IGMD floodplain. The subject lands are generally bounded by Waterloo Street to the north, agricultural lands to the east, the CN railway corridor to the south, and the Forest Glen residential subdivision to the west. The subject lands are currently under an interim agricultural use.

MTE conducted a detailed topographical survey of the subject lands in 2010. Existing topographic conditions for the subject lands are illustrated in **MTE Drawing 35056-104-EC1.1.** Under existing conditions, the subject lands are moderately sloped throughout the majority of the site (generally between 1.0% and 6.0%). Existing elevations range between 339.5m near the IGMD floodplain in the north, 340.0m near the wetland feature in the south, and 347.50m in the southeastern corner of the lands.

2.2 Pre-Development Conditions

The southern portion of the subject lands primarily drains to an adjacent woodlot and wetland feature along the CN railway, as illustrated in **MTE Drawing 35056-104-EC1.1**. This wetland feature has a positively draining surface outlet through the existing 900mm diameter culvert under the CN railway, and flows south through the remainder of the wetland towards the WEL. Based on monitoring data and a hydrogeological study completed as part of the preliminary design of the WEL, it is understood that this wetland is maintained from surface water inputs along the CN railway corridor and from the agricultural tile drain system throughout the subject lands. Stormwater runoff flowing south from the subject lands eventually reaches the western culvert beneath Highway 7/8, south of the WEL, and confluences with the Nith River approximately 1.0km further south.

The northern portion of the subject lands drains towards the IGMD. The IGMD flows northward, through a culvert beneath Waterloo Street, eventually reaching the Nith River approximately 700m away.

2.3 GRCA Mapping

As illustrated in **Figure 2.1,** a portion of the subject lands to the north is within a significant groundwater recharge area (SGRA) as defined by the Source Water Protection Plan Mapping. The SGRA limits within the subject lands has been modified slightly to reflect the geotechnical investigation. The SGRA limit corresponds with a surficial sand layer at the north portion of the subject lands. The SGRA has a vulnerability score of 2.0 generally representing a low score of surface groundwater interaction and base flow to IGMD and the Nith River.

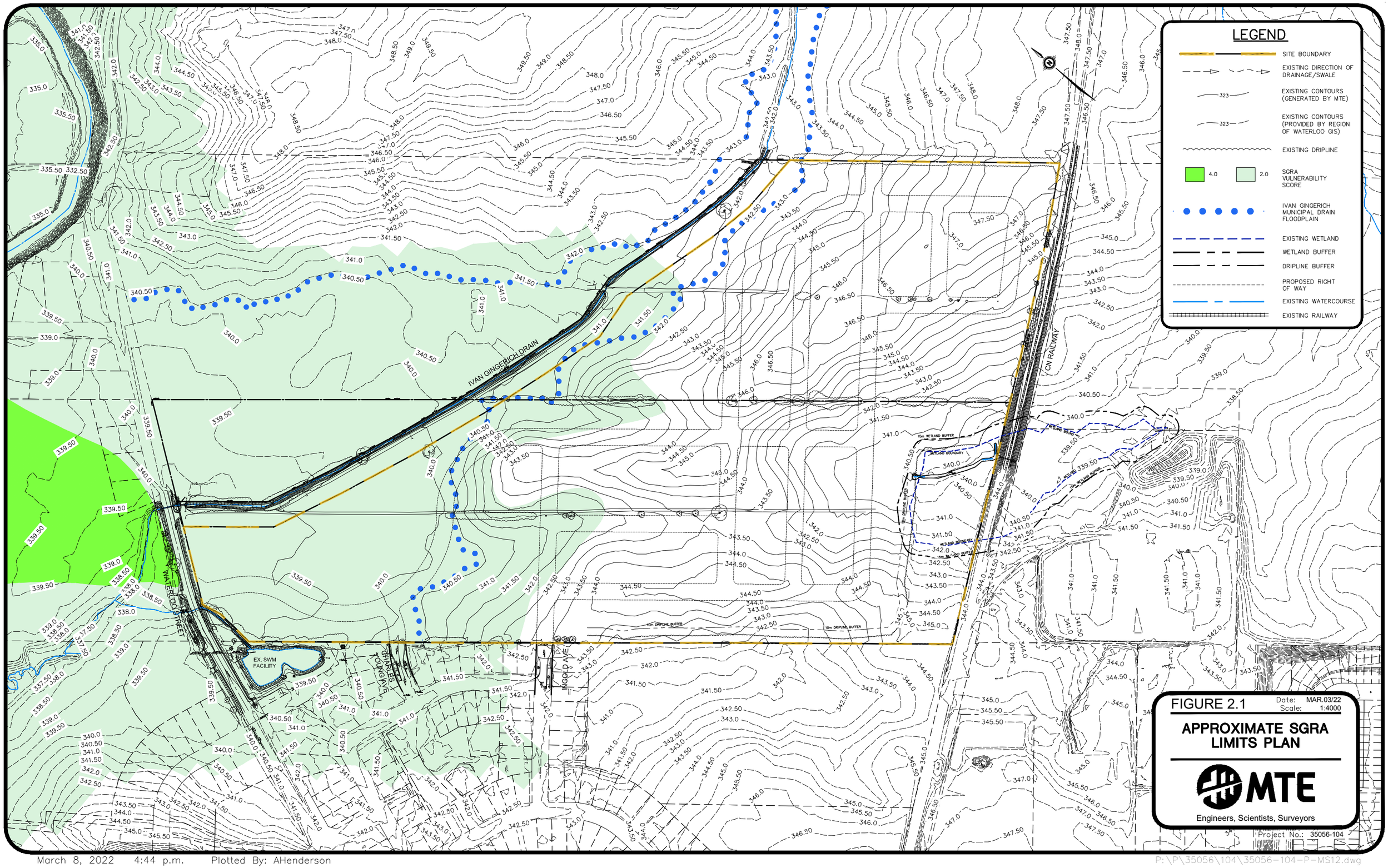


FIGURE 2.1 Date: MAR.03/22 Scale: 1:4000

APPROXIMATE SGRA LIMITS PLAN

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Project No.: 35056-104

March 8, 2022 4:44 p.m. Plotted By: AHenderson

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2.4 Geotechnical and Hydrogeological Information

In February 2022, Peto MacCallum Ltd. (Peto) prepared a geotechnical investigation for the subject lands. The fieldwork for the investigations on the subject lands carried out in 2018 included: 22 boreholes, 10 of which included monitoring wells, to depths ranging between 6.5m to 12.6m.

In 2021/2022, MTE carried out a Hydrogeological Assessment Report (April 2022) for the subject lands. This study conducted fieldwork and summarizes the hydrogeological investigations performed to date for the development study area.

Based on the results of the detailed investigations, the subsurface stratigraphy is generally described as topsoil and localized fill underlain by extensive deposits of clayey silt, locally containing cohesionless silt, sandy silt, silty sand, and sand layers.

Wet and saturated conditions are generally encountered throughout the site. Based on hydrostatic groundwater level readings recorded by Peto, groundwater levels generally rise and fall with the topography. The groundwater contours indicate that groundwater flow in the northern portion of the subject lands is generally northerly, while the opposite is true for the southern portion of the lands.

Sandy soils may act as an aquifer were only encountered within a few boreholes on the North portion of the subject lands, while the balance of the site indicate a dominate clayey soils overburden on the south portion of the subject lands. Infiltration is minor and the subject lands are not significant with respect to groundwater recharge.

In March 2021, Peto provided MTE with updated water levels within monitoring wells MW101-MW110. Levels were measured from November 2020 to February 2021 and provided supplemental information to the groundwater contours. More recently, MTE has been monitoring water levels within existing wells as well as within the newly drilled wells (up to October 2021) as part of MTE's *Hydrogeological Assessment Report*. Seasonal high groundwater contours, as shown in **MTE Drawing 35056-104-QU2.1**, have been generated for the subject lands based on collected groundwater level monitoring to date.

Refer to Peto's Geotechnical Investigation Report in **Appendix B** for more details.

3.0 Proposed Development

The Draft Plan of Subdivision for this residential development includes the following:

- Single detached and Townhome residential dwellings;
- Multiple residential dwellings;
- A neighbourhood park and open space buffers;
- Walkways and trails;
- A Service Corridor Block;
- 20m Municipal right-of-ways (ROW); and
- Two Stormwater Management (SWM) Facilities.

Refer to the Draft Plan of Subdivision created by MHBC (dated January 25, 2022) in **Appendix A** for more details.

3.1 Municipal Right-of-Ways

As shown in the Draft Plan of Subdivision, the proposed development will be serviced by local roads. The roadways will be constructed to a full urban cross-section, including: asphalt pavement, concrete curb and gutters, concrete sidewalks, roadway illumination, and boulevard landscaping.

Local roads within the subject lands will consist of 20.0m right-of-way widths. Since the Township currently does not have a design standard for an urban cross-section, through discussions and coordination with Township staff, a standard urban cross-section was developed for the subject lands.

A typical road cross-section of the 20.0m right-of-way are included in **Appendix C** for reference.

As previously mentioned, a geotechnical investigation was completed by Peto, dated February 24, 2022. The proposed pavement structure outlined in this report is summarized in **Table 3.11** below.

Table 3.1 – Proposed Pavement Structure

Pavement Structure	Local Roads (mm)
Asphaltic Concrete - Surface	80
Granular ‘A’ Base	150
Granular ‘B’ Sub-base	600

3.2 Sight Line Analysis Waterloo Street

Using the Transportation Association of Canada (TAC) *Geometric Design Guide for Canadian Roads* (2017), A sight-line analysis was performed for the proposed Street Two and Waterloo Street. Refer to **Figure 3.1** for a plan depicting the required sight distances.

For the westbound traffic on Waterloo Street, with a design speed limit of 70km/h (10km/h over the posted speed), the minimum stopping sight distance (SSD) is 105m. For the eastbound traffic, with a design speed of 60km/h, the minimum stopping sight distance is 85m.

The intersection sight distance (ISD) represents the sight distance for drivers to make a decision and turn onto a roadway to attain design speed without being overtaken by a vehicle approaching behind them. Utilizing Section 9.9 from the TAC manual, the minimum ISD for a left turn into westbound traffic is 150m, and the minimum ISD for a right turn into eastbound traffic is 110m.

In order to meet the ISD for eastbound traffic, the vegetation south of the intersection of Street Two and Waterloo Street will need to be removed to the extent where safe sight distances can be achieved. The vegetation removal has been illustrated on **Figure 3.1.**

3.3 Traffic Calming and Pedestrian Refuge

An Urban Design Brief was completed by MHBC (February, 2022) to discuss the overall design vision and objectives of the development, and assess it compatibility in support of zoning by-law amendment and plan of subdivision applications.

An active transportation plan was prepared as part of the Design Brief, which outlines pedestrian movement, trail connections and primary connections to adjacent developments.

A pedestrian crossing is proposed along Street Two to cross the right-of-way from Park Block 19. It is proposed at the location of the crossing to ensure safe pedestrian movement and traffic calming. Refer to **Figure 3.2**.

3.4 Waterloo Street Left-In Turn Lane Requirements

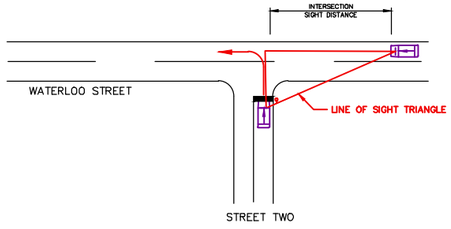
A Transportation Impact Study (TIS) completed by Paradigm (March, 2022) to assess the impact of the proposed development on the adjacent existing road infrastructure. It was determined that westbound left-turn lanes are required on Waterloo Street at Street Two and Laschinger Boulevard.

Refer to **Figures 3.3 and 3.4** for a functional design of the proposed left-turn lane from Waterloo Street into Street Two, and Waterloo Street into Laschinger Boulevard, respectively.

Detailed design for both intersections introducing left turn lanes will be completed during the final design phase of the subdivision requiring approval by the Township of Wilmot and the Region of Waterloo.

INTERSECTION SIGHT DISTANCE – LEFT TURN FROM STOP (TABLES 9.9.2 / 9.9.4)

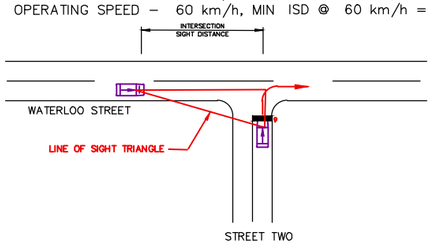
POSTED SPEED LIMIT – 60 km/h, MIN ISD @ 60 km/h = 130 m
DESIGN SPEED – 70 km/h, MIN ISD @ 70 km/h = 150 m
OPERATING SPEED – 70 km/h, MIN ISD @ 70 km/h = 150 m



SCALE: N.T.S

INTERSECTION SIGHT DISTANCE – RIGHT TURN FROM STOP (TABLES 9.9.2 / 9.9.6)

POSTED SPEED LIMIT – 50 km/h, MIN ISD @ 50 km/h = 95 m
DESIGN SPEED – 60 km/h, MIN ISD @ 60 km/h = 110 m
OPERATING SPEED – 60 km/h, MIN ISD @ 60 km/h = 110 m



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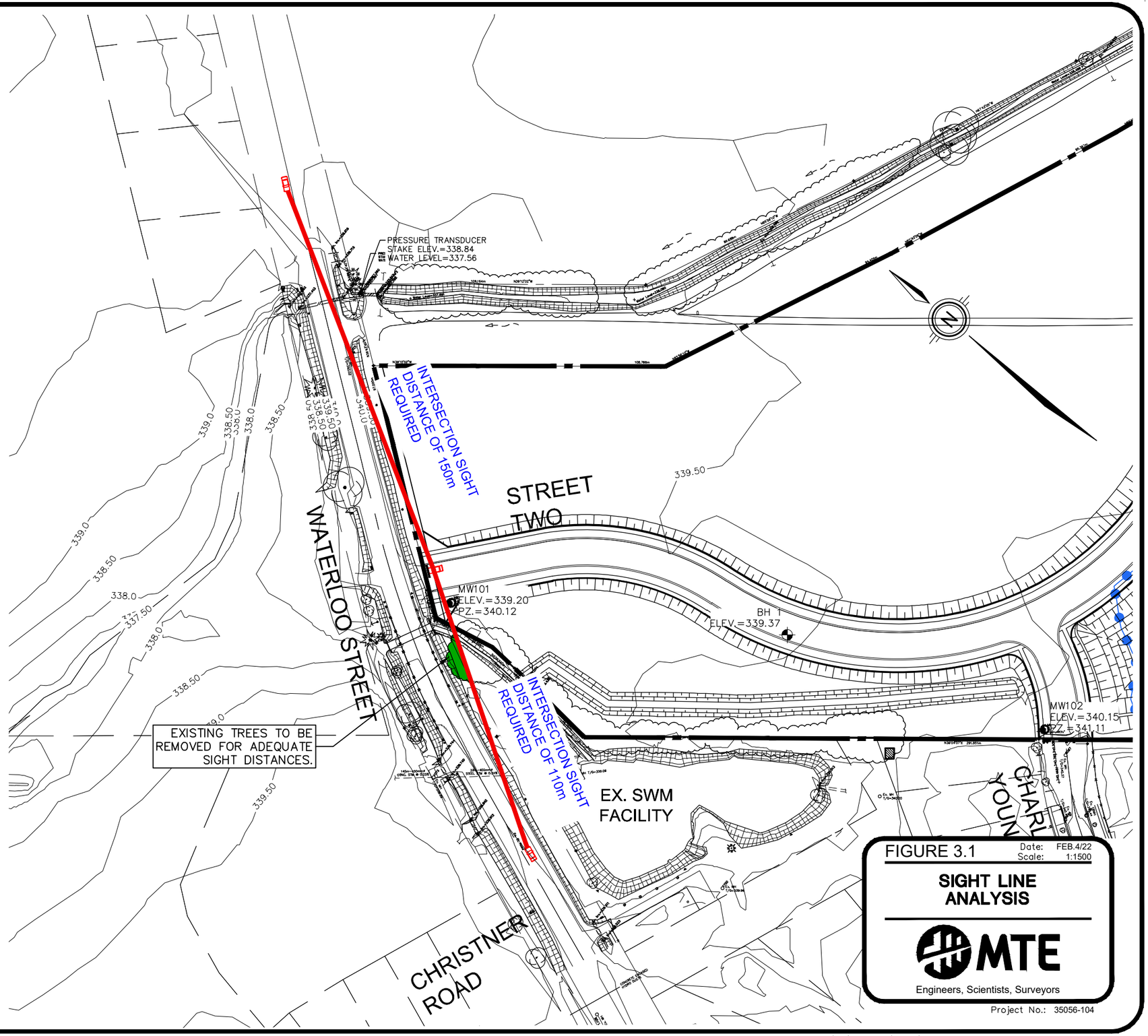
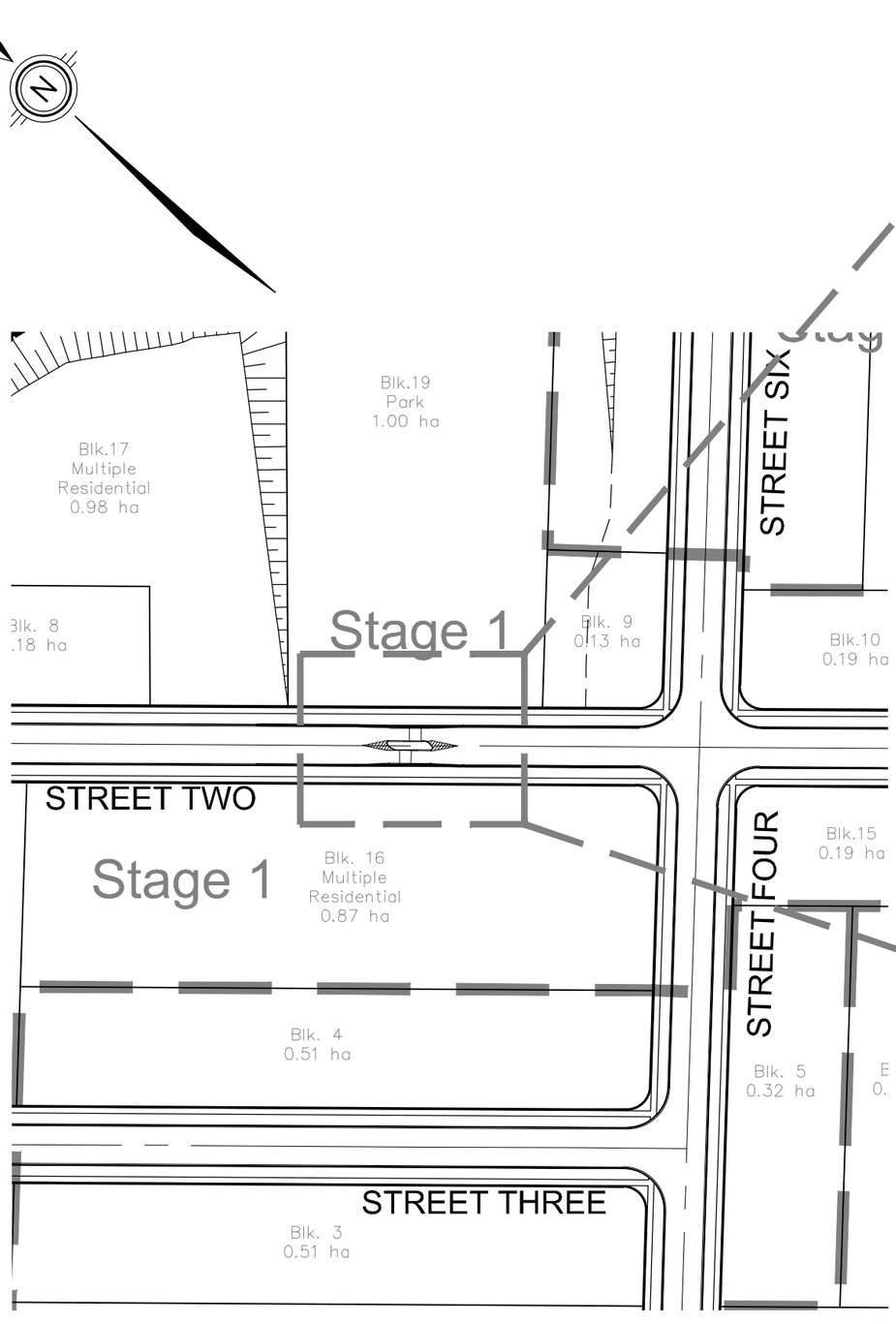


FIGURE 3.1 Date: FEB.4/22 Scale: 1:1500

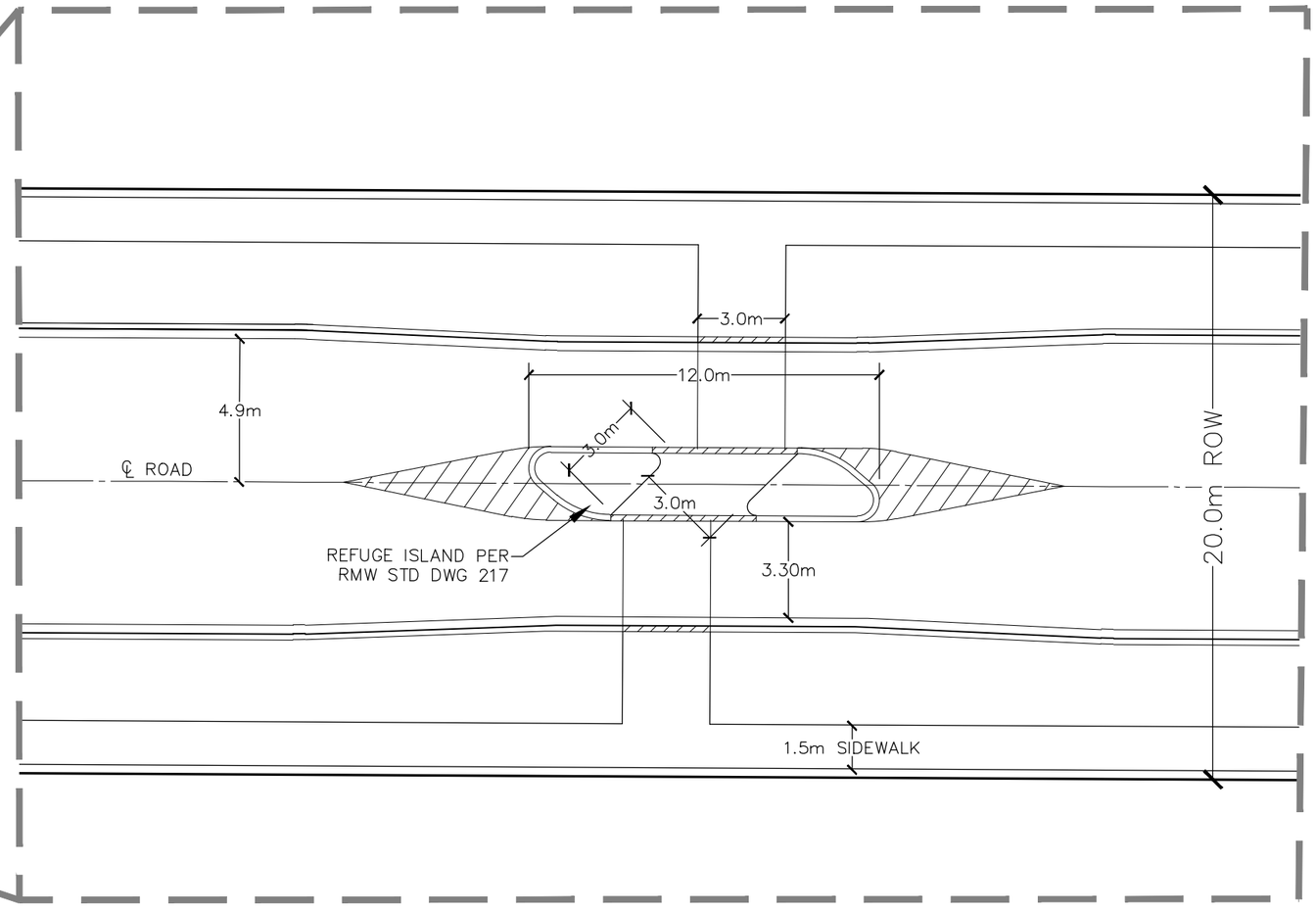
SIGHT LINE ANALYSIS

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SCALE 1:200

FIGURE 3.2
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STREET TWO TRAFFIC CALMING REFUGE ISLAND

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Project No.: 35056-104

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LEGEND

- PROPERTY BOUNDARY
- PROPOSED LINE PAINTING
- EXISTING LINE PAINTING
- 3.25 LANE DIMENSION

45m TAPER TRANSITION TO LEFT–TURN LANE

45m TAPER TRANSITION TO EXISTING ROAD STRUCTURE

EXISTING BARRICADE TO BE REMOVED AND REPLACED

30m VEHICLE STORAGE IN LEFT–TURN LANE

WATERLOO STREET

STREET TWO

338.50
339.0
339.50
340.0

4.50
3.25
4.50
4.50

N38°43'40"W
97.000m
N39°12'02"W
N50°16'58"E
25.896m
N47°06'50"W
11.384m
N52°53'10"E

FIGURE 3.3

Date: FEB.4/22
Scale: 1:400

WATERLOO STREET LEFT TURN LANE FUNCTIONAL DESIGN (STREET TWO)

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Project No.: 35056-104

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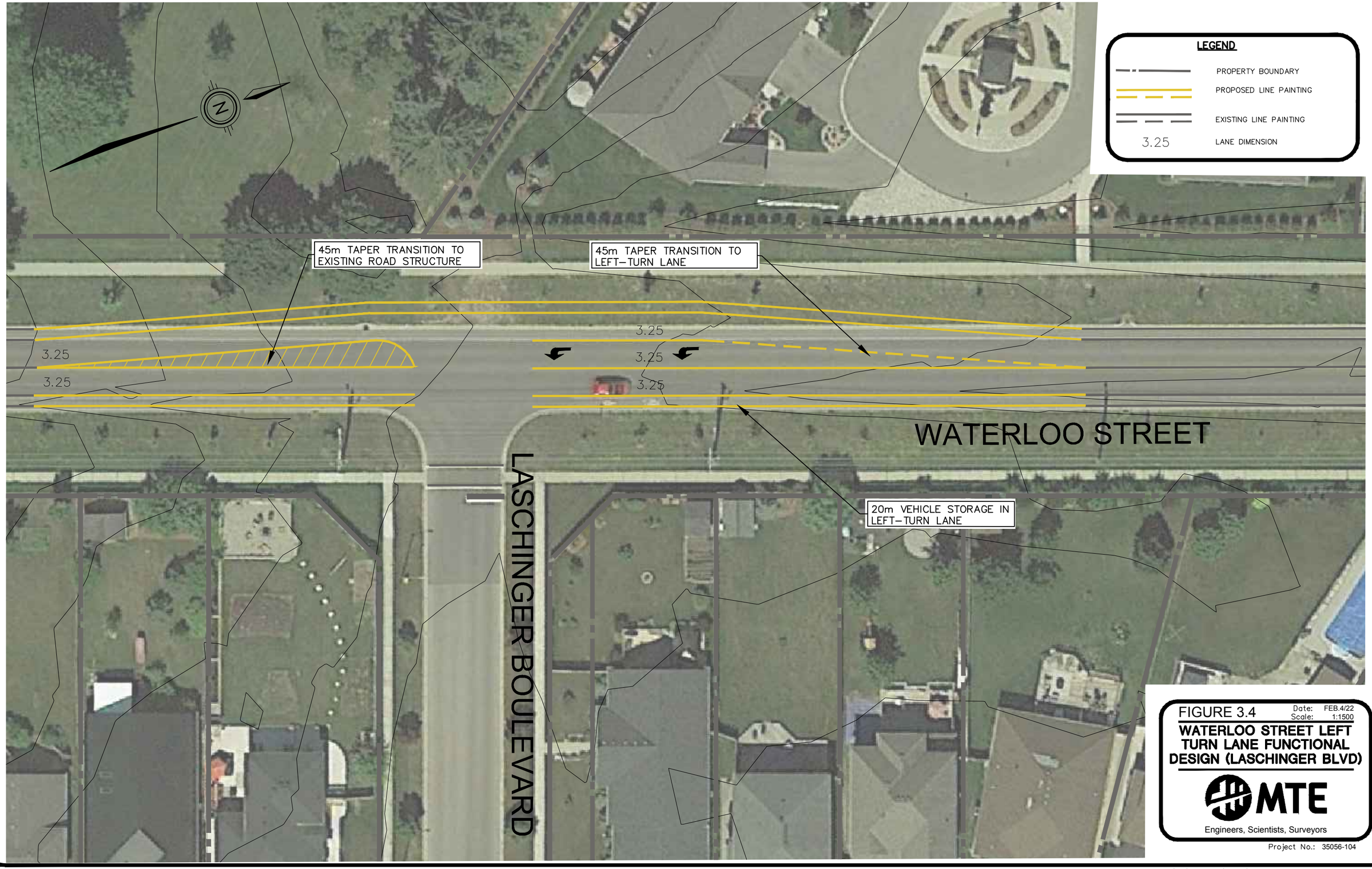


FIGURE 3.4 Date: FEB.4/22 Scale: 1:1500

WATERLOO STREET LEFT TURN LANE FUNCTIONAL DESIGN (LASCHINGER BLVD)

MTE

Engineers, Scientists, Surveyors

Project No.: 35056-104

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4.0 Proposed Grading

4.1 Grading Considerations

The following is a list of grading constraints which influenced and/or governed the grading design of the subject lands:

- Match the proposed centreline of road elevations at existing Waterloo Street, Ingold Avenue, and Charles Young Avenue;
- Match the existing and proposed boundary grades around the perimeter of the property, while respecting the limits of existing natural heritage features;
- Minimize grading within recommended buffers associated with natural heritage features with some minor incursions in recognition of engineering design considerations;
- Ensure adequate cover is provided over municipal services;
- Ensure major storm event overland flow routes are directed towards the road right-of-ways, where applicable, and towards the appropriate stormwater management facility;
- Comply with Township of Wilmot standards for minimum and maximum road grades;
- Utilize enhanced sump pump systems within areas of soils with low conductivity (10^{-6}m/s);

  Implement a groundwater management system in areas of soils with high conductivity (10^{-4}m/s) and grading is constrained by street connections, floodplain interface and boundary conditions;
- Ensure adequate separation between seasonal high groundwater and the proposed underside of house footings;
- Minimize the cut/fill deficit for the subject lands; and
- Ensure walkways and trails are AODA compliant.

4.2 Roadworks and Lot Grading

Utilizing the proposed road layout, preliminary slopes for centreline of road ranging from 0.5% (minimum) to 5.0% (maximum) were used to complete the preliminary lot grading design. The maximum road grade was designed at 1.5%. Preliminary lot grades range from 2.5% (minimum) to 5.0% (maximum) with a combination of traditional back to front drainage, split drainage, and walk-out type lots. The considerations listed in Section 4.1 were incorporated into the overall preliminary grading design and is illustrated in **MTE Drawing 35056-104-QU1.1**.

The seasonal high groundwater surface was modelled based on MTE's *Hydrogeological Assessment Report* (April 2022). The preliminary house grades and underside of footing elevations were designed to maintain a minimum vertical separation of 0.60m above the seasonal high groundwater elevations where possible. The groundwater separation is illustrated in **MTE Drawing 35056-104-QU2.1.** The seasonal high groundwater throughout the development lands is generally found at an elevation between 338.0m and 344.0m. Grading around buildings generally range from 342.5m to 346.5m. Basement floor elevations were assumed to be generally 2.2m below front of house grade. The average separation between the underside of footings and seasonal high groundwater is generally more than 0.6m. In instances where walkout lots are utilized and the foundation footing is near surface, groundwater separation is achieved as well.

Where adequate groundwater separation cannot be achieved, a groundwater management system may be proposed. This is further discussed in **Section 5.3.2**.

4.3 Railway Crash Berm

MTE, along with the project team, have been retained by Wilmot Woods to confirm the development proposed by the Plan of Subdivision (the Proposed Development) complies with the Railway Authorities Proximity Guidelines.

As required by the Proximity Guidelines, a 30m setback is proposed adjacent to the CN railway and Street Nine. Within the setback and within SWM Facility 2, a standard 2.5m high railway crash berm is proposed adjacent to the rail corridor.

Outlined in **Appendix G**, are the relevant sections of the Proximity Guidelines in italics, and a response from MTE as to the means by which the Proposed Development has met the guideline requirements. We note that this report has been prepared to document compliance to the Proximity Guidelines for the Wilmot Woods development. Attached (**Appendix G**) is **MTE Drawing 35056-104-MS11** referred to throughout the technical memo, which illustrates the development and various applicable “setback” lines from the CN Principal Main Line.

5.0 Municipal Servicing

5.1 Sanitary Servicing

5.1.1 Sanitary Sewage Collection System

The subject lands are intended to be serviced by the proposed 450mm diameter trunk sanitary sewer located within the sanitary servicing easement beneath the CN railway and towards the WEL to the south. Per the Baden – New Hamburg Wastewater Servicing Strategy, this trunk sewer is meant to service the majority of the subject lands by gravity, the adjacent Cachet Lands east of the property, and also include capacity for the northern portion of the lands being conveyed to the nearby Forest Glen Wastewater Pumping Station (FGWWPS) located along Waterloo Street. FGWWPS collects wastewater from neighbouring residential subdivisions, such as the Forest Glen Subdivision and the Sugarlane Ridge Subdivision, but is also anticipated to collect sanitary sewage from Wilmot Woods and other future growth areas to the east along Waterloo Street.

The subject lands, in addition to the existing and future growth areas serviced by the FGWWPS, are located within the drainage area of the Morningside Wastewater Pumping Station (MWWPS) and ultimately the New Hamburg Wastewater Treatment Plant. As such, sanitary sewage flow generated within the subject lands will eventually make its way to the treatment plant; where sufficient capacity exists to accommodate sanitary flow from this area. As discussed earlier the means for making capacity available within the Morningside trunk sewer is subject to the two ongoing studies being *B/NH-W/WW-SR and the* MT-SS-EA.

The development of the subject lands was considered in order to adequately size the sanitary sewers within the sanitary servicing easement and all other proposed downstream sewers as part of the WEL design. The design of the receiving sanitary sewers within the WEL provide for anticipated flows from the subject lands and will accommodate the proposed development size and population densities.

As part of the current design, an internal sanitary sewer network was developed to ensure and confirm that previously anticipated and allocated flows were not exceeded. As a result, it is concluded that there are no capacity issues downstream of the subject lands assuming capacity constraints within the Morningside trunk sewer are resolve by the *B/NH-W/WW-SR*.

The proposed drainage areas, as illustrated in **Appendix D**, generally flow northward to the FGWWPS and southward to the trunk sanitary sewer crossing the CN railway. The following drainage areas are delineated with respective population densities to determine the preliminary design peak flows.

Preliminary Sanitary Sewer Design Sheets have been prepared with pipe diameters and slopes for the proposed conditions. The design sheets and the corresponding drainage area plans are located in **Appendix D**.

Figure 5.1 illustrates a schematic of the sanitary sewer design, including proposed finished road grades and depths of sewers at key points in the sewer network. The 'spine' sewers located on proposed Street Two and Street Eight will collect and convey sanitary flows from the local streets. The depth of these sewers ranges from approximately 2.8m to 6.5m. The deepest point is located in Street Two prior to entering the existing FGWWPS block. Sanitary sewers extended through the remaining local roads within the proposed road allowances are at typical depths ranging from 2.8m to 5.0m.

A sanitary sewer plug is provided at the stub of Street Eight to accommodate flows from the adjacent Cachet Lands as defined within the overall Baden-New Hamburg wastewater servicing strategy.

5.1.2 Forest Glen Sanitary Pump Station and Forcemain

In 2019, the Township retained Watson & Associates Economists Ltd. to create a *Development Charges (DC) Background Study* to outline the cost associated with the upgrades of water and wastewater infrastructure. The study was updated on July 21, 2021 to reflect amended DC rates to be implemented.

Included within the DC Study was cost estimates for the Forest Glen Pumping Station, the forcemain within the subject lands, as well as the sanitary sewer casing associated with the railway crossing (as discussed in Section 5.1.3). The total gross capital cost estimates for the FGWWPS and forcemain equate to $1,936,000 and $293,000, respectively.

The existing FGWWPS has a capacity of approximately 20L/s, equivalent to 1675m^3/day. As shown in **Appendix D**, several external catchments and a portion of the subject lands sanitary flows are directed towards the FGWWPS under the ultimate buildout of Baden – New Hamburg. The subject lands are directing a peak flow of 10.4 L/s towards the FGWWPS, while the remaining future lands will direct 120.5 L/s.

These flows are pumped through the subject lands via forcemain and ultimately drain into the trunk sewer heading south through the servicing corridor and trunk sanitary system through the WEL.

5.1.3 Service Corridor Directional Drilling to WEL

In order to provide the sanitary servicing outlet for the subject lands, a directional drilling plan is proposed underneath the CN (GEXR) railway right-of-way. The directional drill has been extended to avoid interfering with the wetland south of the railway. This trunk sewer connects through the WEL, and ultimately flows towards the Morningside WWPS. Refer to MTE Drawing **35056-104-MS5.1.**

5.2 Water Distribution

The subject lands are located along the boundary between the New Hamburg Pressure Zone and the Baden Pressure Zone. The pressure divide is established by the existing pressure reducing valve (PRV) at the intersection of Snyder's Road West and Nafziger Road, northeast of the subject lands. The current hydraulic grade line (HGL) in the New Hamburg Pressure Zone is approximately 390.8m, whereas the HGL in the Baden Pressure Zone is approximately 400.0m.

Water supply for the subject lands will be provided through the New Hamburg Pressure Zone, through two external connection points to the existing/future municipal water distribution system, as follows:

- Direct connection to the proposed extension of the existing 300mm diameter watermain along Waterloo Street, at the intersection with proposed Street Two; and,
- Direct connection to the existing 150mm diameter watermain stub along Ingold Avenue.

The water distribution network and analysis for the proposed development is presented in the *Wilmot Woods Subdivision – Preliminary Water Distribution Analysis* (April 2022) prepared by MTE (see **Appendix E** for the complete report). The analysis was also used to determine the preliminary pipe sizes for the proposed internal water distribution network, which is generally 'looped' following the proposed road allowances, as shown in **Figure 5.2**. The following summarizes the key points of the report:

- Connections to the existing/future watermains (listed above) will adequately service the proposed water distribution network for the subject lands;
- The proposed water distribution network will adequately provide the required daily water demands and recommended *FUS* fire flows within the respective pressure guidelines;
- A 300mm watermain stub has been provided at Street Eight at the Cachet property line; and
- The installation of pressure reducing valves is not required within the subject lands.

LEGEND

- SUBJECT LANDS
- PROPOSED SANITARY SEWER
- PROPOSED SANITARY FORCEMAIN
- PROPOSED SANITARY TRUNK SEWER
- EXISTING SANITARY PUMPING STATION
- F/G=360.35 / SAN OBV.=357.46± / DEPTH=2.90m± — C/L ROAD GRADE / PROPOSED LOCAL SANITARY OBVERT / SANITARY COVER

EXT 40.6ha

SAN. PLUG INV. 340.60±

F/G=345.54 SAN OBV.=340.37± DEPTH=5.17m±

F/G=346.00 SAN OBV.=343.20± DEPTH=2.80m±

F/G=346.30 SAN OBV.=343.31± DEPTH=2.99m±

F/G=345.62 SAN OBV.=342.27± DEPTH=3.35m±

F/G=345.35 SAN OBV.=342.23± DEPTH=3.12m±

F/G=345.11 SAN OBV.=339.83± DEPTH=5.28m±

F/G=345.34 SAN OBV.=342.50± DEPTH=2.84m±

F/G=345.67 SAN OBV.=342.31± DEPTH=3.42m±

F/G=345.02 SAN OBV.=341.87± DEPTH=3.15m±

F/G=344.66 SAN OBV.=341.48± DEPTH=3.18m±

F/G=344.41 SAN OBV.=339.50± DEPTH=4.91m±

F/G=344.14 SAN OBV.=340.87± DEPTH=3.27m±

F/G=344.00 SAN OBV.=339.00± DEPTH=5.0m±

F/G=343.68 SAN OBV.=338.02± DEPTH=5.66m±

F/G=344.04 SAN OBV.=340.20± DEPTH=3.84m±

F/G=344.64 SAN OBV.=341.37± DEPTH=3.27m±

F/G=344.90 SAN OBV.=342.10± DEPTH=2.80m±

F/G=345.35 SAN OBV.=342.45± DEPTH=2.90m±

F/G=344.90 SAN OBV.=342.10± DEPTH=2.80m±

F/G=344.85 SAN OBV.=341.38± DEPTH=3.40m±

F/G=345.73 SAN OBV.=342.90± DEPTH=2.83m±

F/G=342.68 SAN OBV.=339.19± DEPTH=3.49m±

F/G=341.94 SAN OBV.=335.45± DEPTH=6.49m±

F/G=342.44 SAN OBV.=339.70± DEPTH=2.74m±

F/G=339.65 SAN OBV.=335.09± DEPTH=4.56m±

STREET ONE
STREET TWO
STREET THREE
STREET FOUR
STREET FIVE
STREET SIX
STREET SEVEN
STREET EIGHT
STREET NINE
STREET TEN

SAN. FORCEMAIN

375mmØ SAN TRUNK @ 0.60%

375mmØ SAN TRUNK @ 1.00%

300mmØ SAN TRUNK @ 0.40%

450mmØ SAN TRUNK @ 0.60%

200mmØ SAN @ 0.60%
200mmØ SAN @ 1.00%
200mmØ SAN @ 2.00%
200mmØ SAN @ 1.25%
200mmØ SAN @ 0.80%
200mmØ SAN @ 1.50%
200mmØ SAN @ 1.20%
200mmØ SAN @ 1.80%
200mmØ SAN @ 1.60%

Blk.20 Open Space 0.92 ha
Blk.19 Park 1.00 ha
Blk.17 Multiple Residential 0.98 ha
Blk.18 Multiple Residential 0.19 ha
Blk.21 Open Space 3.30 ha
Blk.22 Open Space 0.93 ha
Blk.23 SWM Facility 1.02 ha
Blk.34 Road Widening 0.03 ha
Blk. 7 Open Space 2.86 ha

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. SWM FACILITY

FOREST GLEN WWPS

WETLAND BOUNDARY

10m DRIPLINE BUFFER

15m WETLAND BUFFER

CONNECT TO RECIEVING PIT INV.338.30±

FOR SANITARY TRUNK EXTENSION UNDER GEXR CROSSING, SEE 35056-104-MS5.1

TO WWPS BY GRAVITY

TO TRUNK SEWER BY GRAVITY

FIGURE 5.1

Date: JAN.27/22
Scale: 1:3000

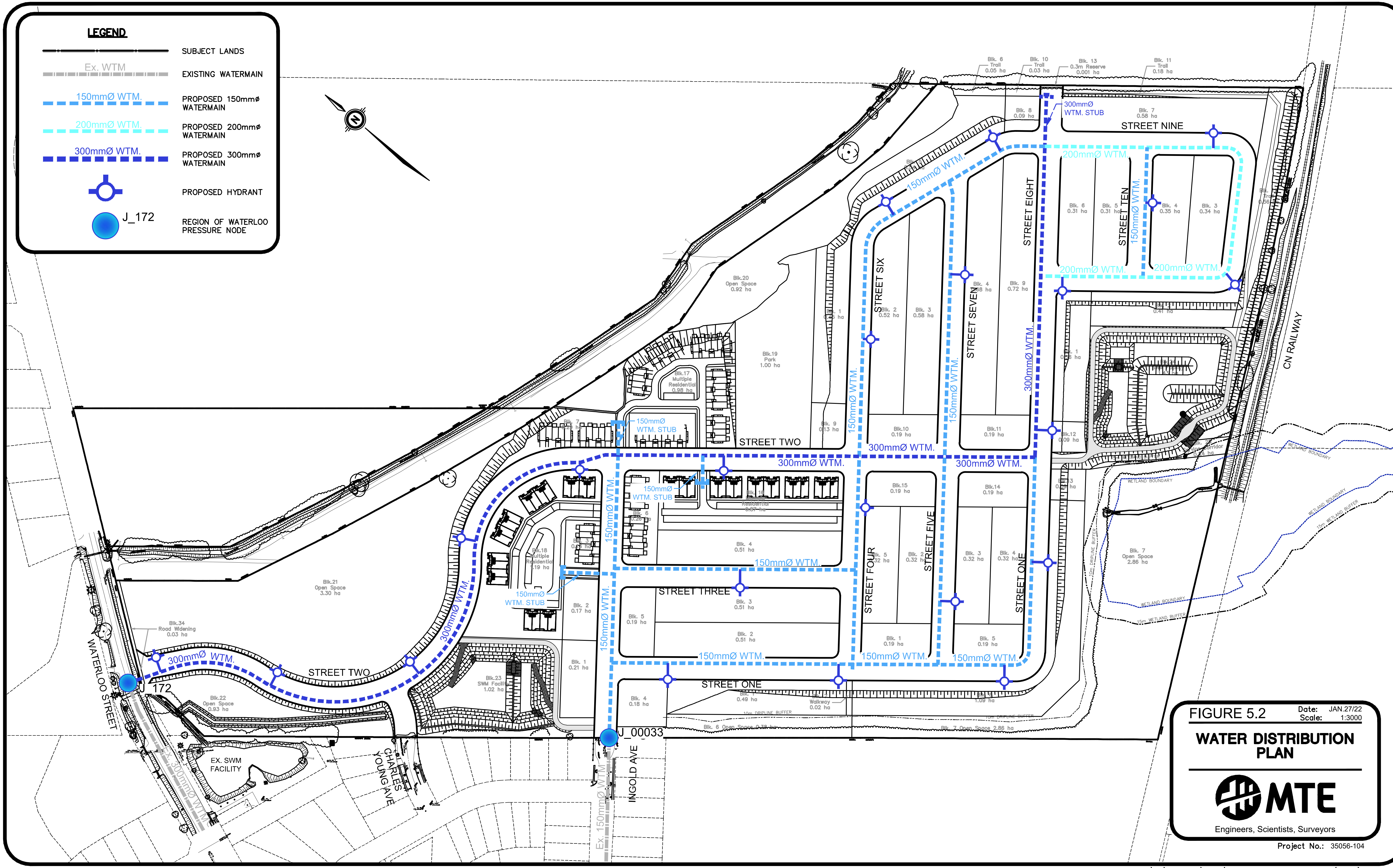
SANITARY SERVICING PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

February 17, 2022 — 4:29 p.m. — Plotted By: acressman

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March 7, 2022 — 10:46 a.m. — Plotted By: acressman

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5.3 Storm Drainage

5.3.1 Storm Sewer Network

Storm drainage for the proposed development will be provided through a combination of minor (piped) and major (overland) drainage systems. Based on the existing grading conditions of the subject lands, stormwater runoff drainage patterns can generally be described by two main subcatchment areas: the northern portion draining to the IGMD and the southern portion draining to the existing wetland and 900mm diameter culvert beneath the CN railway. Under post-development conditions, drainage patterns will mimic existing conditions; with stormwater runoff being conveyed to appropriately sized SWM facilities prior to being discharged to their respective receiving water bodies.

The proposed internal drainage areas, as illustrated in **Appendix F**, generally flow northward to the proposed SWMF 1 and ultimately the IGMD, and southward to the proposed SWMF 2 and ultimately the existing culvert beneath the CN railway. The following drainage areas are delineated with respective runoff coefficients to determine the preliminary design peak flows.

Figure 5.3 illustrates a schematic of the overall storm sewer design, including proposed finished road grades and depths of sewers at key points in the sewer network. The depth of these sewers ranges from approximately 1.5m to 2.0m.

Preliminary Storm Sewer Design Sheets have been prepared with pipe diameters and slopes for the proposed conditions. The design sheets and the corresponding drainage area plan are located in **Appendix F**.

5.3.2 Groundwater Management System

Several multi-residential blocks and portions of single family residential lots are within the SGRA limits. Seasonal high groundwater contours in this area also vary from 339.0 to 341.0m. In order to accommodate the SGRA and provide adequate groundwater separation from proposed basements, a groundwater management system (GWMS) is proposed if required. Refer to **Figure 5.4**.

The GWMS consists of solid pipe along Street Two, Street Three and Ingold Avenue. Perforated GWMS pipes will be provided within the Site blocks. The system is directed north through SWMF1 and along Street Two, which ultimately discharges north of Waterloo Street to the IGMD. The GWMS is set at an invert elevation of 339.30m, and surrounding basement floor elevations will be designed to a minimum depth of 339.80m. All GWMS manholes will be equipped with watertight lids to maintain a closed collection system.

5.3.3 External Cachet Lands Drainage

Approximately 4.17ha of external drainage adjacent the CN railway corridor, near the southeastern corner of the subject lands, currently drains towards the existing 900mm diameter culvert. Under existing conditions, this area drains to the ditch within the CN corridor. Under proposed conditions, this external area is to be conveyed through a ditch inlet catchbasin at the low point of the depression, and a 450mm storm sewer system to SWMF2. The ditch inlet catchbasin drains to a storm sewer flowing westerly within the 30m railway setback outletting to SWMF2. The location of this local storm sewer is shown in **Figure 5.3.**

LEGEND

SUBJECT LANDS

PROPOSED STORM SEWER

F/G=314.28	C/L ROAD GRADE
STM OBV.=312.78±	LOCAL STORM OBVERT
DEPTH=1.50m±	STORM COVER

EXT 4.17ha

F/G=346.94 STM OBV.=345.44± DEPTH=1.50m±

F/G=345.46 STM OBV.=343.96± DEPTH=1.50m±

F/G=345.73 STM OBV.=344.23± DEPTH=1.50m±

F/G=346.14 STM OBV.=344.50± DEPTH=1.64m±

F/G=345.78 STM OBV.=344.05± DEPTH=1.73m±

F/G=345.50 STM OBV.=343.77± DEPTH=1.73m±

F/G=344.93 STM OBV.=343.37± DEPTH=1.56m±

F/G=344.68 STM OBV.=343.30± DEPTH=1.38m±

F/G=345.59 STM OBV.=343.82± DEPTH=1.77m±

F/G=343.30 STM OBV.=342.19± DEPTH=1.11m±

F/G=343.80 STM OBV.=342.30± DEPTH=1.50m±

F/G=343.54 STM OBV.=341.90± DEPTH=1.64m±

F/G=344.12 STM OBV.=342.62± DEPTH=1.50m±

F/G=344.57 STM OBV.=343.04± DEPTH=1.53m±

F/G=344.07 STM OBV.=342.70± DEPTH=1.37m±

F/G=343.95 STM OBV.=342.47± DEPTH=1.48m±

F/G=344.77 STM OBV.=343.03± DEPTH=1.50m±

F/G=342.80 STM OBV.=341.30± DEPTH=1.50m±

F/G=342.50 STM OBV.=341.00± DEPTH=1.50m±

F/G=343.01 STM OBV.=341.51± DEPTH=1.50m±

F/G=344.73 STM OBV.=343.23± DEPTH=1.50m±

F/G=345.32 STM OBV.=343.82± DEPTH=1.50m±

F/G=344.87 STM OBV.=343.40± DEPTH=1.50m±

F/G=340.23 STM OBV.=337.88± DEPTH=2.35m±

F/G=342.20 STM OBV.=340.70± DEPTH=1.50m±

F/G=341.15 STM OBV.=339.65± DEPTH=1.50m±

F/G=342.59 STM OBV.=341.10± DEPTH=1.5m±

F/G=345.66 STM OBV.=344.16± DEPTH=1.50m±

F/G=342.39 STM OBV.=340.97± DEPTH=1.42m±

STREET NINE

STREET EIGHT

STREET TEN

STREET SIX

STREET SEVEN

STREET TWO

STREET THREE

STREET FOUR

STREET FIVE

STREET ONE

CN RAILWAY

WATERLOO STREET

INGOLD AVE

CHARLES YOUNG AVE

EX. SWM FACILITY

1.2m BOX CULVERT

WETLAND BOUNDARY

15m WETLAND BUFFER

10m DRIPLINE BUFFER

TO NITH RIVER

TO GEXR CULVERT

FIGURE 5.3

Date: JAN.27/22
Scale: 1:3000

STORM SERVICING PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2022 — 10:47 a.m. — Plotted By: acressman

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LEGEND

- SUBJECT LANDS
- PROPOSED GWMS (SOLID)
- LOTS WITH MINIMUM BFFG=339.80±
- 2.0
- 4.0

SGRA VULNERABILITY SCORE

WATERLOO STREET

Blk.34
Road Widening
0.03 ha

Blk.21
Open Space
3.30 ha

Blk.22
Open Space
0.93 ha

Blk.23
SWM Facility
1.02 ha

Blk.19
Park
1.00 ha

Blk.17
Multiple
Residential
0.98 ha

Blk.18
Multiple
Residential
1.19 ha

Blk. 1
0.21 ha

Blk. 2
0.17 ha

Blk. 3
0.18 ha

Blk. 4
0.18 ha

Blk. 5
0.19 ha

Blk. 6
0.26 ha

Blk. 16
Multiple
Residential
0.87 ha

Blk. 2
0.51 ha

Blk. 3
0.51 ha

Blk. 4
0.51 ha

STREET ONE

STREET TWO

STREET THREE

300mmØ GWMS @ 0.3%

300mmØ GWMS @ 0.3%

1.2m BOX CULVERT

300mmØ GWMS @ 0.3%

300mmØ GWMS @ 0.3%

300mmØ GWMS @ 0.3%

INV.=338.90

300mmØ GWMS

OUTLET TO SURFACE INV.=338.40±

300mmØ GWMS

INV.=339.30

300mmØ GWMS

INV.=339.30

300mmØ GWMS

300mmØ GWMS

300mmØ GWMS

INV.=339.30

300mmØ GWMS

300mmØ GWMS

300mmØ GWMS

INV.=339.30

300mmØ GWMS

FIGURE 5.4

Date: JAN.27/22
Scale: 1:1500

GROUNDWATER MANAGMENT SYSTEM PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

February 17, 2022 — 4:32 p.m. — Plotted By: acressman

P:\P\35056\104\35056-104-P-F5.5 (GWMS).dwg

5.4 Stormwater Management

Due to the extensive amount of clayey soils throughout the subject lands, infiltration measures are not proposed. The proposed SWM infrastructure for the subject lands will include the proposed storm sewer network within the proposed right-of-ways. The storm sewer network is proposed to convey stormwater flow to SWMF1 and SWMF2, located in the northwestern and southern portions of the subject lands, respectively. The SWM strategy for the proposed development is presented in the *Wilmot Woods Subdivision - Preliminary Stormwater Management Report* (April 2022) prepared by MTE. The following summarizes the key points of the report:

- Water quantity and quality control will be provided within SWMF1. This facility will provide quantity control of runoff from the contributing drainage area for storm events up to and including the Regional storm event;
- An Enhanced Level of water quality control will be provided in SWMF 1;
- Water quantity control will be provided within SWMF2. This facility will provide quantity control of runoff from the contributing drainage area for storm events up to and including the Regional storm event;
- An Enhanced Level of water quality control will be provided in the downstream communal SWMF within WEL for the runoff outletting from SWMF2, whereas SWMF2 is providing Basic water quality control; and,
- Surface water inputs to the adjacent natural areas will be maintained in the post-development condition by directing clean roof water if necessary.

Storm drainage for the proposed development will be provided through a combination of minor (piped) and major (overland) drainage systems. The proposed development area will drain via storm sewers to SWMF1 and SWMF2, as shown in **Figure 5.3**. The storm sewers are designed for the 5-year storm event, with overland flow routes generally flowing through the proposed road allowances.

5.5 Salt Management Plan

As a condition of Site Plan Approval of the proposed multi-residential blocks, detailed salt management plans will be prepared at the time of site plan submission.

6.0 Utility Servicing

The proposed development will connect to existing services to be extended along Waterloo Street and Ingold Avenue, wherever available. KW Hydro (electrical), Bell Canada (telephone), Enbridge Gas (natural gas), and Rogers Cable (cable television) are all expected to extend their services to the subject lands during construction of the proposed development. Confirmation of utility servicing will be undertaken at the appropriate time to ensure services are available prior to occupancy.

7.0 Summary

The main findings of the Functional Servicing Report for the subject lands are:

1. Proposed lot grading and roadworks within the proposed development can be completed in compliance with the Township of Wilmot's Design Standards while maintaining the minimum required cover over the proposed sewers, maximizing the allowable flows to existing infrastructure, minimizing the need for retaining walls, avoiding grading into the buffer areas where practical; and minimizing grading within the buffer areas to the maximum practical extent possible where minor intrusions are required.
2. Streets within the subdivisions will be constructed to the Township of Wilmot's Design Standards illustrated in the cross-section in Appendix C;
3. The functional servicing of the subdivision implements the recommendations of the original *Baden and New Hamburg Water and Wastewater Master Plan Update* and all subsequent studies to date; The B/NH-W/WW-SR and the MT-SS-EA to be completed in 2022 will clarify when capacity will be made available in the downstream Morningside Trunk Sewer.
4. There is adequate capacity in the Morningside Wastewater Pumping Station to accommodate sanitary flow from the proposed subdivision;
5. Sanitary sewage collection system for the north portion of the subject lands are serviced by gravity sewer to the FG-WW-PS and forcemain which outlet to new gravity sewers servicing the south portion of the subject lands. The sanitary sewers require a CN trenchless railway crossing and outlet to the extension of the proposed gravity sewer through the Wilmot Employment Lands to the south;
6. Water Distribution – Water supply for the proposed development can satisfactorily meet the pressure and flow demands through connections to extensions of the existing municipal water distribution system within the New Hamburg Pressure Zone;
7. Storm sewer system for the proposed development can be adequately serviced through the use of existing and proposed outlets within the Ivan Gingerich Municipal Drain and through the development of Wilmot Employment Lands, respectively;
8. Stormwater management for the development will be directed to and can be accommodated by SWMF 1 and SWMF 2 within the subject lands, as outlined in the *Wilmot Woods Subdivision - Preliminary Stormwater Management Report* (April 2022); and,
9. The proposed development can be adequately serviced through the extension of existing utilities, including: hydro, gas, cable TV, and telephone.

All of which is respectfully submitted,

MTE Consultants Inc.



Alex Cressman, EIT
Designer
519-743-6500 ext. 1279
acressman@mte85.com

Jeff Martens, P.Eng.
Design Engineer
519-743-6500 ext. 1231
jmartens@mte85.com

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Appendix A

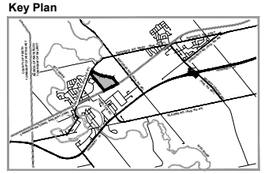
Draft Plan of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISION

Legal Description

PART OF LOT 20, CONCESSION SOUTH OF SNYDER'S ROAD
TOWNSHIP OF WILMOT
REGIONAL MUNICIPALITY OF WATERLOO

Key Plan



Subject Lands

north

SCALE: NTS

Source: SLRN, Region of Waterloo

Owner's Certificate

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

DATE: January 12, 2022

Adam Belsky

Adam Belsky, Wilmot Woods Developments Inc.

Surveyor's Certificate

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: JAN. 14, 2022

Trevor D.A. McNeil, OLS (MTE OLS LTD.)

Additional Information Required Under Section 51(17) of the Planning Act
R.S.O. 1990, c.P.13 as Amended

A. AS SHOWN	B. AS SHOWN	C. AS SHOWN
D. RESIDENTIAL, MULTIPLE RESIDENTIAL, STORMWATER MANAGEMENT, PARK, OPEN SPACE		
E. AS SHOWN	F. AS SHOWN	G. AS SHOWN
H. MUNICIPAL WATER SUPPLY	I. SANDY LOAM/CLAY LOAM	J. AS SHOWN
K. ALL SERVICES AS REQUIRED	L. AS SHOWN	

Notes

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. BOUNDARY INFORMATION AND TOPOGRAPHICAL BASE INFORMATION PROVIDED BY MTE, May 31, 2021
3. ADJACENT PARCEL FABRIC IS APPROXIMATE.
4. LOTS/BLOCKS ON THE PLAN ARE RESIDENTIAL UNLESS OTHERWISE LISTED

■ ■ ■ DENOTES STAGE LIMITS (TO BE CONFIRMED AND SHOWN ON FINAL PLAN)

19/25 MINIMUM/MAXIMUM LOT YIELD PER BLOCK

Rev. No.	Date	Issued / Revision	By
2.	Jan. 25, 2022	Final Draft Plan for Distribution;	DGS
1.	Sept. 30, 2021	For pre-consultation meeting submission;	DGS

Area Schedule 30T-_____

	Stage 1		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
Residential*	1-15	57/113	2.68
Multiple Residential	16-18	120/304	3.04
Park	19		1.00
Open Space	20-22		4.99
Stormwater Management	23,24		2.54
Service Corridor	25		0.24
0.3m Reserve	26-33		0.01
Road Widening	34		0.03
Roads			3.04
Total	34	177/417	17.57

*Blks. 2,3,5,6,7,8,9,10,11,14,15 [street towns (6m) and small single detached lots (9m)]
Blk. 1 [small single detached lots (9m-12m)]
Blks. 4,12,13 [large single detached lots (9-13.76m)]
Blks. 16,17,18 [40 uph to 100 uph (Low=Towns High=Stacked Towns)]

	Stage 2		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-5	58/103	2.34
Open Space	6		0.38
Trail			
Walkway	7		0.02
0.3m Reserve	8		0.001
Roads			0.90
Total	8	58/103	3.64

*Blks. 3,4,5 [street towns (6m) and small single detached lots (9m)]
Blk. 2 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

	Stage 3		
Lots/Blocks	Units (min/max)*	Area (ha)	
1-5	66/98	2.77	
6		0.05	
7		0.001	
		1.02	
7	66/98	3.84	

*Blk. 1 [street towns (6m) and small single detached lots (9m)]
Blks. 2,3,4,5 [small single detached lots (9m-12m)]

	Stage 4		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-6	56/79	2.43
Open Space	7		2.86
Trail			
0.3m Reserve			
Roads			0.87
Total	7	56/79	6.16

*Blks. 1,2,3,4,5 [small single detached lots (9m-12m)]
Blk. 6 [large single detached lots (9-13.76m)]

	Stage 5		
Lots/Blocks	Units (min/max)*	Area (ha)	
1-9	79/138	3.47	
10-12		0.77	
13		0.001	
		1.74	
13	79/138	5.98	

*Blks. 2(part), 3,4,5,6,7(part) [street towns (6m) and small single detached lots (9m)]
Blks. 2(part), 7(part), 9 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

	Total		
Description	Lots/Blocks	Units (min/max)	Area (ha)
Residential	40	316/531	13.69
Multiple Residential	3	120/304	3.04
Park	1		1.00
Open Space	5		8.23
Stormwater Management	2		2.54
Trail	4		0.82
Walkway	1		0.02
Service Corridor	1		0.24
0.3m Reserve	11		0.01
Road Widening	1		0.03
Roads			7.57
Total	69	436/835	37.19

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON, N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Approval Stamp

Date	January 25, 2022
File No.	2123A
Plan Scale	1:2,000 (24x36)
Drawn By	D.G.S.
Checked By	P.B.

Project Wilmot Woods

Applicant

Wilmot Woods Developments Inc.
310 Fairway Rd. S
P.O. Box 45016
Kitchener, ON. N2C 2R6
P: 519.570.2137

north

File Name DRAFT PLAN

Dwg No. 1 of 1

Scale Bar 0 10 25 50 100m

K:\2123A-NH Properties-New Hamburg\DP\Draft Plan January25 2022 email.dwg

Appendix B

Geotechnical Investigation

GEOTECHNICAL INVESTIGATION
PROPOSED WILMOT WOODS DEVELOPMENT
NEW HAMBURG, ONTARIO

for

WILMOT WOODS DEVELOPMENT INC.

PETO MacCALLUM LTD.
16 FRANKLIN STREET SOUTH
KITCHENER, ONTARIO
N2C 1R4
PHONE: (519) 893-7500
FAX: (519) 893-0654
EMAIL: kitchener@petomaccallum.com

Distribution:
1 cc: Wilmot Woods Development Inc.
1 cc: MTE Consultants Inc. (+email – jcabral@mte85.com)
1 cc PML Kitchener

PML Ref.: 18KF031
Report: 1
February 24, 2022

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 1

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr. Belksy

Geotechnical Investigation
Proposed Wilmot Woods Development
New Hamburg, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed at the above noted project site. Authorization to proceed with this assignment was provided by Mr. Galbraith in an email dated July 9, 2018.

In general, the project involves the proposed construction of a residential subdivision on a 37 Ha site located south of Waterloo Street and north or the railway in New Hamburg, Ontario. The proposed development is located on an existing agricultural property. Details of the proposed development have yet to be established, but in general it is understood that approximately 600 residential dwellings will be constructed at the site. It is anticipated that the proposed development will have full municipal servicing including watermain, storm and sanitary sewers, with typical invert depths expected to be to a maximum 3 m depth below existing grade. It is also understood that a trunk sewer will extend southward from the site, under the railway and connect to a proposed trunk sewer on the neighbouring property (the Wilmot Employment Lands). Two storm water ponds also are proposed for the development, one near the northwest corner of the site, and the second at the south side of the site.

16 Franklin Street South, Kitchener, Ontario N2C 1R4
Tel: (519) 893-7500 Fax: (519) 893-0654
E-mail: kitchener@petomaccallum.com
BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

The purpose of the current geotechnical investigation was to explore the subsurface soil and ground water conditions at the site and based on this information, to provide geotechnical recommendations for the proposed development. Specific considerations to be addressed in this report include:

- A description of the site and the field investigation procedure;
- A summary of the subsurface soil and ground water conditions encountered;
- Log of borehole sheets, a borehole location plan drawing, and geotechnical laboratory test results;
- Excavation and construction dewatering requirements;
- House foundation design, including bearing resistances, settlement projections and site class for seismic design;
- Slab on grade floors and below grade walls, including compaction requirements and geotechnical suitability of onsite soils for re-use;
- Site servicing (storm, sanitary, water and utilities) including pipe bedding requirements;
- Pavement structure design for new roadways; and,
- Suitability of native soils for infiltration of stormwater.

Recommendations for the proposed trenchless crossing of the railway will be provided under separate cover.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for the current project only. Any changes in plans will require review by PML to assess the applicability of the report, and may require modified recommendations, additional analysis and / or investigation. When the project design is complete, the general recommendations given in this report should be reviewed by PML to ensure their applicability.

Investigation Procedure

The field work for this geotechnical investigation was conducted between July 30 and October 15, 2018. The investigation program comprised a total of 22 boreholes (BH1 to BH12 and MW101 to MW110) advanced to between 6.5 and 12.6 m depth, with monitoring wells installed in ten of the boreholes (designated MW101 to MW110). The borehole and monitoring well locations are shown on the appended Borehole Location Plan, Drawing 1.

The borehole locations were established in the field by PML. Borehole locations were surveyed by PML using a Global Navigation Satellite System (GNSS). The survey equipment was provided by SOKKIA Canada, model GCX-2.

The boreholes were advanced using a Diedrich D-50 track mounted drillrig fitted with continuous flight solid and hollow stem augers and automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under the full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) were carried out during sampling operations in the boreholes using conventional split spoon equipment. Pocket penetrometer testing was carried out on the recovered samples to determine the undrained shear strength of the cohesive soils. Ground water observations were made in the boreholes during and upon completion of drilling. The boreholes were backfilled in accordance with O.Reg.903 upon completion of drilling.

Monitoring wells were installed in ten boreholes to more accurately measure ground water levels. The monitoring wells comprised 50 mm diameter PVC pipe, filter sand, bentonite seals, and protective casings. Subsequent water level measurements from the wells were conducted by PML.

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification, and routine moisture content determinations. The laboratory testing also included particle size distribution analyses on eleven samples of the major soil types encountered.

Summarized Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the field work including soil descriptions, inferred stratigraphy, standard penetration test (SPT) N values, pocket penetrometer test values, ground water observations and laboratory moisture content determinations.

Due to the soil sampling procedures and the limited size of samples, the depth / elevation demarcations on the borehole logs must be viewed as "transitional" zones, and cannot be construed as exact geologic boundaries between layers.

In general, the soil stratigraphy encountered comprised surficial topsoil and localized fill, underlain by an extensive clayey silt deposit containing localized discontinuous cohesionless silt, sandy silt, silty sand and sand layers.

Surficial topsoil was contacted in all of the boreholes, with the exception of Borehole 104. The topsoil was between 180 and 850 mm thick, with an average of 294 mm.

Surficial fill was encountered locally in Borehole 104, and extended 0.68 m depth.

An extensive clayey silt deposit was encountered below the surficial topsoil and fill deposits, in all of the boreholes, and extended to the 6.5 to 12.6 m borehole termination depths. The cohesive clayey silt deposit was generally firm to very stiff based on SPT N values between 4 and 30 blows per 0.3 m penetration of the split spoon sampler. Pocket penetrometer shear strengths of the clayey silt ranged between 50 and 225 kPa. Moisture content ranged between 8 and 31% indicating drier than plastic limit (DTPL) to wetter than limit (WPL) conditions in the cohesive clayey silt soils.

Reference is given to the appended Figures 1 to 6 for the results of the particle size analyses conducted on samples of the clayey silt.

Discontinuous localized layers of cohesionless silt, sandy silt, silty sand and sand were encountered above, below and within the clayey silt, in Boreholes BH5, BH6, BH9, MW101, MW102. These layers were loose to compact based on SPT N values between 5 to 28 blows per 0.3 m penetration of the split spoon sampler. Moisture contents ranged between 5 and 22% indicating damp to saturated conditions in the cohesionless soils. Reference is given to Figures 6 to 11 for the results of particle size distribution analyses conducted on samples of the silt, sandy silt, silty sand, and sand soils.

Ground Water Conditions

Ground water observations carried out during and upon completion of drilling are presented on the appended Log of Borehole Sheets.

During drilling, wet and saturated conditions were generally encountered in the silt, sandy silt, silty sand and sand layers below 1.0 to 2.9 m depth (Elevation 338.1 to 340.3). Free water was observed upon completion of drilling, in Boreholes 2 and 9, below 2.0 to 2.3 m depth (Elevation 339.4 to 340.9).

On November 26, 2018 water level measurements from the monitoring wells installed in Boreholes 101 to 110 ranged between 0.1 to 5.4 m depth below existing grade (about Elevation 338.1 to 344.1).

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns. It should be noted that the relatively impermeable nature of the clayey silt deposits could contribute to the development of perched water conditions following short term and seasonal participation events.

Discussion and Recommendations

In general, the project involves the proposed construction of a residential subdivision on a 37 Ha site located south of Waterloo Street and north of the railway in New Hamburg, Ontario. It is anticipated that the proposed development will have full municipal servicing including watermain, storm and sanitary sewers, with typical invert depths expected to be to a maximum 3 m depth below existing grade. It is also understood that a trunk sewer will extend southward from the site, under the railway and connect to a proposed trunk sewer on the neighbouring property (the Wilmot Employment Lands). Two storm water ponds also are proposed for the development.

Foundations and Earthworks Grading

Details of the buildings in the proposed residential subdivision have yet to be established. We have provided the following preliminary foundation design recommendations and earthworks grading recommendations for the development.

The site is generally underlain by firm to very stiff clayey silt. It is feasible to support buildings on conventional spread or strip footings founded in the native firm to very stiff clayey silt. Based on the investigation findings, footings founded a minimum 0.3 m into the firm to very stiff native clayey silt deposits, below any surficial fill and topsoil and local surficial soft or loose zones, may be designed for a net bearing resistance of 150 kPa at the serviceability limit state (SLS) and a factored bearing resistance of 225 kPa at the ultimate limit state (ULS).

Alternatively, in areas where grades are to be raised footings may be placed at higher elevations on engineered structural fill. The existing topsoil and fill must be excavated to the levels of competent native clayey silt deposits in advance of engineered structural fill placement. Engineered structural fill used to establish footing founding subgrade levels should comprise an approved compactable inorganic soil, placed in lifts with a maximum thickness of 300 mm and be compacted to at least 98% standard Proctor maximum dry density (SPMDD). Additional generic recommendations for engineered fill construction are provided in Appendix A. Footings supported on approved engineered structural fill may also be designed using the values for a net factored resistance of 150 at SLS and 225 kPa at ULS. Full time inspection of any structural fill placement by PML personnel is recommended to approve subgrade conditions, fill materials and to verify that the specified compaction levels are being achieved.

The excavated soils likely to be used for site grading will comprise primarily clayey silt soils, in DTPL to WTPL condition, with moisture contents between 8 to 31%. Material described as 'wet' or 'WTPL' on the appended borehole will generally not be compactible to 98% SPMDD and should be segregated and allocated to areas where post construction settlement would not present a concern. The bulk of the clayey silt soil to be excavated would be too wet for immediate reuse given the observed moisture conditions.

Therefore, the excavated soils are considered suitable for reuse only if the work is carried out during the dry summer months and the construction schedule is flexible to permit air drying to reduce the moisture content closer to the optimum value.

It should also be noted that the in-situ clayey silt materials will tend to retain a voided structure when placed as backfill. Sufficient compaction must be applied to breakdown all lumps / clods within the fill matrix to achieve a non-voided condition. Significant post construction settlement could otherwise result.

The maximum total settlement of foundations designed for the net SLS bearing pressures noted above are not expected to exceed 25 mm. Differential settlements of around 50 to 75% of the total settlement should be anticipated.

All founding surfaces should be examined by PML personnel prior to concrete placement, to check that all loose, frozen, organic or otherwise deleterious materials have been satisfactorily removed and the required bearing capacity is available throughout.

All exterior footings and all footings exposed to seasonal freezing conditions must be provided with frost protection. The minimum frost protection should be 1.2 m of earth cover or the thermal insulation equivalent.

Design provisions for earthquake loading should also be applied. For the soil conditions at the site, a Class D site category may be assumed, in accordance with the 2012 Ontario Building Code.

Slab-on-Grade Floors

Preparation of the floor slab subgrade should include stripping of the surficial, topsoil, and other deleterious material, placement and compaction of engineered fill, if necessary, followed by proof rolling of the exposed subgrade with a heavy roller to ensure uniform adequate support. Excessively loose, soft or compressible materials revealed during the proofrolling operations should be subexcavated and replaced with well compacted approved material.

Engineered fill placed under the floor slab to achieve finished subgrade levels or as foundation wall backfill should comprise approved inorganic material having a moisture content within 3% of the optimum value, placed in maximum 200 mm thick lifts, and compacted to at least 95% SPMDD. Reference is given to Appendix A for additional engineered fill construction recommendations.

A minimum 150 mm thick layer of free draining Granular A type material compacted to 98% SPMDD is recommended directly beneath the slab-on-grade. A polyethylene vapour barrier should be placed on the surface of the granular base if a moisture sensitive finish is to be placed on the floor. Joints should be saw cut into concrete floor immediately after initial set of the concrete to control potential cracking of the slab.

Below Grade Walls

Below grade walls and basement walls should be designed as retaining walls to resist the unbalanced horizontal earth pressure imposed by the backfill adjacent to the wall. The unfactored lateral earth pressure, p, may be computed using the following equation, assuming a triangular pressure distribution:

$$p = K(\gamma h + q)$$

where K = lateral earth pressure coefficient
= 0.5 for wall restrained at both top and bottom

γ = unit weight of free-draining granular material
= *21* kN/m^3

h = depth below final grade (m)

q = surcharge load (kPa), if present

The excavation adjacent to the basement walls should be backfilled with free-draining granular material satisfying the OPS Granular B gradation specification and a weeping tile system installed to minimize the build-up of hydrostatic pressure behind the wall.

The weeping tiles should be surrounded by a properly designed graded granular filter or wrapped with approved geotextile to prevent migration of fines into the system. The drainage pipe should be placed on a positive grade and lead to a frost-free sump or outlet.

Excavation and Ground Water Control

It is generally envisaged that excavations for the earthworks and site servicing will extend to a maximum 5 m depth within the proposed development.

Excavations for service installations are expected to extend up to about 3 m depth through topsoil and into the native clayey silt deposits containing localized layers of silt, sandy silt, silty sand and sand, which are classified as Type 3 materials as defined in the OHSA. Subject to inspection and providing adequate ground water control is achieved, excavations within Type 3 soils that are to be entered by workers should be inclined from the base of the excavation at one horizontal to one vertical (1H:1V) or flatter.

It is anticipated that ground water seepage or surface water entering the excavations will be handled readily by conventional sump pumping. The actual dewatering methods should be established at the contractor's discretion within the context of a performance specification for the project. Regardless of the dewatering method chosen, the hydraulic head and ground water inflow must be properly controlled to ensure a stable and safe excavation and to facilitate construction. The design of the dewatering system should be specified to maintain and control ground water at least 0.3 m below the excavation base level, in order to provide a stable excavation base throughout construction.

It should be noted that, under the Ontario Water Resources Act, the Water Taking and Transfer Regulation 387/04, a Permit to Take Water (PTTW) from the Ministry of Environment Conservation and Parks (MECP) is required if the dewatering discharge is greater than 400,000 L/day. In accordance with the above noted regulatory requirements and in compliance with the MECP's PTTW Manual (April 2005), and application should be filed to the MECP for the subject property construction dewatering PTTW, if the dewatering discharge is greater than 400,000 L/day, or about 4.6 L/S. If the dewatering discharge is between 50,000 L/day (or about 0.6 L/S) and 400,000 L/day (or about 4.6 L/S) dewatering activities need to be registered on the Environmental Activity and Sector Registry (EASR). PML would be pleased to assist with this process, if required. The depth of excavations for site grading and site servicing are expected to extend to a maximum 3 m depth into clayey silt deposits with wet to saturated layers of silt, sand, sandy silt, and silty sand and it is generally envisaged that sump pumping from within trenching excavating will have dewatering rates less than 50,000 L/day, and a PTTW or EASR should not be required.

It is recommended that test pits be carried out during the tendering stage of the project in order that prospective contractors may familiarize themselves with soil and ground water conditions to be contacted. Also, as noted above, the dewatering requirements should be established by the contractor in the context of a performance specification.

Pipe Bedding and Cover

It is expected that the proposed water and sewer pipes will be founded on competent native deposits, or engineered fill. Providing adequate ground water control is achieved, bearing problems are not anticipated for conduits founded on the native mineral soils or engineered fill. It may be necessary to increase the bedding thickness if excessively loose, soft or wet conditions are present at the pipe subgrade. The need for this is best determined during construction.

Conventional bedding and cover constructed in accordance with applicable Ontario Provincial Standard Drawings (OPSD) will be suitable. Material containing stones larger than 50 mm size should not be used in the bedding layer. The bedding and cover material should be placed in 150 mm lifts compacted to at least 95% SPMDD. Compaction should be provided beneath the pipe haunches to provide uniform support. Over-compaction should be avoided as damage to the pipe could result.

Trench backfill material should comprise approved material placed in uniform 200 mm thick lifts within 3% of the optimum moisture content and compacted to at least 95% SPMDD.

It is anticipated that the excavated material will primarily comprise clayey silt. The in-situ moisture content of the clayey silt typically ranges from 8 to 31%. Based on our experience with similar types of material, the upper limit of placement moisture content compatible with efficient compaction is expected to be about 15%. Therefore, the excavated clayey silt containing wet and saturated soils are considered suitable for reuse only if the work is carried out during the dry summer months and the construction schedule is flexible to permit air drying to reduce the moisture content closer to the optimum value.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for reuse. Organic soil, topsoil, deleterious or excessively wet material should not be used as backfill. Should construction start during the winter season, particular attention must be given to ensure that frozen material is not used as backfill for service trenches. Topsoil may be reused for landscape purposes only.

It should also be noted that the in-situ clayey silt materials will tend to retain a voided structure when placed as backfill. Sufficient compaction must be applied to breakdown all lumps / clods within the fill matrix to achieve a non-voided condition. Significant post construction settlement could otherwise result.

The trenching and backfilling operations should be carried out in a manner which minimizes the length of trench left open yet accommodates efficient pipe laying and compaction activities.

Soil Infiltration

Two storm water management (SWM) ponds are proposed for the site. The first SWM pond will be near Boreholes BH2, MW102 and MW103, while the second will be near MW108 and MW109. Design details of the ponds have yet to be finalized. Typical soils at the pond site comprise clayey silt with occasional to numerous silt layers and deposits of sand and sandy silt. Although the clayey silt is considered to be relatively impermeable, the silt, sandy silt and sand layers which are interlayered with the clayey silt are more permeable. Therefore, it will be necessary to line the base of the ponds to maintain the permanent pool water levels.

The earthen liner should comprise clayey silt soils having a hydraulic conductivity of no more than $1x10^{-6}$ cm/s. The native clayey silt has a permeability less than $1x10^{-6}$ cm/sec, however, inspection and testing during construction will be required to confirm if excavated materials are suitable for reuse as the earth liner.

Fill used for earth liner construction at the pond, should be placed in lifts with a maximum 300 mm thickness, and compacted to at least 95%SPMDD. General recommendations for fill subgrade preparation and engineered fill construction are provided in Appendix A.

Where berms are required, they should be constructed using select soil placed in maximum 300 mm thick lifts compacted to 95% SPMDD. Finished slopes of the ponds should not be steeper than 5H:1V for the interior. Slopes should be provided with vegetation cover or other means for erosion protection.

Full-time inspection should be carried out by PML personnel to examine and approve backfill, fill placement operations, and to check the compaction by in situ density testing using nuclear gauges.

It is understood that onsite storm water infiltration parameters are required. The following table provides hydraulic conductivity and infiltration design parameters for the major onsite soils encountered. An appropriate factor of safety should also be used for design.

SOIL	HYDRAULIC CONDUCTIVITY (cm/s)	INFILTRATION RATE (mm/hr)
Clayey Silt/Silt	Less than $1x10^{-6}$	Less than 0.1
Silt/Sandy Silt/Silty Sand	$1x10^{-4}$ to $1x10^{-5}$	2
Sand	$1x10^{-3}$	40

Cognizant of the low permeability and infiltration rates and considering the limited extent and high groundwater level within the silt/sandy silt/silty sand/sand layers, the amount of onsite infiltration is expected to be negligible.

Pavement Design

Based on the proposed pavement usage, frost susceptibility, and strength of the expected subgrade soils, the following minimum pavement component thicknesses are considered suitable for the proposed residential subdivision roadways.

PAVEMENT COMPONENT	THICKNESS (mm)
Asphalt	80
Granular A Base	150
Granular B Subbase	600

The pavement design considers that construction will be carried out during the drier time of the year and that the subgrade is stable, as determined by proofrolling and inspection by PML personnel. If the subgrade is wet and unstable, subexcavation and placement of additional granular subbase material will be required.

In areas where the subgrade is sensitive to disturbance or construction is to occur outside of the drier time of year, then consideration can be given to thickening the granular subbase or using a geotextile separator between the pavement structure and subbase, in lieu of additional granular subbase. The geotextile separator envisaged should provide reinforcement, filtration and separation of the granular subbase from the anticipated clayey silt / clayey silt fill subgrade soils, and a woven geotextile such Terrafix's 200 W (or equivalent) is envisaged.

The pavement materials should conform to current OPS and municipal specifications. The Granular A base and Granular B subbase courses should be placed in thin lifts and be compacted to a minimum of 100% SPMDD, and asphalt should be placed to a minimum of 92% of the material's maximum relative density (MRD) and reference is made to OPS Specification 310.

During construction, testing should be conducted to confirm the gradation and compactibility characteristics of the granular base materials and the mix design properties of the asphalt.

Proofrolling procedures and the placement and compaction of all the granular materials and asphalt for the pavement construction should be inspected on a continuous basis by PML personnel.

The pavement subgrade materials will lose strength to support traffic loads if allowed to become wet. Moreover, the silty clay subgrade soils are considered frost susceptible and the roadway may heave during freezing and thawing periods. Drainage of the pavement structure is essential to maintain structural integrity and limit frost heave. In this regard, installation of longitudinal subdrains is recommended. The longitudinal subdrains should comprise a minimum 100 mm diameter perforated plastic pipe, set below the subbase level, and outlet to ditching, or catch basins. Subdrain pipes should be surrounded by appropriate filter media such as clear stone wrapped in geotextile, or alternatively the pipes should be wrapped in filter cloth and surrounded by concrete sand.

Geotechnical Review and Construction Inspection and Testing

When development design is complete, it is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify the specified degree of compaction is achieved uniformly throughout fill materials.

The comments and recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where service trenches exist. Geotechnical review during construction should be on going to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

This report is subject to the Statement of Limitations that is included in Appendix B, which must be read in conjunction with the report

Closure

We trust the information presented in this report is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

LICENSED PROFESSIONAL ENGINEER
W.A.P. LOGHRIN
100143946
Feb. 24/2022
PROVINCE OF ONTARIO

William Loghrin, P.Eng.
Manager Engineering Services

LICENSED PROFESSIONAL ENGINEER
G.P. MITCHELL
32057507
Feb 24/22
PROVINCE OF ONTARIO

Gerry Mitchell, MEng, P.Eng.
Senior Consultant

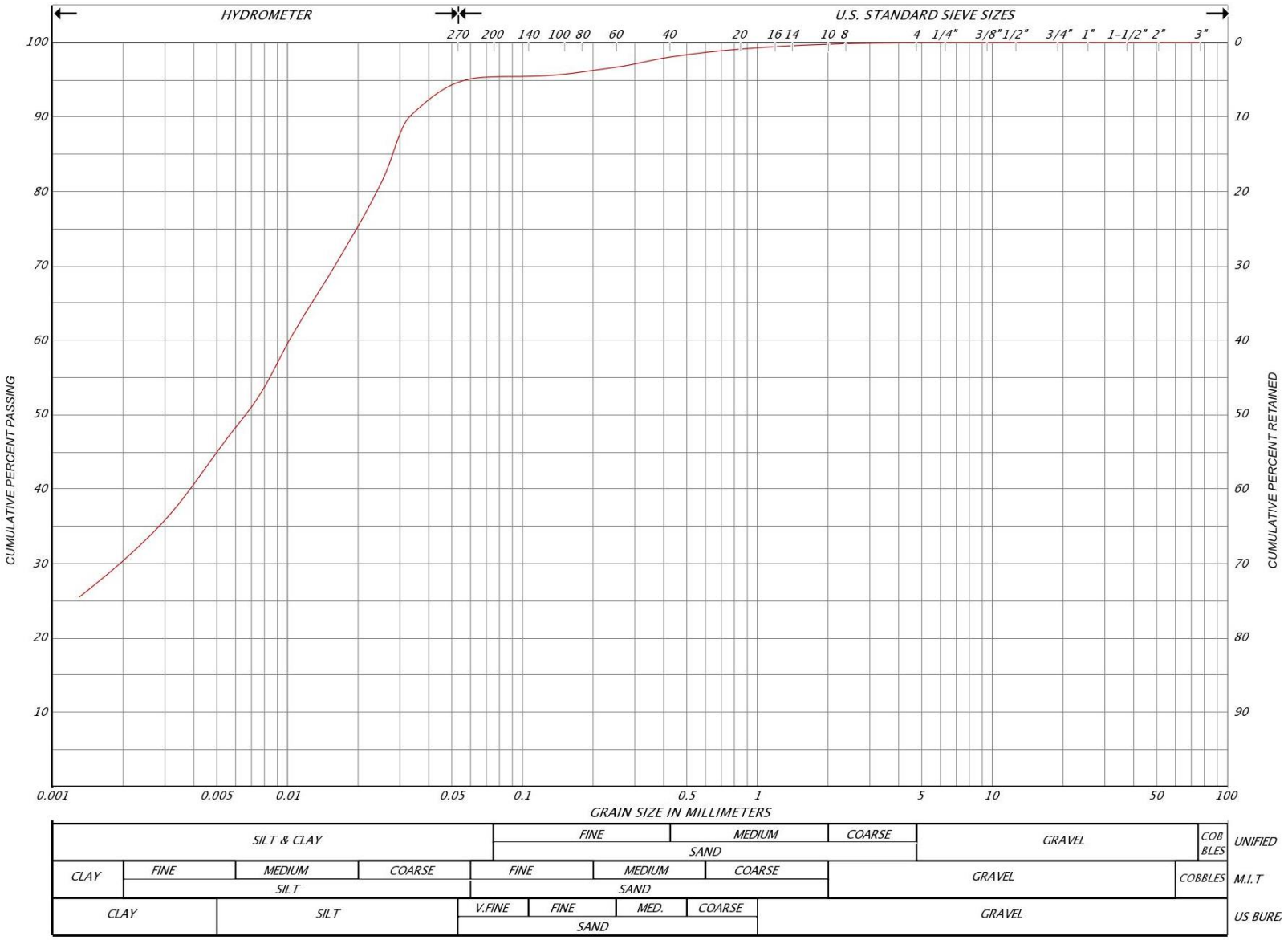
WL/GM:tm

Enclosures:
Figures 1 to 11 - Particle Size Distribution Charts
List of Abbreviations
Log of Boreholes BH1 to BH12 and BH/MW101 to BH/MW110
Drawing 1 - Borehole Location Plan
Appendix A – Engineered Fill
Appendix B – Statement of Limitations

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 1



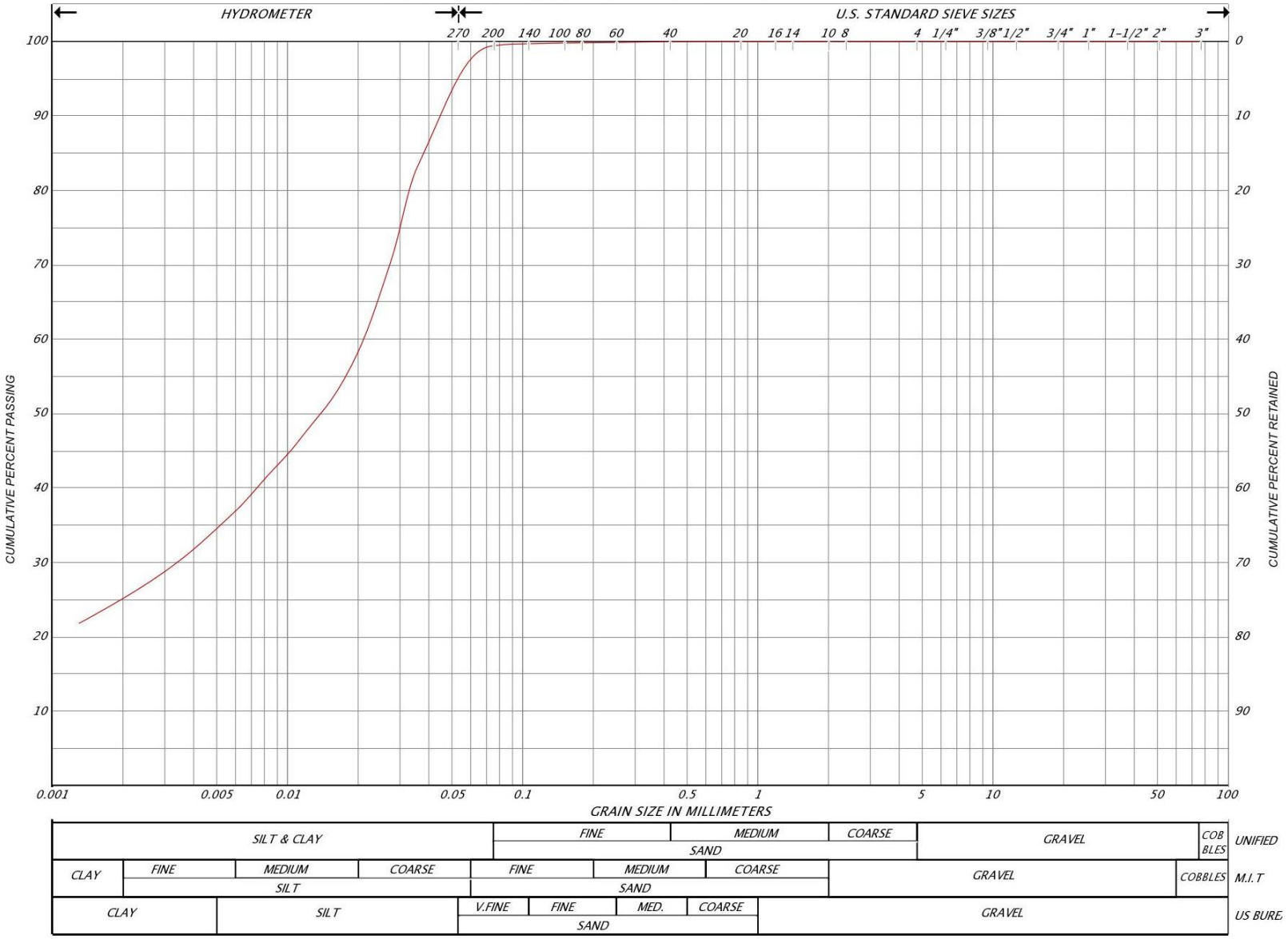
REMARKS Borehole MW101, Sample SS7, Depth 6.1 to 6.5 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 2



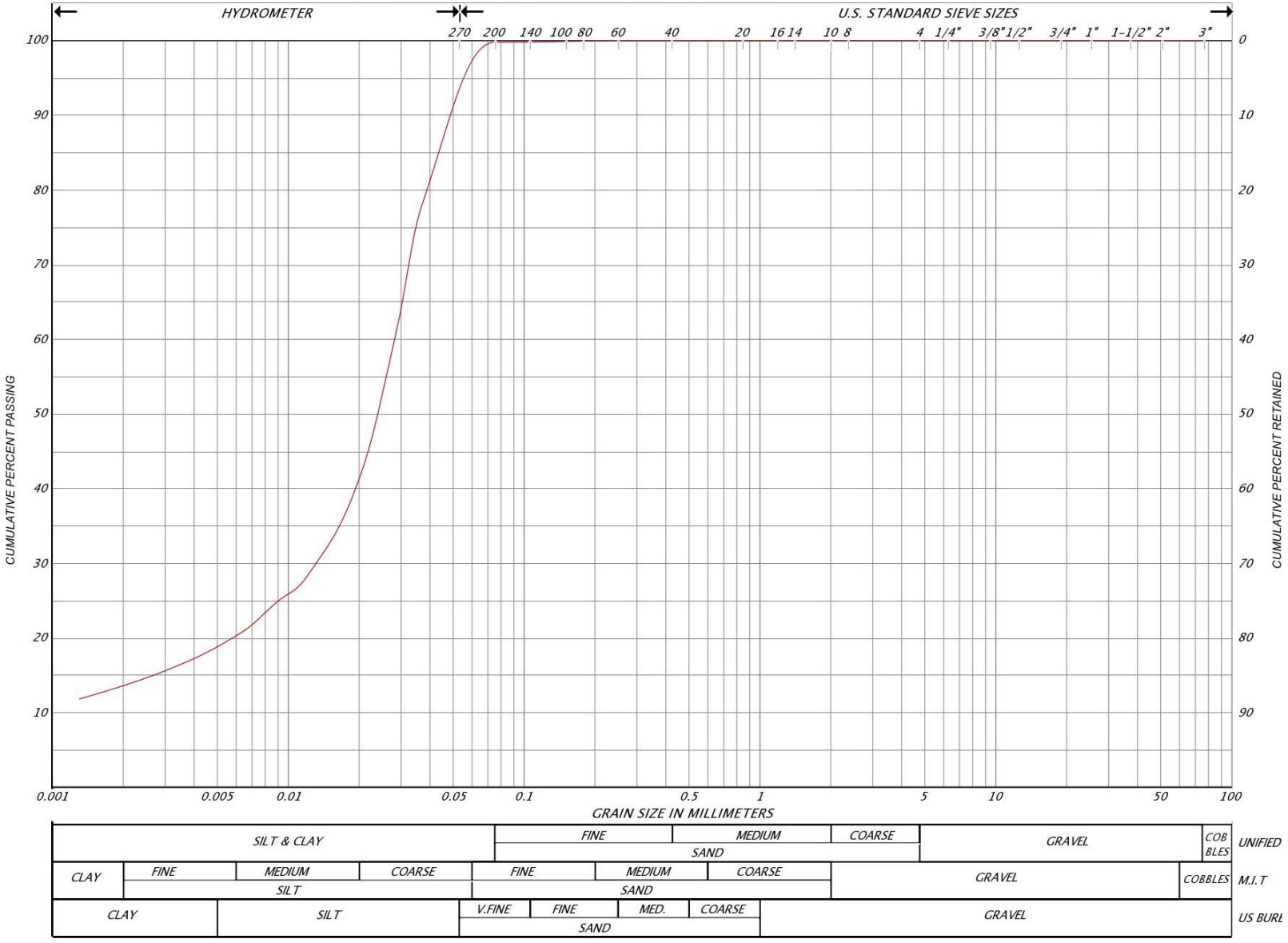
REMARKS Borehole MW104, Sample SS6, Depth 4.6 to 5.0 m

CLAYEY SILT

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PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 3



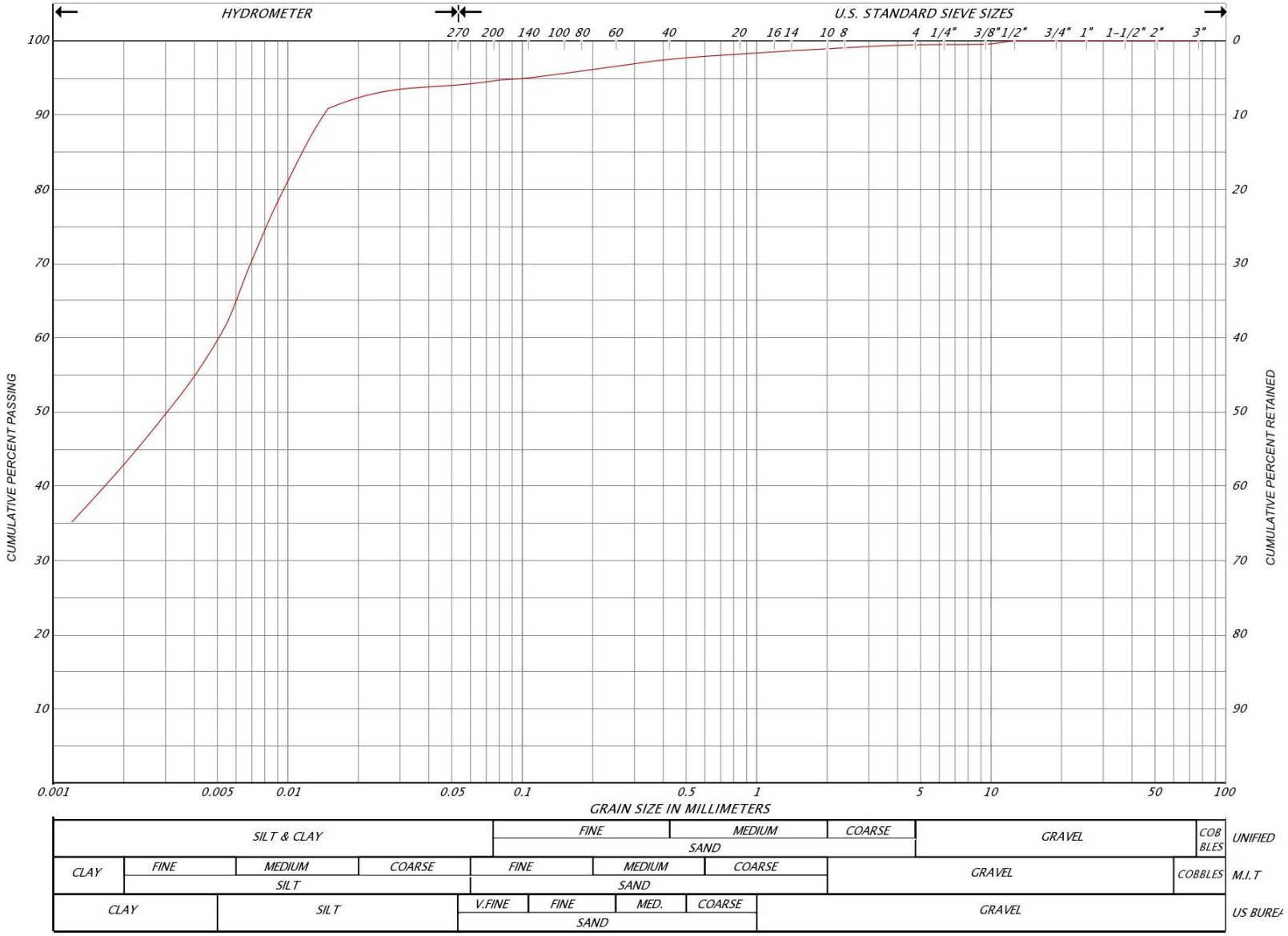
REMARKS Borehole MW105, Sample SS6, Depth 4.5 to 5.0 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 4



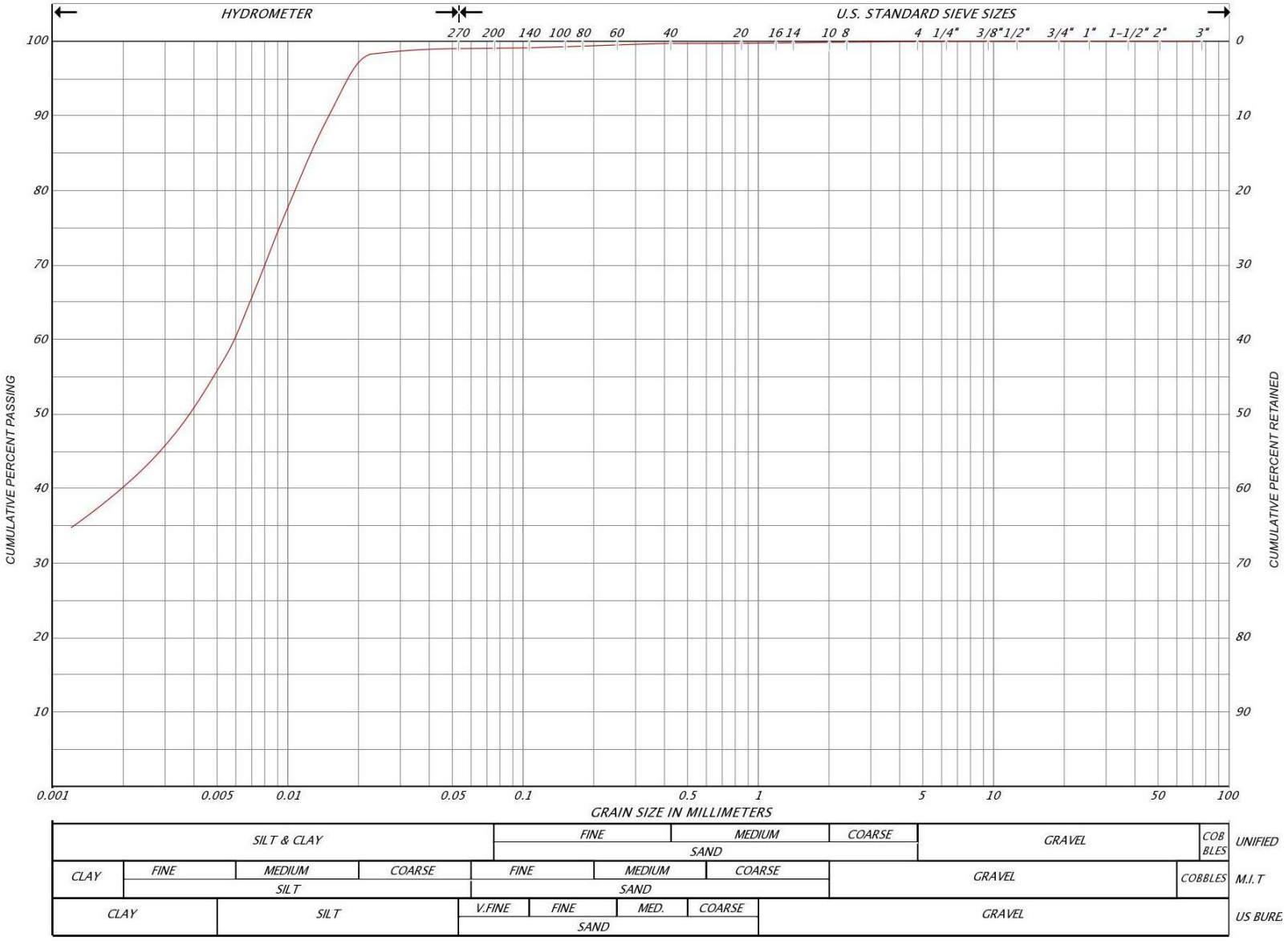
REMARKS Borehole MW107, Sample SS3, Depth 1.5 to 2.0 m

CLAYEY SILT

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CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 5



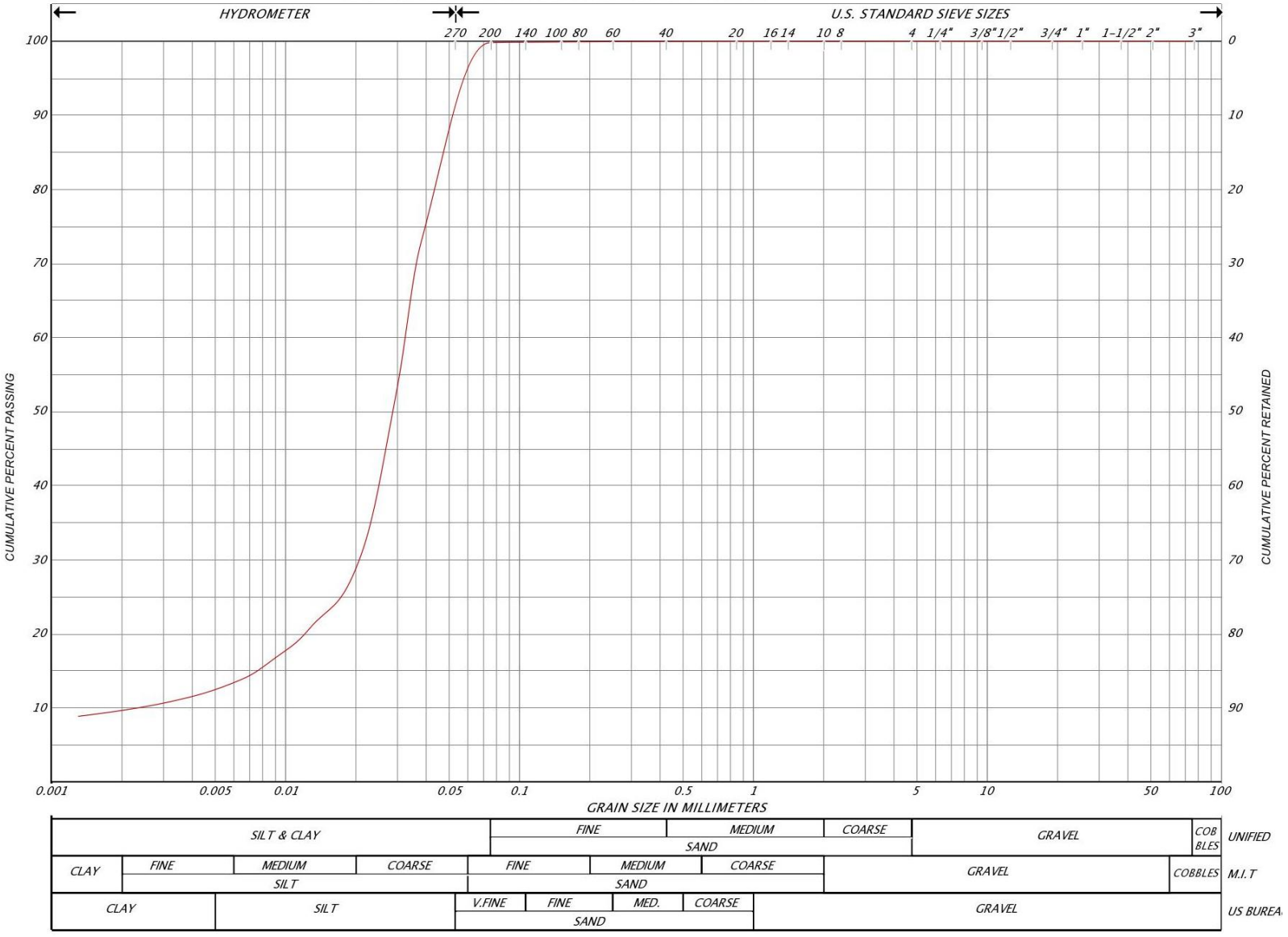
REMARKS Borehole MW107, Sample SS6, Depth 4.6 to 5.0 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 6



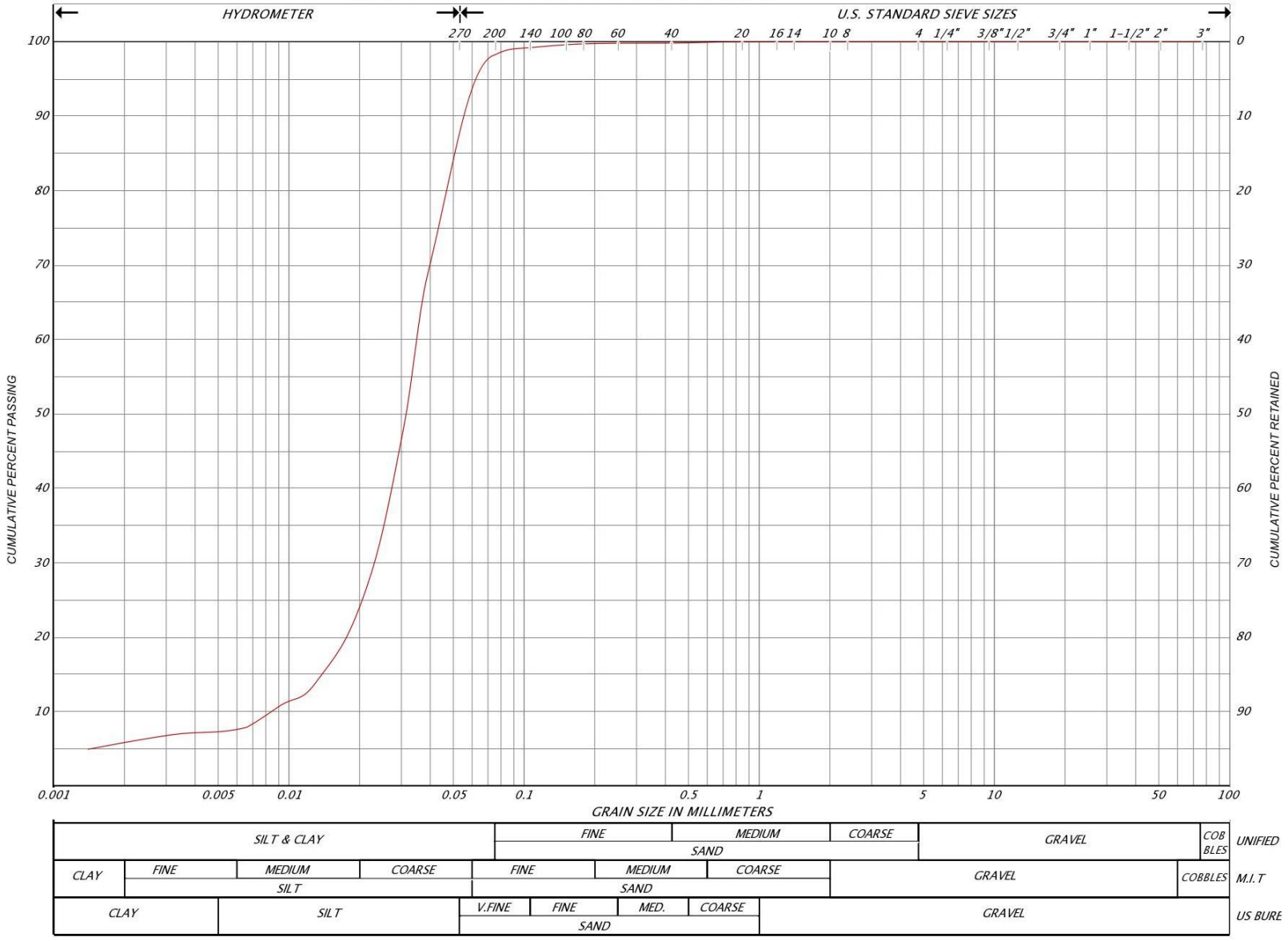
REMARKS Borehole MW109, Sample SS11, Depth 9.1 to 9.6 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 7



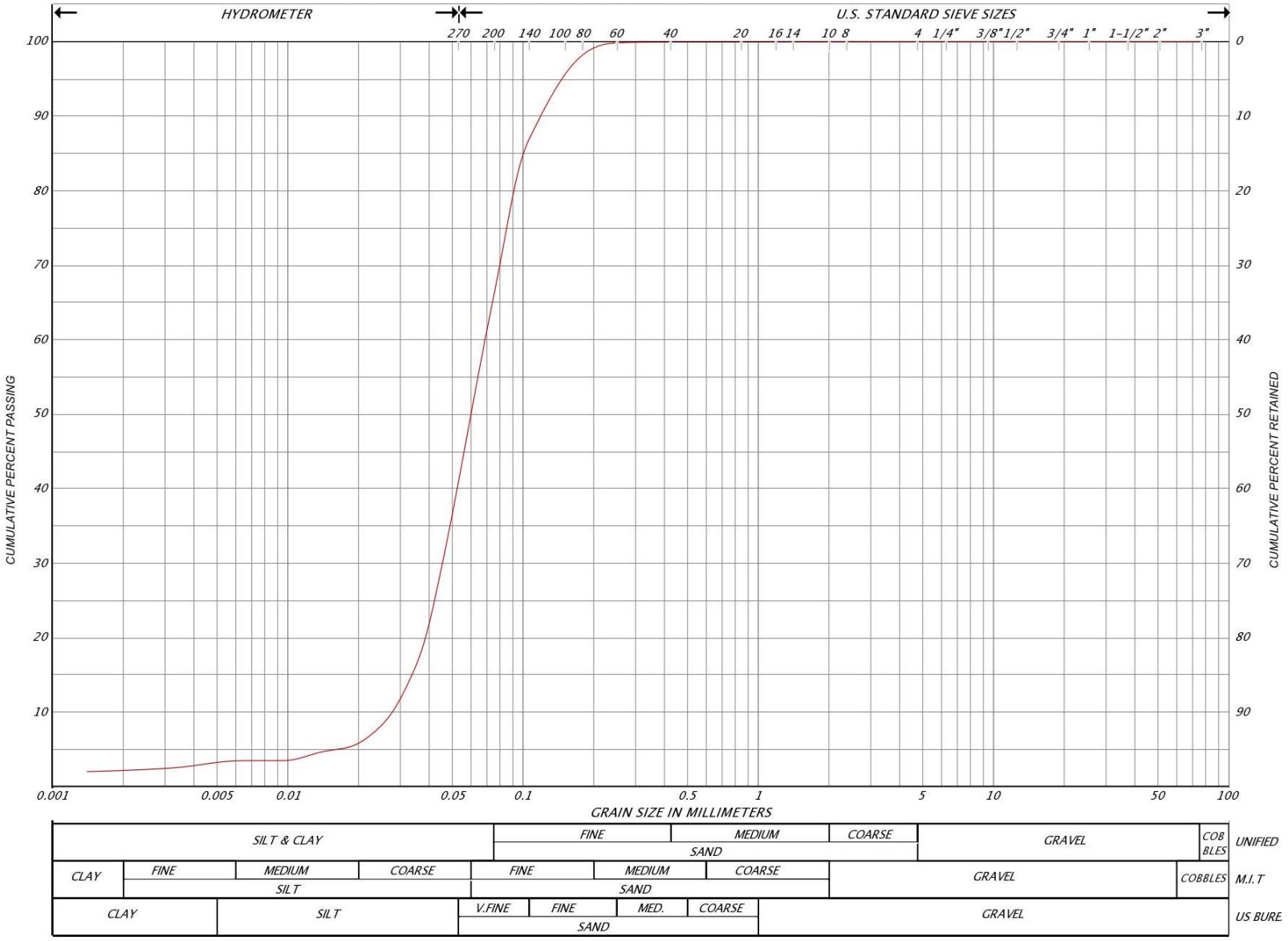
REMARKS Borehole BH9, Sample SS3, Depth 1.5 to 2.0 m

SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 8



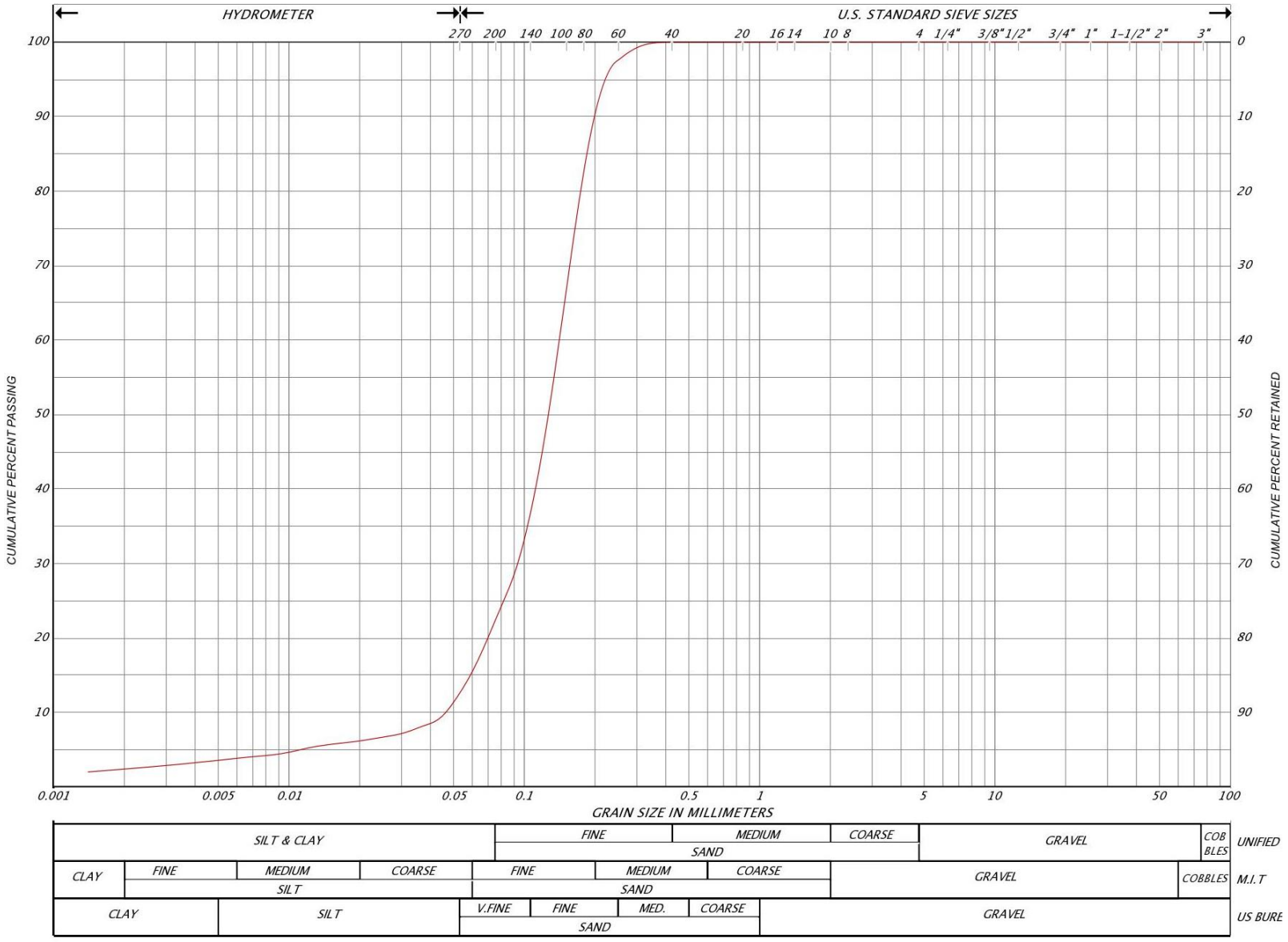
REMARKS Borehole MW102, Sample SS6, Depth 4.6 to 5.0 m

SANDY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 9



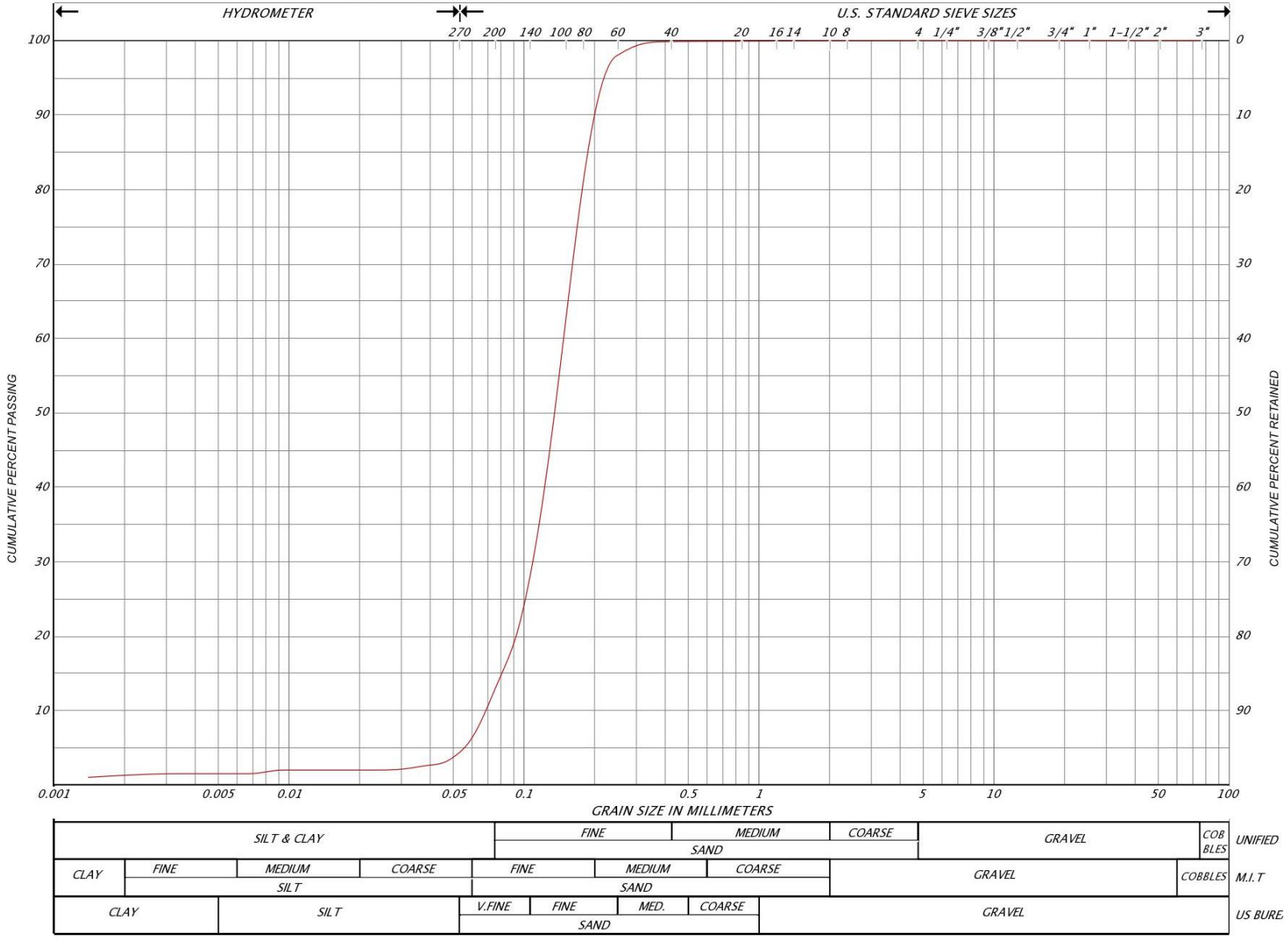
REMARKS Borehole BH9, Sample SS5, Depth 3.1 to 3.5 m

SILTY SAND

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 10



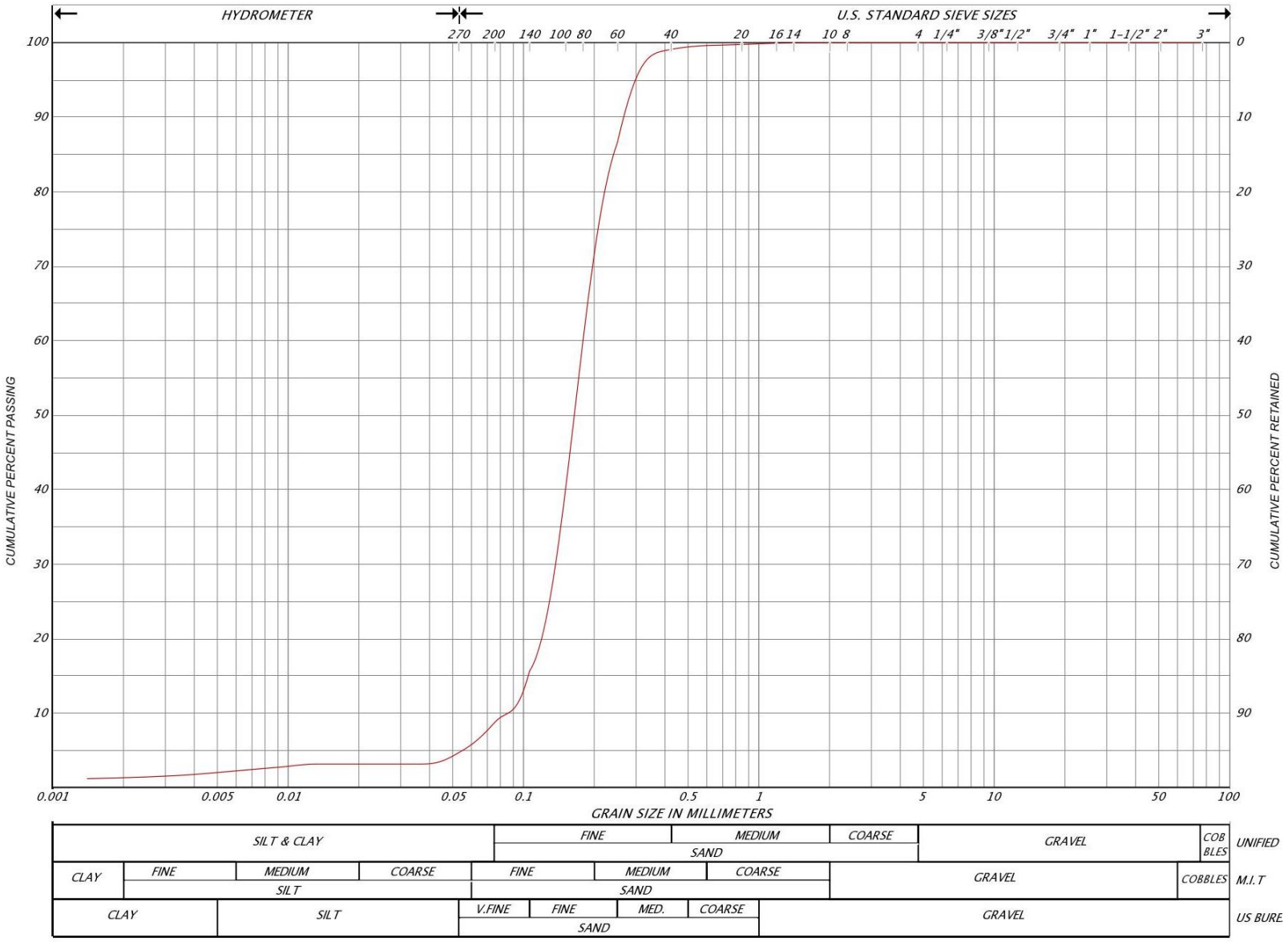
REMARKS Borehole BH6, Sample SS5, Depth 3.1 to 3.5 m

SAND

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 11



REMARKS Borehole MW102, Sample SS4, Depth 2.3 to 2.7 m

SAND

LIST OF ABBREVIATIONS

PENETRATION RESISTANCE

Standard Penetration Resistance N: - The number of blows required to advance a standard split spoon sampler 0.3 m into the subsoil. - Driven by means of a 63.5 kg hammer falling freely a distance of 0.76 m.

Dynamic Penetration Resistance: The number of blows required to advance a 51 mm, 60 degree cone, fitted to the end of drill rods, 0.3 m into the subsoil. The driving energy being 475 J per blow.

DESCRIPTION OF SOIL

The consistency of cohesive soils and the relative density or denseness of cohesionless soils are described in the following terms:

CONSISTENCY	N (blows/0.3 m)	c (kPa)	DENSENESS	N (blows/0.3 m)
Very Soft	0 - 2	0 - 12	Very Loose	0 - 4
Soft	2 - 4	12 - 25	Loose	4 - 10
Firm	4 - 8	25 - 50	Compact	10 - 30
Stiff	8 - 15	50 - 100	Dense	30 - 50
Very Stiff	15 - 30	100 - 200	Very Dense	> 50
Hard	> 30	> 200		

WTPL	Wetter Than Plastic Limit
APL	About Plastic Limit
DTPL	Drier Than Plastic Limit

TYPE OF SAMPLE

SS	Split Spoon	TW	Thinwall Open
WS	Washed Sample	TP	Thinwall Piston
SB	Scraper Bucket Sample	OS	Oesterberg Sample
AS	Auger Sample	FS	Foil Sample
CS	Chunk Sample	RC	Rock Core
ST	Slotted Tube Sample	USS	Undisturbed Shear Strength
PH	Sample Advanced Hydraulically	RSS	Remoulded Shear Strength
PM	Sample Advanced Manually		

SOIL TESTS

Qu	Unconfined Compression	LV	Laboratory Vane
Q	Undrained Triaxial	FV	Field Vane
Qcu	Consolidated Undrained Triaxial	C	Consolidation
Qd	Drained Triaxial		

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LOG OF BOREHOLE NO. 1

17T 523755E 4804492N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** September 24, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** M. Rapsey

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 339.37					
0.22	339.15	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1	SS	6	339
		CLAYEY SILT: Soft brown clayey silt, some sand, moist					
1.1				2	SS	3	
1.4	338.0	becoming WTPL becoming firm					338
				3	SS	7	
2.1	337.3	becoming stiff, numerous silt layers					
				4	SS	14	337
				5	SS	12	336
							335
				6	SS	11	
							334
				7	SS	12	
6.6	332.8	BOREHOLE TERMINATED AT 6.55 m					333

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

17T 523879E 4804339N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** September 24, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** M. Rapsey

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 341.42			
0.0	341.24	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, damp	1	SS	4
0.70	340.72	SAND: Loose brown sand, some silt, damp			
1.0		SANDY SILT: Loose brown sandy silt, moist	2	SS	6
1.4	340.0	becoming compact, saturated	3	SS	18
2.0			4	SS	17
3.0			5	SS	23
3.9	337.5	SILT: Compact grey silt, trace sand, occasional clayey silt seams, saturated			
4.0			6	SS	17
5.0					
6.0					
6.2	335.2	CLAYEY SILT: Very stiff grey clayey silt, trace sand, WTPL	7	SS	17
6.6	334.8	BOREHOLE TERMINATED AT 6.55 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

ELEVATION SCALE: 341, 340, 339, 338, 337, 336, 335

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Free water encountered after SS3

Upon completion of augering Wet cave at 2.0 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

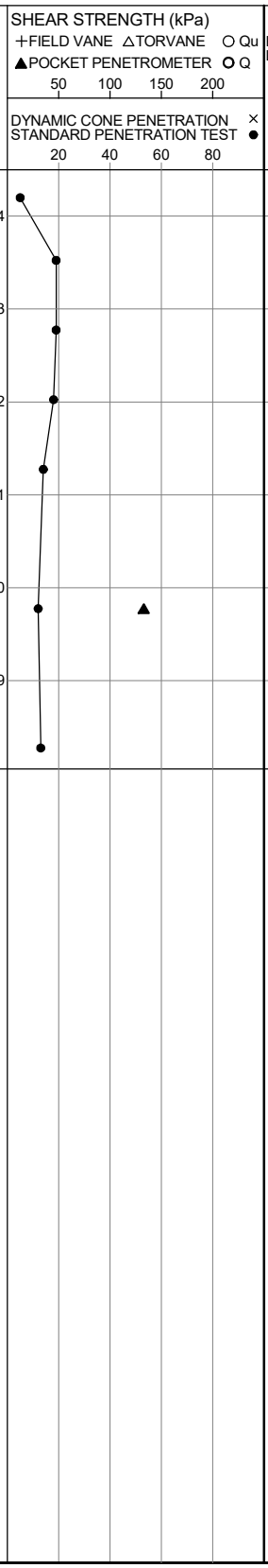
17T 524026E 4804185N

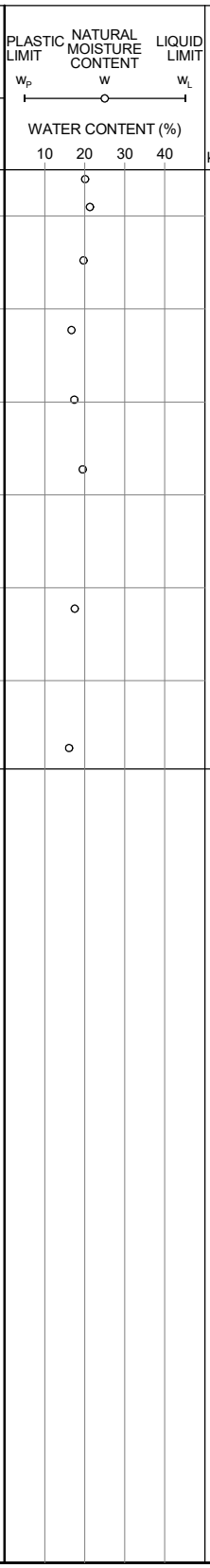
PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** July 31, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" VALUES
		SURFACE ELEVATION 344.50				
0.0	344.50					
0.20	344.30	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	5
				1B		
		CLAYEY SILT: Very stiff brown clayey silt, some sand, WTPL, numerous silt layers		2	SS	19
1.0						
				3	SS	19
2.0						
				4	SS	18
2.9	341.6	becoming stiff, grey				
3.0				5	SS	14
4.0						
				6	SS	12
5.0						
6.0				7	SS	13
6.5	338.0	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						





UNIT WEIGHT kN/m³	GROUND WATER OBSERVATIONS AND REMARKS	GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL
	Upon completion of augering Open Dry	

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

17T 524118E 4804016N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 30, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
0.0		SURFACE ELEVATION 342.61					
0.24	342.37	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7	342
				1B			
		CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL		2	SS	6	
1.0							
				3	SS	6	341
2.1	340.5	becoming stiff, some sand, WTPL, numerous silt layers					
2.0				4	SS	15	340
3.0				5	SS	15	
4.0	338.6	becoming grey					339
				6	SS	11	338
5.0							
5.6	337.0	becoming very stiff					337
6.0				7	SS	16	
6.5	336.1	BOREHOLE TERMINATED AT 6.5 m					
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

17T 523995E 4804385N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031
LOCATION New Hamburg, Ontario — **BORING DATE** July 31, 2018 — **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 341.78					
0.0		TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	13	
0.31	341.47			1B			
		CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL		2	SS	11	341
1.0							
1.4	340.4	numerous silt layers		3	SS	13	340
2.0							
2.6	339.2	becoming grey, WTPL		4	SS	14	339
3.0				5	SS	9	
4.0							338
				6	SS	11	337
5.0							
6.0							336
6.5	335.3	BOREHOLE TERMINATED AT 6.5 m		7	SS	13	
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

17T 524153E 4804198N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 31, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
		SURFACE ELEVATION 343.61				
0.0	343.61					
0.25	343.36	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	7
				1B		
		SILTY SAND: Compact brown silty sand, trace gravel, damp				
1.0				2A	SS	17
1.1				2B		
1.4	342.2	SILT: Compact brown silt, trace clay, trace sand, wet				
		SAND: Compact brown sand, some silt, wet		3	SS	20
2.0						
2.1	341.5	becoming saturated		4	SS	19
3.0				5	SS	22
4.0						
				6	SS	28
5.0						
5.5	338.1	CLAYEY SILT: Very stiff grey clayey silt, WTPL, numersous silt layers				
6.0				7	SS	23
6.5	337.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 343, 342, 341, 340, 339, 338

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Cave at 2.1 m
Dry

NOTES

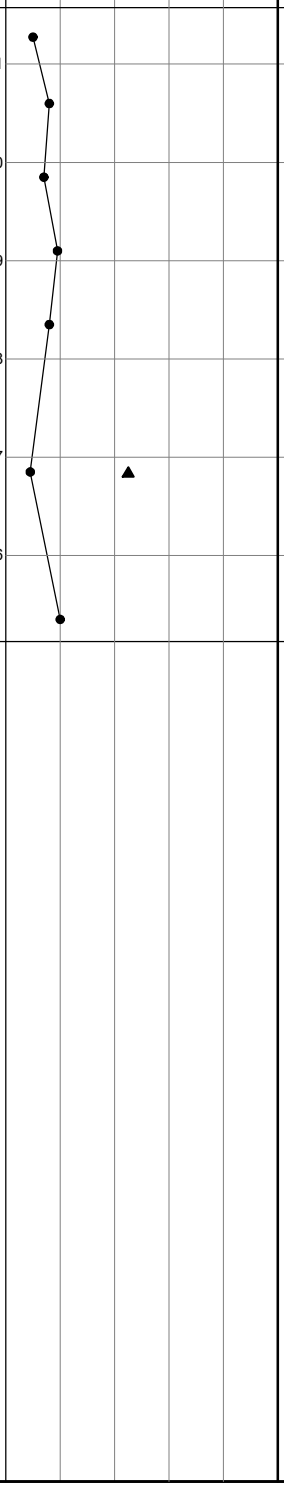
Peto MacCallum Ltd.
CONSULTING ENGINEERS

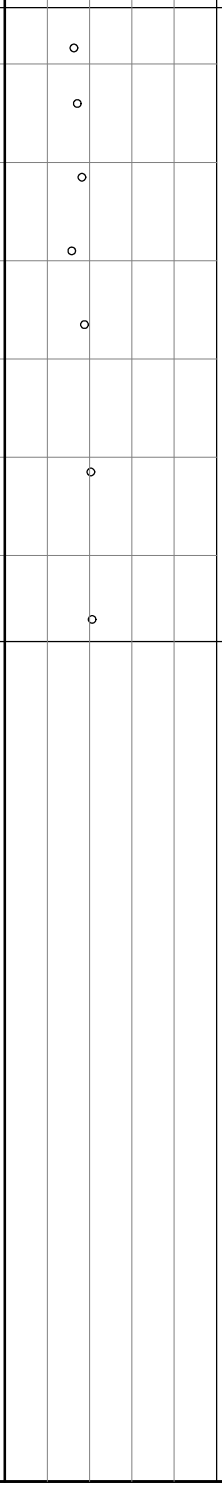
LOG OF BOREHOLE NO. 7

17T 524277E 4804038N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** July 30, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 341.57				
0.0	341.57					
	0.22	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	10
	341.35			1B		
		CLAYEY SILT: Stiff to very stiff brown clayey silt, some sand, trace gravel, DTPL		2	SS	16
1.0						
	1.4					
	340.2	numerous silt layers		3	SS	14
2.0						
	2.1					
	339.5	becoming grey, WTPL		4	SS	19
3.0						
				5	SS	16
4.0						
				6	SS	9
5.0						
6.0				7	SS	20
	6.5					
	335.1	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						





UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 8

17T 524205E 4804333N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 343.37				
0.0 / 343.37	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	5
0.39 / 342.98	SANDY SILT: Compact brown sandy silt, moist; with topsoil inclusions		1B		
0.95 / 342.42	CLAYEY SILT: Stiff brown clayey silt, some sand, WTPL, numerous silt layers		2A, 2B	SS	11
			3	SS	14
			4	SS	15
2.9 / 340.5	becoming grey		5	SS	12
			6	SS	15
			7	SS	9
6.5 / 336.9	BOREHOLE TERMINATED AT 6.5 m				

SHEAR STRENGTH (kPa): + FIELD VANE, △ TORVANE, ○ Qu, ▲ POCKET PENETROMETER, O Q; DYNAMIC CONE PENETRATION ×, STANDARD PENETRATION TEST ●

PLASTIC LIMIT (w_P) — NATURAL MOISTURE CONTENT (w) — LIQUID LIMIT (w_L); WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 9

17T 524349E 4804152N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 1, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 343.24			
0.27 / 342.97	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist	1A / 1B	SS	5
0.68 / 342.56	SILTY SAND: Compact brown silty sand, damp			
	SILT: Compact brown silt, trace sand, trace clay, moist to wet	2	SS	16
		3	SS	17
		4	SS	14
2.9 / 340.3	SILTY SAND: Compact brown silty sand, wet	5	SS	22
4.0 / 339.2	becoming saturated	6	SS	16
5.5 / 337.7	SANDY SILT: Compact grey sandy silt, trace clay, saturated	7	SS	26
6.5 / 336.7	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L; WATER CONTENT (%); 10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Free water at 2.3 m
Cave at 2.4 m

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 10

17T 524328E 4804366N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031

LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 342.20					
0.27 / 341.93	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist		1A	SS	8	342
			1B			
	CLAYEY SILT: Firm brown clayey silt, DTPL, numerous silt layers		2	SS	5	341
1.4 / 340.8	becoming stiff		3	SS	10	
			4	SS	12	340
2.9 / 339.3	becoming grey, WTPL		5	SS	8	339
			6	SS	14	338
			7	SS	10	337
6.5 / 335.7	BOREHOLE TERMINATED AT 6.5 m					336

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 11

17T 524447E 4804190N

PROJECT Wilmot Woods Development
PML REF. 18KF031
LOCATION New Hamburg, Ontario
BORING DATE August 2, 2018
ENGINEER H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	ELEVATION SCALE
		SURFACE ELEVATION 346.37					
0.0	346.37	TOPSOIL: Dark brown clayey silt, trace sand, occasional rootlets, DTPL		1A	SS	9	346
0.30	346.07			1B			
		CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL		2	SS	14	
1.0							345
				3	SS	9	
2.0							
				4	SS	11	344
3.0							
				5	SS	12	343
4.0	342.4	becoming grey, WTPL					
				6	SS	11	342
5.0							
							341
6.0				7	SS	15	
6.5	339.9	BOREHOLE TERMINATED AT 6.5 m					340
7.0							
8.0							
9.0							
10.0							
11.0							
12.0							
13.0							
14.0							
15.0							

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%)
GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 12

17T 524560E 4804228N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH / ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	ELEVATION SCALE
	SURFACE ELEVATION 346.22					346
0.25 / 345.97	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1A	SS	10	
	CLAYEY SILT: Stiff to very stiff brown clayey silt, some sand, DTPL to APL, numerous silt layers		1B			
			2	SS	14	345
			3	SS	17	
			4	SS	14	344
2.9 / 343.3	becoming grey, WTPL		5	SS	10	343
			6	SS	12	342
			7	SS	8	341
6.5 / 339.7	BOREHOLE TERMINATED AT 6.5 m					340

SHEAR STRENGTH (kPa)
+ FIELD VANE △ TORVANE ○ Qu
▲ POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Upon completion of augering
Open
Dry

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 101

17T 523684.7E 4804597N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.04			
0.0	339.04	TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist	1A	SS	7
0.38			1B		
0.68		SANDY SILT: Loose brown sandy silt, moist, occasional rootlets	2A	SS	8
0.98		SILT: Loose brown silt, some sand, trace clay, moist	2B		
1.0	338.06	SILTY SAND: Compact brown silty sand, wet	3	SS	11
2.1	336.9	CLAYEY SILT: Stiff to very stiff grey clayey silt, trace sand, WTPL, numerous silt layers	4	SS	17
3.0			5	SS	12
4.0					
5.0			6	SS	16
6.0					
6.5	332.5	BOREHOLE TERMINATED AT 6.5 m	7	SS	16
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

ELEVATION SCALE: 338, 337, 336, 335, 334, 333

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200

DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%): 10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	2.4	336.6
2018-08-03	1.8	337.2
2018-11-07	0.9	338.1
2018-11-26	0.9	338.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 102

17T 523788.7E 4804396N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	STRAT PLOT	SAMPLE NUMBER	SAMPLE TYPE	"N" VALUES
		SURFACE ELEVATION 340.00				
0.0		TOPSOIL: Dark brown sandy silt, some clay, occasional rootlets, moist		1A	SS	8
0.30	339.70			1B		
		CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL, numerous silt layers		2A	SS	6
1.0				2B		
1.1	338.9	SAND: Loose brown sand, trace silt, wet to saturated				
1.4	338.6	becoming compact		3	SS	14
2.0				4	SS	17
3.0				5	SS	15
4.0	336.0	SANDY SILT: Compact grey sandy silt, trace clay, saturated		6	SS	20
5.0						
6.0				7	SS	21
6.5	333.5	BOREHOLE TERMINATED AT 6.5 m				
7.0						
8.0						
9.0						
10.0						
11.0						
12.0						
13.0						
14.0						
15.0						

ELEVATION SCALE: 339, 338, 337, 336, 335, 334

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	1.7	338.3
2018-08-03	1.7	338.3
2018-11-07	1.4	338.6
2018-11-26	1.2	338.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 103

17T 523910.3E 4804249N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 343.23			
0.0	343.23				
	0.21	TOPSOIL: Dark brown sandy silt topsoil,	1A	SS	8
	343.02	some clay, occasional rootlets, moist	1B		
		CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers			
1.0			2	SS	10
			3	SS	13
2.0	2.1				
	341.1	becoming WTPL	4	SS	14
3.0			5	SS	18
4.0	4.0				
	339.2	becoming grey			
			6	SS	17
5.0					
6.0			7	SS	21
	6.5				
	336.7	BOREHOLE TERMINATED AT 6.5 m			
7.0					
8.0					
9.0					
10.0					
11.0					
12.0					
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER O Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L

WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	4.0	339.2
2018-08-03	2.8	340.4
2018-11-07	2.3	340.9
2018-11-26	1.9	341.3

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 104

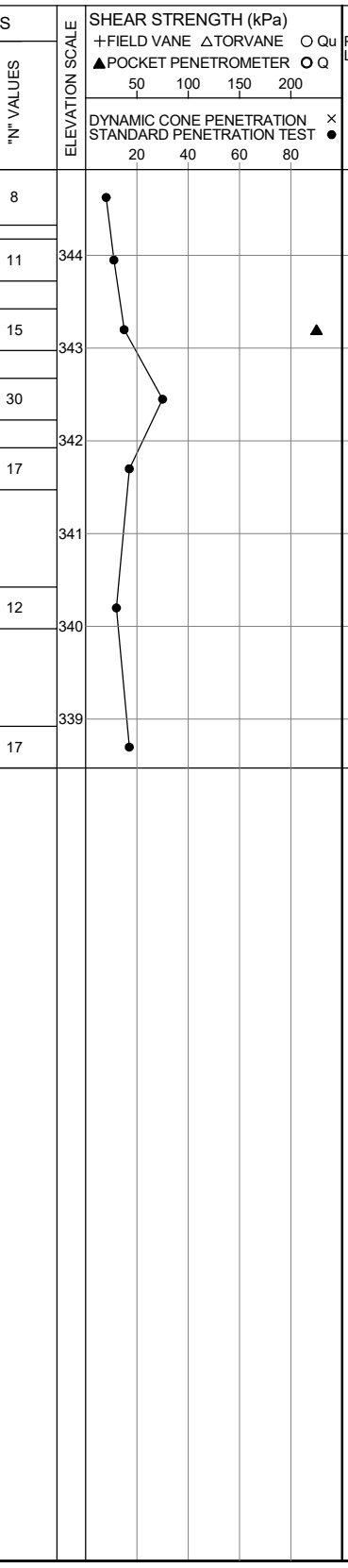
17T 524180E 4803929N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** July 30, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES
	SURFACE ELEVATION 344.92				
0.18 / 344.74	FILL: Dark brown clayey silt, some sand, occasional rootlets, APL, occasional wood fragments		1A		
			1B	SS	8
0.68 / 344.24	FILL: Firm brown silty clay , some sand, WTPL, occasional wood fragments		2	SS	11
	CLAYEY SILT: Stiff to very stiff brown clayey silt, trace sand, DTPL, numerous silt layers		3	SS	15
2.1 / 342.8	becoming grey, WTPL		4	SS	30
			5	SS	17
			6	SS	12
			7	SS	17
6.5 / 338.4	BOREHOLE TERMINATED AT 6.5 m				



SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL



Water Level Readings:

Date	Depth	Elev.
2018-07-31	DRY	----
2018-08-03	3.3	341.6
2018-11-07	1.4	343.5
2018-11-26	0.8	344.1

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 105

17T 524125.6E 4804437N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 1, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	341.05	SURFACE ELEVATION 341.05			
0.0	341.05	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A	SS	9
0.46	340.59	CLAYEY SILT: Firm brown clayey silt, trace sand, DTPL, numerous silt layers	1B		
			2	SS	7
1.4	339.6	becoming stiff			
			3	SS	10
2.1	338.9	becoming WTPL			
			4	SS	9
			5	SS	9
			6	SS	13
5.6	335.4	becoming very stiff			
			7	SS	17
6.5	334.5	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-01	DRY	----
2018-08-03	1.4	339.6
2018-11-07	1.0	340.0
2018-11-26	0.8	340.2

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 106

17T 524544.9E 4804378N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 342.98			
0.20 / 342.78	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL	1A	SS	11
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers	1B		
		2	SS	15
		3	SS	16
2.1 / 340.9	becoming firm, grey, WTPL	4	SS	7
		5	SS	8
4.0 / 339.0	becoming stiff to very stiff	6	SS	13
		7	SS	25
6.5 / 336.5	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	4.3	338.7
2018-08-03	2.7	340.3
2018-11-07	1.5	341.5
2018-11-24	1.2	341.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 107

17T 524733E 4804139N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031
LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres) / ELEV	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 346.96				
0.20 / 346.76	TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, DTPL		1A	SS	12
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers		1B		
			2	SS	11
			3	SS	12
			4	SS	12
2.9 / 344.1	becoming firm to stiff, grey, WTPL		5	SS	7
			6	SS	9
			7	SS	10
6.5 / 340.5	BOREHOLE TERMINATED AT 6.5 m				

SHEAR STRENGTH (kPa): +FIELD VANE △TORVANE ○ Qu; ▲POCKET PENETROMETER ○ Q; DYNAMIC CONE PENETRATION ×; STANDARD PENETRATION TEST ●

PLASTIC LIMIT (w_P) — NATURAL MOISTURE CONTENT (w) — LIQUID LIMIT (w_L); WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS; GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	DRY	----
2018-08-03	DRY	----
2018-11-07	2.5	344.5
2018-11-26	2.3	344.7

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 108

17T 524541.1E 4804122N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** August 2, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Solid Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH ELEV (metres)	DESCRIPTION	NUMBER	TYPE	"N" VALUES
	SURFACE ELEVATION 345.32			
0.22 / 345.10	TOPSOIL: Dark brown sandy silt, trace clay, occasional rootlets, moist	1A / 1B	SS	9
	CLAYEY SILT: Stiff brown clayey silt, trace sand, DTPL, numerous silt layers	2	SS	17
		3	SS	12
		4	SS	14
		5	SS	12
4.0 / 341.3	becoming WTPL			
		6	SS	15
		7	SS	13
6.5 / 338.8	BOREHOLE TERMINATED AT 6.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ● Q; DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%)

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete

Bentonite Seal

Filter Sand

Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-02	DRY	----
2018-08-03	DRY	----
2018-11-07	5.9	339.4
2018-11-26	5.4	339.9

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 109

17T 524441.1E 4803985N

PROJECT Wilmot Woods Development | **PML REF.** 18KF031
LOCATION New Hamburg, Ontario | **BORING DATE** August 2, 2018 | **ENGINEER** H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers | **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.93			
0.0		TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, APL to WTPL	1	SS	5
0.85	339.08	CLAYEY SILT: Soft to firm brown clayey silt, trace sand, DTPL, numerous silt layers, occasional cobbles	2A 2B	SS	3
			3	SS	7
2.1	337.8	becoming stiff	4	SS	11
2.9	337.0	becoming WTPL	5	SS	15
			6	SS	13
			7	SS	9
			8	SS	14
			9	SS	10
			10	SS	10
			11	SS	12
10.1	329.8	becoming very stiff	12	SS	16
			13	SS	15
12.5	327.4	BOREHOLE TERMINATED AT 12.5 m			

SHEAR STRENGTH (kPa): + FIELD VANE △ TORVANE ○ Qu ▲ POCKET PENETROMETER ○ Q; 50 100 150 200
DYNAMIC CONE PENETRATION × STANDARD PENETRATION TEST ●; 20 40 60 80
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%): 10 20 30 40
UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-03	3.7	336.2
2018-11-07	0.1	339.8
2018-11-26	0.1	339.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 110

17T 524499.6E 4803961N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** October 15, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.98			
0.0		TOPSOIL: Dark brown silt, trace sand, occasional rootlets, moist to wet	1	SS	3
0.36	339.62	CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL, numerous silt layers			
0.70	339.28	becoming firm to stiff, occasional cobbles, WTPL	2	SS	10
1.0					
			3	SS	12
2.0					
			4	SS	16
2.9					
3.0	337.1	becoming firm to stiff grey, trace sand, WTPL	5	SS	8
4.0			6	SS	7
			7	SS	9
5.0					
			8	SS	9
6.0					
			9	SS	9
7.0					
7.0	333.0	becoming very stiff, occasional silt layers			
			10	SS	18
8.0					
8.5					
8.5	331.5	becoming stiff, numerous silt layers			
9.0					
			11	SS	12
10.0					
			12	SS	10
11.0					
			13	SS	13
12.0					
12.6					
12.6	327.4	BOREHOLE TERMINATED AT 12.6 m			
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

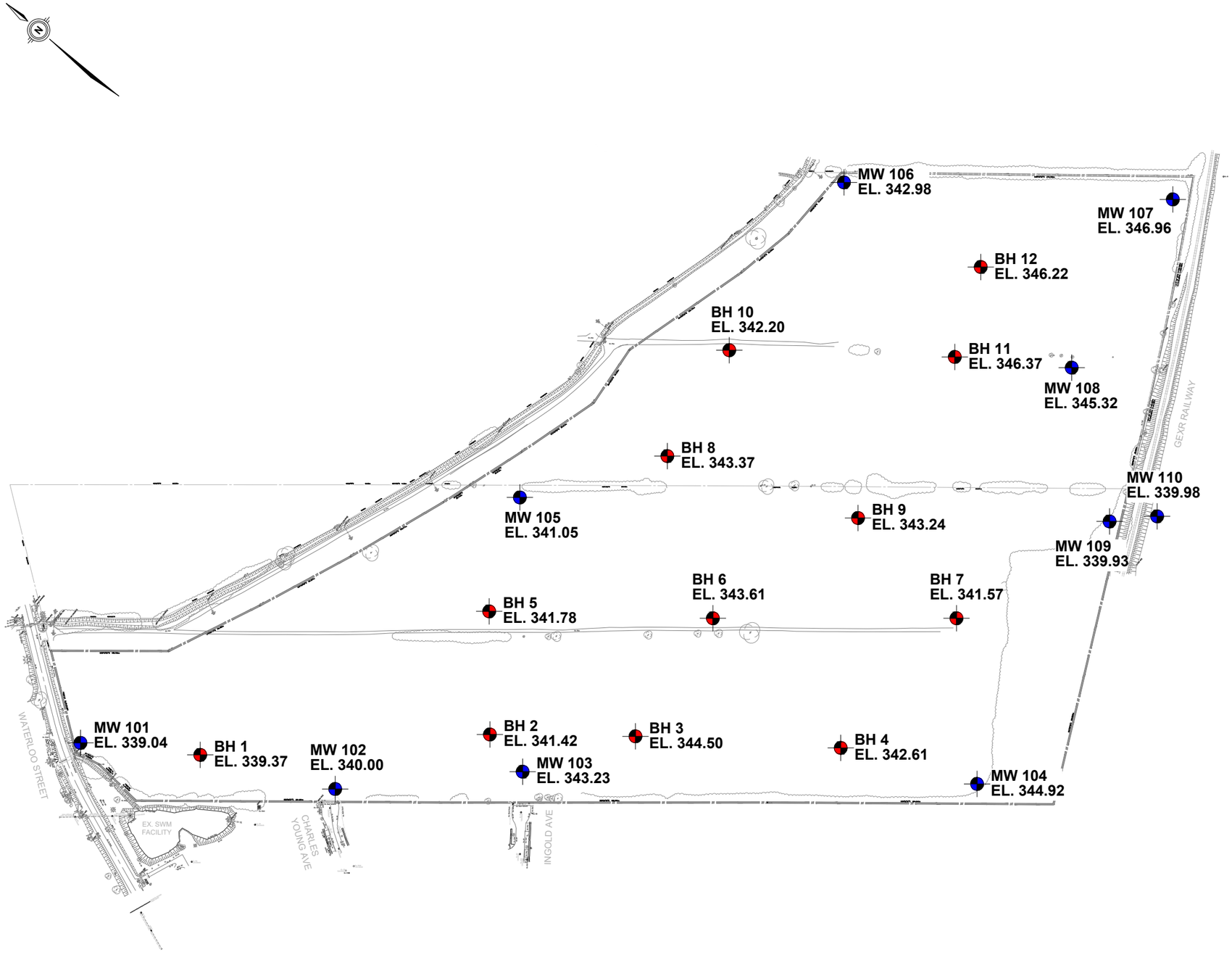
GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
50 mm pipe
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

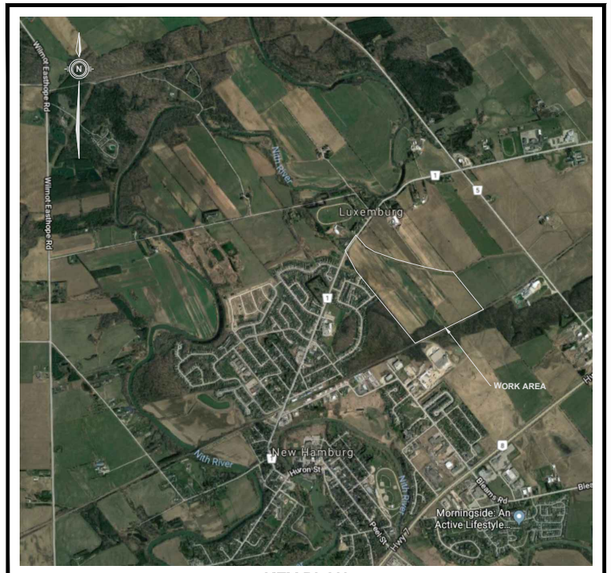
Date	Depth	Elev.
2018-10-15	DRY	----
2018-11-07	0.5	339.5
2018-11-26	0.2	339.8

NOTES



SCALE

0 m 100 m 200 m 300 m 400 m 500 m



KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

WILMOT WOODS DEVELOPMENT INC.

PROPOSED WILMOT WOODS DEVELOPMENT

NEW HAMBURG

NEW HAMBURG, ONTARIO

BOREHOLE LOCATION PLAN

Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	W. LOGHRIN	FEBRUARY 2022	AS SHOWN	18KF031	1
APPROVED	G. MITCHELL				

APPENDIX A

ENGINEERED FILL

ENGINEERED FILL

The information presented in this appendix is intended for general guidance only. Site specific conditions and prevailing weather may require modification of compaction standards, backfill type or procedures. Each site must be discussed, and procedures agreed with Peto MacCallum Ltd. prior to the start of the earthworks and must be subject to ongoing review during construction. This appendix is not intended to apply to embankments. Steeply sloping ravine residential lots require special consideration.

For fill to be classified as engineered fill suitable for supporting structural loads, a number of conditions must be satisfied, including but not necessarily limited to the following:

1. Purpose

The site specific purpose of the engineered fill must be recognized. In advance of construction, all parties should discuss the project and its requirements and agree on an appropriate set of standards and procedures.

2. Minimum Extent

The engineered fill envelope must extend beyond the footprint of the structure to be supported. The minimum extent of the envelope should be defined from a geotechnical perspective by:

- at founding level, extend a minimum 1.0 m beyond the outer edge of the foundations, greater if adequate layout has not yet been completed as noted below; and
- extend downward and outward at a slope no greater than 45° to meet the subgrade

All fill within the envelope established above must meet the requirements of engineered fill in order to support the structure safely. Other considerations such as survey control, or construction methods may require an envelope that is larger, as noted in the following sections.

Once the minimum envelope has been established, structures must not be moved or extended without consultation with Peto MacCallum Ltd. Similarly, Peto MacCallum Ltd. should be consulted prior to any excavation within the minimum envelope.

3. Survey Control

Accurate survey control is essential to the success of an engineered fill project. The boundaries of the engineered fill must be laid out by a surveyor in consultation with engineering staff from Peto MacCallum Ltd. Careful consideration of the maximum building envelope is required.

During construction it is necessary to have a qualified surveyor provide total station control on the three dimensional extent of filling.

4. Subsurface Preparation

Prior to placement of fill, the subgrade must be prepared to the satisfaction of Peto MacCallum Ltd. All deleterious material must be removed and in some cases, excavation of native mineral soils may be required.

Particular attention must be paid to wet subgrades and possible additional measures required to achieve sufficient compaction. Where fill is placed against a slope, benching may be necessary and natural drainage paths must not be blocked.

5. Suitable Fill Materials

All material to be used as fill must be approved by Peto MacCallum Ltd. Such approval will be influenced by many factors and must be site and project specific. External fill sources must be sampled, tested and approved prior to material being hauled to site.

6. Test Section

In advance of the start of construction of the engineered fill pad, the Contractor should conduct a test section. The compaction criterion will be assessed in consultation with Peto MacCallum Ltd. for the various fill material types using different lift thicknesses and number of passes for the compaction equipment proposed by the Contractor.

Additional test sections may be required throughout the course of the project to reflect changes in fill sources, natural moisture content of the material and weather conditions.

The Contractor should be particularly aware of changes in the moisture content of fill material. Site review by Peto MacCallum Ltd. is required to ensure the desired lift thickness is maintained and that each lift is systematically compacted, tested and approved before a subsequent lift is commenced.

7. Inspection and Testing

Uniform, thorough compaction is crucial to the performance of the engineered fill and the supported structure. Hence, all subgrade preparation, filling and compacting must be carried out under the full time inspection by Peto MacCallum Ltd.

All founding surfaces for all buildings and residential dwellings or any part thereof (including but not limited to footings and floor slabs) on structural fill or native soils must be inspected and approved by PML engineering personnel prior to placement of the base/subbase granular material and/or concrete. The purpose of the inspection is to ensure the subgrade soils are capable of supporting the building/house foundation and floor slab loads and to confirm the building/house envelope does not extend beyond the limits of any structural fill pads.

8. Protection of Fill

Fill is generally more susceptible to the effects of weather than natural soil. Fill placed and approved to the level at which structural support is required must be protected from excessive wetting, drying, erosion or freezing. Where adequate protection has not been provided, it may be necessary to provide deeper footings or to strip and recompact some of the fill.

9. Construction Delay Time Considerations

The integrity of the fill pad can deteriorate due to the harsh effects of our Canadian weather. Hence, particular care must be taken if the fill pad is constructed over a long time period.

It is necessary therefore, that all fill sources are tested to ensure the material compactability prior to the soil arriving at site. When there has been a lengthy delay between construction periods of the fill pad, it is necessary to conduct subgrade proof rolling, test pits or boreholes to verify the adequacy of the exposed subgrade to accept new fill material.

When the fill pad will be constructed over a lengthy period of time, a field survey should be completed at the end of each construction season to verify the areal extent and the level at which the compacted fill has been brought up to, tested and approved.

In the following spring, subexcavation may be necessary if the fill pad has been softened attributable to ponded surface water or freeze/thaw cycles.

A new survey is required at the beginning of the next construction season to verify that random dumping and/or spreading of fill has not been carried out at the site.

10. Approved Fill Pad Surveillance

It should be appreciated that once the fill pad has been brought to final grade and documented by field survey, there must be ongoing surveillance to ensure that the integrity of the fill pad is not threatened.

Grading operations adjacent to fill pads can often take place several months or years after completion of the fill pad.

It is imperative that all site management and supervision staff, the staff of Contractors and earthwork operators be fully aware of the boundaries of all approved engineered fill pads.

Excavation into an approved engineered fill pad should never be contemplated without the full knowledge, approval and documentation by the geotechnical consultant.

If the fill pad is knowingly built several years in advance of ultimate construction, the areal limits of the fill pad should be substantially overbuilt laterally to allow for changes in possible structure location and elevation and other earthwork operations and competing interests on the site. The overbuilt distance required is project and/or site specified.

Iron bars should be placed at the corner/intermediate points of the fill pad as a permanent record of the approved limits of the work for record keeping purposes.

11. Unusual Working Conditions

Construction of fill pads may at times take place at night and/or during periods of freezing weather conditions because of the requirements of the project schedule. It should be appreciated therefore, that both situations present more difficult working conditions. The Owner, Contractor, Design Consultant and Geotechnical Engineer must be willing to work together to revise site construction procedures, enhance field testing and surveillance, and incorporate design modifications as necessary to suit site conditions.

When working at night there must be sufficient artificial light to properly illuminate the fill pad and borrow areas.

Placement of material to form an engineered fill pad during winter and freezing temperatures has its own special conditions that must be addressed. It is imperative that each day prior to placement of new fill, the exposed subgrade must be inspected and any overnight snow or frozen material removed. Particular attention should be given to the borrow source inspection to ensure only nonfrozen fill is brought to the site.

The Contractor must continually assess the work program and have the necessary spreading and compacting equipment to ensure that densification of the fill material takes place in a minimum amount of time. Changes may be required to the spreading methods, lift thickness, and compaction techniques to ensure the desired compaction is achieved uniformly throughout each fill lift.

The Contractor should adequately protect the subgrade at the end of each shift to minimize frost penetration overnight. Since water cannot be added to the fill material to facilitate compaction, it is imperative that densification of the fill be achieved by additional compaction effort and an appropriate reduced lift thickness. Once the fill pad has been completed, it must be properly protected from freezing temperatures and ponding of water during the spring thaw period.

If the pad is unusually thick or if the fill thickness varies dramatically across the width or length of the fill pad, Peto MacCallum Ltd. should be consulted for additional recommendations. In this case, alternative special provisions may be recommended, such as providing a surcharge preload for a limited time or increase the degree of compaction of the fill.

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

The findings an comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may effect the validity of the findings and recommendations given in this report.

STATEMENT OF LIMITATIONS

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence any action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.

GEOTECHNICAL INVESTIGATION
PROPOSED WILMOT WOODS DEVELOPMENT
CN RAILWAY CROSSING
NEW HAMBURG, ONTARIO

for

WILMOT WOODS DEVELOPMENT INC.

PETO MacCALLUM LTD.
16 FRANKLIN STREET SOUTH
KITCHENER, ONTARIO
N2C 1R4
PHONE: (519) 893-7500
FAX: (519) 893-0654
EMAIL: kitchener@petomaccallum.com

Distribution:
1 cc: Wilmot Woods Development Inc.
1 cc: MTE Consultants Inc. (+email – jcabral@mte85.com)
1 cc: PML Kitchener

PML Ref.: 18KF031
Report: 2
February 24, 2022

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 2

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr.Belksy

Geotechnical Investigation
Proposed Wilmot Woods Development
CN Railway Crossing
New Hamburg, Ontario

Peto MacCallum Ltd. (PML) is pleased to report the results of the geotechnical investigation recently completed at the above noted project site. Authorization to proceed with this assignment was provided by Mr. Galbraith in email dated July 9, 2018.

In general, the project involves the proposed installation of a proposed trunk sanitary sewer extending from the proposed Pfenning Farm development southward under the railway, and will connect to a proposed trunk sewer on the neighboring property (the Wilmot employment Lands). The railway which runs along the south side of the Pfenning Farm development site is located on top of an embankment at about Elevation 345. It is understood that a trenchless installation using jack and bore or pipe ramming methods is being considered for the railway crossing. Detailed design of the crossing has not been provided. However, in general, sewer crossing under the railway will comprise a 400 mm dimeter pipe with inverts at about Elevation 335.7, about 9 m below the railway and 4 to 5 m depth below existing grade beyond the railway.

The purpose of this geotechnical report is to assess the existing subsurface soil and ground water information, and provide preliminary geotechnical engineering recommendations for the proposed trenchless installation of the trunk sanitary sewer under the railway.

Recommendations for the proposed construction of a residential subdivision are provided under separate cover, PML Ref. 18KF031, Report 1.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for the current project only. Any changes in plans will require review by PML to assess the applicability of the report, and may require modified recommendations, additional analysis and / or investigation. When the project design is complete, the general recommendations given in this report should be reviewed by PML to ensure their applicability.

16 Franklin Street South, Kitchener, Ontario N2C 1R4
Tel: (519) 893-7500 Fax: (519) 893-0654
E-mail: kitchener@petomaccallum.com
BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

Investigation

The field work for this geotechnical investigation was conducted on August 2, 2018 and October 15, 2018 as part of the investigation for the entire development. The investigation program for the railway crossing comprised two boreholes (MW109 and MW110) advanced to between 12.5 and 12.6 m depth, with monitoring wells installed in both of the boreholes, at the locations shown on the appended Drawing 1. Details of the geotechnical investigation are presented under separate cover in our previous report PML Ref 18KF031 Report 1. Reference is given to Appendix A for the Log of Borehole Sheets, and particle size analyses applicable to the current Railway crossing.

The borehole locations were established in the field by PML. Borehole locations were surveyed by PML using Global Navigation Satellite System (GNSS). The survey equipment was provided by SOKKIA Canada, model GCX-2.

The boreholes were advanced using a Diedrich D-50 track mounted drillrig fitted with continuous flight solid and hollow stem augers and automatic hammer, supplied and operated by a specialist drilling contractor. The work was carried out under the full-time supervision of a PML engineering staff member who directed the drilling and sampling operations, documented the soil stratigraphy, monitored ground water conditions and processed the recovered samples.

Representative samples of the overburden were recovered at regular intervals throughout the depths explored. Standard penetration tests (SPT) were carried out during sampling operations of the boreholes using conventional split spoon equipment. Pocket penetrometer testing was carried out on the recovered samples to determine the undrained shear strength of the cohesive soils. Ground water observations were made in the boreholes during and upon completion of drilling. The boreholes were backfilled and compacted in accordance with O.Reg.903 upon completion of drilling.

Monitoring wells were installed in Boreholes MW109 and MW110 to more accurately measure ground water levels. The monitoring wells comprised 50 mm diameter PVC pipe, filter sand,

All of the recovered samples were returned to PML's laboratory for detailed visual examination, classification, and routine moisture content determinations. The laboratory testing also included particle size distribution analyses on samples of the major soil type encountered.

Summarized Subsurface Conditions

Reference is made to the appended Log of Borehole sheets for details of the field work including soil descriptions, inferred stratigraphy, standard penetration test (SPT) N values, dynamic cone penetration test values, ground water observations and laboratory moisture content determinations.

Due to the soil sampling procedures and the limited size of samples, the depth / elevation demarcations on the borehole logs must be viewed as "transitional" zones, and cannot be construed as exact geologic boundaries between layers.

In general, the soil stratigraphy encountered comprised surficial topsoil, underlain by an extensive clayey silt deposit containing numerous cohesionless silt layers.

Surficial topsoil was contacted in both boreholes and was between 850 mm and 360 mm thick in Boreholes MW109 and MW110, respectively.

An extensive clayey silt deposit was encountered below the surficial topsoil, in both boreholes, and extended to the 12.5 to 12.6 m borehole termination depths. The cohesive clayey silt deposit was generally firm to very stiff based on standard penetration N values between 7 and 18 blows per 0.3 m penetration of the split spoon sampler. Pocket penetrometer shear strengths of the clayey silt ranged between 75 and 125 kPa. Moisture content ranged between 18 and 28% indicating drier than plastic limit (DTPL) to wetter than limit (WTPL) conditions in the cohesive clayey silt soils. Occasional cobbles and boulders are present in the clayey silt deposit.

Ground Water Conditions

Ground water observations carried out during and upon completion of drilling are presented on the appended Log of Borehole Sheets.

During drilling, WTPL conditions were generally encountered in the clayey below 2.9 m depth (Elevation 337.0 and 337.1).

On November 26, 2018 water level measurements from the monitoring wells installed in Boreholes 109 and 110 ranged between 0.1 to 0.2 m depth below existing grade (about Elevation 339.8).

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns. It should be noted that the relatively impermeable nature of the clayey silt deposits could contribute to the development of perched water conditions following short term and seasonal participation events.

Discussion and Recommendations

As noted previously, the project involves the proposed installation of a trunk sewer below the railway tracks which will extend southward from the Pfenning Farm to the Wilmot employment Lands. The crossing will house a 400 mm diameter pipe inside a steel casing with proposed inverts about Elevations 335.7. The sewer pipe and casing invert will be about 9 m below the railway tracks and 4 to 5 m below the existing grades on each side of the railway. For discussion purposes a maximum 900 mm diameter steel casing is envisioned. Therefore, the top of the steel pipe crossing will be about 4 m below ground on the lands beside the railway, and about 8 m below the railway tracks.

In general, the soil stratigraphy encountered comprised surficial topsoil, underlain by an extensive clayey silt deposit containing numerous cohesionless silt layers and occasional cobbles. The cohesive clayey silt deposit was generally firm to very stiff. The ground water level is at about Elevation 339.8, and above the proposed trunk sewer depth. Considering the subsurface conditions encountered and details proposed for the crossing, both jack and bore and pipe ramming methods were evaluated, and further details on both methods are provided in the sections below.

Regardless of the method used, it is recommended that the contractor prepare a plan in advance of construction outlining the details of the installation to provide instructions for the construction crews and provide a possible contingency action plan should difficulties occur during the tunnelling operations. The plan should also be reviewed by the project proponent and the railway authorities prior to construction. Upon request, PML can assist in reviewing the plan to check that assumptions regarding soil and ground water conditions are appropriate.

Reference is also given to Ontario Provincial Standard Specifications (OPSS) 415, Construction Specifications for Pipeline and Utility Installation by Tunnelling.

Jack and Bore

Jack and bore (or cased auger boring) typically involves the simultaneous advancement of a continuous flight auger and conduit pipe. The auger is used to excavate soil in advance of the casing and transport cuttings back to the receiving pit where they are removed. Rotary power to auger and pushing force is provided by a drill rig located within a jacking pit. Jack and bore is a common method of trenchless installation and in appropriate site and soil conditions may be preferable from a cost perspective.

Jack and bore installation(s) should be conducted in accordance with OPSS 416, Construction Specifications for Pipeline and Utility Installation by Jacking and Boring.

A jack and bore installation is technically feasible for the installations provided the work is carried out by contractors experienced with tunneling in clayey silt with layered silt conditions, and provided adequate measures are used to prevent loss of ground.

The sanitary sewer installation will be below the ground water level in the clayey silt, and ground water conditions could hinder or prevent a jack and bore installation. In wet soils there is potential for ground surface subsidence due to wet soil flowing into the bore, which could result in voids. Dewatering the clayey silt with numerous silt layers is not likely to be effective, therefore the risk of ravelling soil cannot be entirely eliminated.

The jacking forces should be estimated to select the suitable jacks. Suitable jacking head and suitable bracing between jacks and jacking head should be used to assure that pressure will be applied to the pipe uniformly around the ring of the pipe. Utilizing an effective lubrication system may minimize pipe friction during advance. A suitable face pressure or soil plug should be maintained to minimize loss of ground during advance. Any over-cut during augering and pipe advance which potentially create soil disturbance, space or voids outside the pipe should be grouted or filled to avoid potential ground movements.

The proposed crossing may encounter cobbles and boulders during installation. Contractors working on this assignment should provide measures to break up or remove cobbles and boulders if they are encountered during the jack and bore installation.

Pipe Ramming

Pipe ramming installation is analogous to driving an open-ended tube pile horizontally. Impact forces from a percussive hammer (mole) are used to advance a conduit pipe from an entry pit to a receiving pit. During the advance, most of the soil being penetrated fills the conduit rather than being excavated. The rammed conduit is terminated in a receiving pit at which point the soil contained in the pipe is removed.

When the driving has been completed, soil within the pipe can be removed via augering or a pipe shovel. Augering is expected to be the preferred method, however if soil within the pipe cannot be augered, use of a pipe shovel will be necessary. A pipe shovel is essentially a special scoop made from a pipe which fits inside the liner. Excavation via pipe shovel involves advancing the shovel into the soil plug using impact hammer (mole), then pulling the shovel and its contents out with a chain or cable, the process is repeated as required.

Reference is given to the following section for recommendations pertaining to the construction of entry and receiving pits. Dewatering measures will be required at the entry and receiving pits. Ideally, dewatering measures for the staging works should be established to such that the zone of influence includes as much of the tunnel area as possible as this will generally reduce potential ground water seepage through the tunnel during construction.

A pipe ramming installation is technically feasible for the sanitary sewer installation provided the work is carried out by contractors experienced with tunneling in clayey silt conditions, and adequate ground water control is achieved.

It is noted that grade adjustments cannot be completed once pipe ramming has started. It will be necessary to increase the slope of the crossing due to the potential for uncontrolled deflection during pipe ramming installation.

The proposed crossing may encounter cobbles and boulders during installation. Contractors working on this assignment should provide measures to break up cobbles and boulders if they are encountered during the pipe ramming installation.

The effects of the percussive forces on the railway must also be considered and assessed.

In summary, jack and bore is technically feasible for the proposed crossings, however pipe ramming is generally recommended as an alternative given the ground water conditions within the proposed tunneling depths.

Entry and Receiving Pit Excavation and Ground Water Control

Provided adequate ground water control is achieved, the subsurface soils encountered at the borehole locations are classified as Type 3 soils as defined in the Occupational Health and Safety Act (OHSA). For temporary unsupported excavations within Type 3 soils that are to be entered by workers, the excavation side slopes should be maintained no steeper than 1 horizontal to 1 vertical (1H:1V) from the base of shallow excavations. Workers should not enter an unprotected excavation if there is evidence of ongoing seepage in the banks or base of the excavation. An adequate temporary support system (i.e., trench boxes) should be provided at all locations where space limitations prevent construction of sufficiently shallow slopes.

It will also be important to ensure that the excavations do not undermine possible existing in-ground structures, roads and or other services in their proximity. The need for underpinning and utility support can be established according to criteria illustrated on the appended Figure 1. It should be noted that a trench liner box may not be relied on for bracing purposes.

The envisaged excavations for the sending and receiving pits of the sanitary sewer crossing will extend about 6.5 m into clayey silt with numerous wet silt seams. Excavations are anticipated to require dewatering to control of ground water seepage or surface water entering the excavation, and sump pumps along with a more sophisticated dewatering system such as well points, or eductor wells, or water tight sheet pile or secant caisson cut-off may be required.

Regardless of the dewatering method chosen, the hydraulic head and ground water inflow must be properly controlled to ensure stable and safe excavation and to facilitate construction. The design of the dewatering system should be left to the contractor's discretion, and the system should meet a performance specification to maintain and control ground water at least 0.30 m below the excavation base level, in order to provide a stable excavation base throughout construction.

It should be noted that, under the Ontario Water Resources Act, the Water Taking and Transfer Regulation 387/04, a Permit to Take Water (PTTW) from the Ministry of Environment Conservation and Parks (MECP) is required if the dewatering discharge is greater than 50,000 L/day. In accordance with the above noted regulatory requirements and in compliance with the MECP's PTTW Manual (April 2005), and application should be filed to the MECP for the subject property construction dewatering PTTW, if the dewatering discharge is greater than 400,000 L/day, or about 4.6 L/S. If the dewatering discharge is between 50,000 L/day (or about 0.6 L/S) and 400,000 L/day (or about 4.6 L/S) dewatering activities need to be registered on the Environmental Activity and Sector Registry (EASR). PML would be happy to assist with this process, if required.

The depth of excavations for trunk sewer installation are expected to extend to a maximum 6.5 m depth into clayey silt deposits with wet to saturated layers of silt. Due to the presence of numerous water bearing silt layers in the native deposits, excavations for the sending and receiving pits might have pumping rates that exceed 50,000 L/day, and a PTTW or EASR may be required, along with a hydrogeological investigation in support of the application. The estimated construction dewatering volumes should be reassessed once more detailed design information has been established. Upon request, PML would be please to provide further recommendations in this regard.

It is recommended that test pits be carried out during the tendering stage of the project in order that prospective contractors may familiarize themselves with soil and ground water conditions to be expected. Also, the dewatering requirements should be established by the contractor in the context of a performance specification.

Braced Excavations

If space is not available for an enlarged unsupported open cut excavation then consideration should be given to using an engineered system (timber lagging, sheet piling or caisson wall) to support the excavation walls. The soil parameters presented in the following table may be used for the design of braced excavation systems. The parameters are based on the Rankin method of analysis which ignores wall friction.

SOIL TYPE	**CLAYEY SILT**
Coefficient of Active Earth Pressure K_a	0.33
Coefficient of Passive Earth Pressure K_p	3.00
Angle of Internal Friction Ø	30
Cohesive Strength c_u	50 kPa
Unit Weight γ (kN/m^3)	21

For the soil stratigraphy encountered, the bracing system may be designed as a multi-braced system using a rectangular stress distribution in accordance with methods outlined in the latest Canadian Foundation Engineering Manual (CFEM) and summarized on the appended Figure 2, or as a singly-braced system using a triangular stress distribution and summarized on the appended Figure 3. The system design should also consider load effects from ground water, the adjacent embankments, structures and construction equipment.

The ground surface adjacent to a braced excavation is expected to experience some inward movement and vertical settlement. The magnitude of movements adjacent to a braced cut can be limited by proper selection of the lateral earth pressure coefficient, provided good quality workmanship and construction practices are employed.

The maximum allowable movements of braced excavations must be established in a performance specification, and should be determined through agreement with the railway authority.

Backfill

In general, conventional bedding and cover will be suitable for sewer installation and backfilling of the sending and receiving pits. Material containing stones larger than 50 mm size should not be used in the bedding or cover layers. The bedding should be constructed in accordance with applicable Ontario Provincial Standard Drawings (OPSD) and / or local standards. The bedding and cover material should be placed in 150 mm lifts and compacted to at least 95% standard Proctor maximum dry density (SPMDD).

Backfill materials should comprise approved imported granular soil. The backfill materials should be placed in 300 mm maximum lifts and compacted to a minimum of 95% SPMDD.

Should construction extend to the winter months, care must be taken to ensure that frozen material is not used as backfill.

Excavated materials intended for backfilling purposes should not be exposed to the elements for prolonged time periods, as they might be rendered unsuitable for reuse.

Monitoring

The ground surface over the tunnel route may become distorted and distressed by tunnelling. The most common type of distress is settlement caused by loss of ground around the tunnel. Heave of the ground surface is also possible depending on the type of installation. Monitoring of lateral movement of ground near excavations may also be necessary. Mitigation of the distress or distortion on the railway would be a major inconvenience and possibly a safety issue.

Distress at the ground surface is generally prevented or minimized by good construction practices and proper planning. In this regard, preparation of an installation plan as noted above is recommended.

It is also recommended that the project proponent implement a monitoring program to check the condition of the ground over the tunnel before, during and upon completion of construction. The monitoring program should be carried out by a qualified geotechnical consulting firm that is familiar with the proposed work and subsurface conditions. The monitoring period should begin prior to tunnelling, extend throughout the duration and continue at least 2 weeks after completion of tunnelling. More specific monitoring procedures may also be required by the railway authorities.

Monitoring points should be marked using a method approved by the railway authority. Monitoring points should also be functional throughout the monitoring period and should not deteriorate because of traffic, maintenance activities, and weather conditions.

If distress is observed during construction, the contractor should be informed and corrective action should be undertaken immediately. Specific corrective action will be dependent on the nature of the distress and type of installation. Regardless, the process should be outlined in the monitoring program and be part of the contingency actions in the contractor's installation plan.

In general, settlement or heave of the railway from a properly constructed jack and bore or pipe ramming installation carried out in accordance with the recommendations noted in this report, should be less than 10 mm. If settlement or heave of the ground surface exceeds 10 mm, the construction process should be reviewed and adjusted to mitigate further disturbances for the remainder of the tunnelling work.

If total settlement or heave exceeds 15 mm, tunnelling operations should be terminated, the site secured against further deterioration and mitigative action should be undertaken immediately to reinstate the railway and existing utilities

All actions to prevent, secure, or mitigate destruction or damage to the highway and associated features should be done in accordance with, and approved by the railway authorities.

Geotechnical Review and Construction Inspection and Testing

When development design is complete, it is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with site conditions and recommendations of this report.

Earthworks operations should be carried out under the supervision of PML to approve subgrade preparation, backfill materials, placement and compaction procedures, and verify the specified degree of compaction is achieved uniformly throughout fill materials.

The comments and recommendations provided in the report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary, particularly where service trenches exist. Geotechnical review during construction should be on going to confirm the subsurface conditions are substantially similar to those encountered in the boreholes, which may otherwise require modification to the original recommendations.

This report is subject to the Statement of Limitations that is included in Appendix B, which must be read in conjunction with the report.

Closure

We trust the information presented in this report is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.



William Loghrin, P.Eng.
Manager Engineering Service



Gerry Mitchell, MEng, P.Eng.
Senior Consultant

WL/GM:tm

Enclosures:
Figure 1 – General Recommendations Regarding Underpinning
Figure 2 – Lateral Earth Pressure Distribution Multi-Braced Cuts in Cohesionless Soils
Figure 3 – Lateral Earth Pressure Distribution Singly-Braced Cuts in Cohesionless Soils
Drawing 1 - Borehole Location Plan
Appendix A – Figure 6 and Borehole Logs BH/MW109 and BH/MW110
Appendix B – Statement of Limitations

Closure

We trust the information presented in this report is sufficient for your immediate requirements. If you have any questions or require further information, please do not hesitate to contact our office.

Sincerely

Peto MacCallum Ltd.

William Loghrin, P.Eng.
Manager Engineering Service

Gerry Mitchell, MEng, P.Eng.
Senior Consultant

WL/GM:tm

Enclosures:
Figure 1 – General Recommendations Regarding Underpinning
Figure 2 – Lateral Earth Pressure Distribution Multi-Braced Cuts in Cohesionless Soils
Figure 3 – Lateral Earth Pressure Distribution Singly-Braced Cuts in Cohesionless Soils
Drawing 1 - Borehole Location Plan
Appendix A – Figure 6 and Borehole Logs BH/MW109 and BH/MW110
Appendix B – Statement of Limitations

NOTES

1. The need to underpin existing footings/utilities is dependent upon soil type, proximity of the existing facility to the face of the excavation, loads imposed on the foundation and permissible movements.

   ZONE A:
   Foundations of relatively heavy and/or settlement sensitive structures/ utilities located in Zone A generally require underpinning.

   ZONE B:
   Foundations of structures located within Zone B generally do not require underpinning. Consideration should be given to underpinning of settlement sensitive utilities or heavy foundation units located in this zone.

   ZONE C:

   Utilities and foundations located within Zone C do not normally require underpinning.

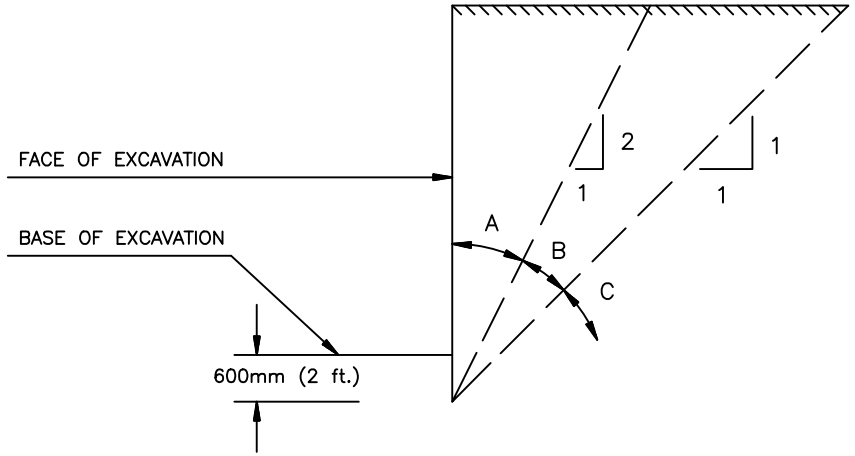
   Underpinning of foundations located in Zones A and B should extend at least into Zone C.

2. As an alternative to underpinning, it may be possible to control movement of existing utilities and foundations by supporting the face of the excavation with bracing/tiebacks or a rigid (caisson) wall. Horizontal and vertical earth pressures imposed on the excavation wall by non–underpinned foundations must be considered in the design of the support system.

3. A condition survey should be conducted prior to construction and appropriate monitoring (surface and insitu) carried out during construction to monitor any movement which may occur.

4. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.

5. This sheet is to be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.



Peto MacCallum Ltd. CONSULTING ENGINEERS

STANDARD DRAWING

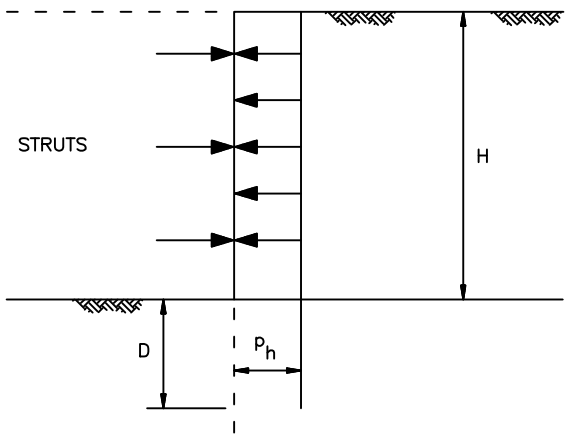
GENERAL RECOMMENDATIONS REGARDING UNDERPINNING OF FOUNDATIONS/UTILITIES LOCATED CLOSE TO EXCAVATION

DATE	JOB NUMBER	FIGURE NO.
FEB 2022	18KF031	1

NOTES

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
2. Stability of base of excavation must be confirmed when bracing system design, excavation geometry and surcharge loads are established. If groundwater table is well above base of excavation and/or artesian conditions exist, local lowering of the groundwater level will be necessary to prevent bottom heave/piping of the base of the excavation.
3. Earth pressure diagram is applicable to maximum depth of cut of 12m (40 ft.).
4. Structural components of bracing system should be confirmed adequate for each level of excavation.
5. If sheeting will not permit drainage, bracing system must be designed to resist water pressure.
6. Surcharge loads such as street/construction traffic, supported utilities, adjacent foundations, temporary stockpiles and other loads carried by bracing system are not included in earth pressure diagram.
7. Temporary surcharge loading should not be closer to the face of the excavation than half the depth of excavation unless accounted for in bracing design.
8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and appppropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, earth pressure diagram must be reviewed, and remedial works may be required.
10. Earth pressure diagram does not account for extended periods of exposure of the excavation to freezing temperatures.
11. Bracing system should be regularly examined for signs of distress.
12. All work should be carried out in accordance with the Occupational Health and Safety Act and local regulations. Good quality workmanship and construction practices are to be employed.
13. This sheet should be read in conjunction with text of report for this project. Additional comments and recommendations concerning these general guidelines will be provided if required.

EARTH PRESSURE DIAGRAM



p_h = design lateral earth pressure
= 0.65 $K\gamma H$

K = lateral earth pressure coefficient

γ = unit weight of soil

H = depth of excavation

D = depth of embedment of soldier piles (if used).

RECOMMENDED DESIGN PARAMETERS

γ = 21.0 kN/m^3

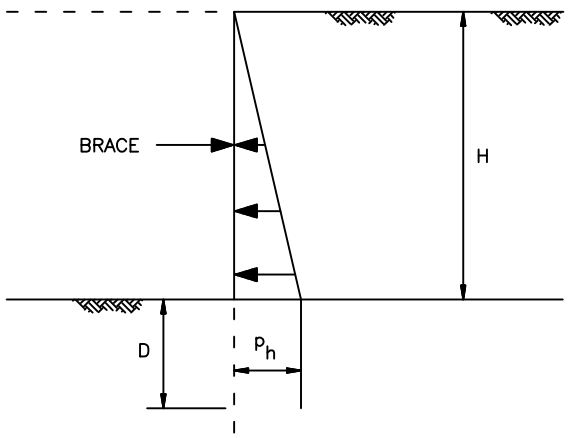
K = 0.33 (movement of retained soil acceptable)
0.50 (movement of adjacent structures/facilities unacceptable)

Peto MacCallum Ltd. CONSULTING ENGINEERS	LATERAL EARTH PRESSURE DISTRIBUTION MULTI–BRACED CUTS IN COHESIONLESS SOILS	DATE FEB 2022	JOB NUMBER 18KF031	FIGURE NO. 2

NOTES

1. The actual magnitude and distribution of the horizontal earth pressures which will act on the bracing system are dependent upon the permissible lateral/vertical movements adjacent to the excavation, the soil type, groundwater conditions, drainage provisions, temporary/permanent surcharge loads, the type of bracing system adopted, weather conditions, quality of workmanship and length of time the excavation will be supported. Hence, the recommended pressure diagram and design parameters should be reviewed when construction details, schedule and type of support system are established.
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8. If settlement sensitive structures are located near the excavation, special measures should be undertaken to control settlements. A condition survey should be conducted prior to construction and apppropriate monitoring (surface and insitu) carried out during construction.
9. Earth pressure diagram is applicable for relatively short construction periods. If excavation is to be open for long periods, monitoring of deformation is essential, the earth pressure diagram must be reviewed, and remedial works may be required.
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EARTH PRESSURE DIAGRAM



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= $K\gamma H$

K = lateral earth pressure coefficient

γ = unit weight of soil

H = depth of excavation

D = depth of embedment of soldier piles (if used).

RECOMMENDED DESIGN PARAMETERS

γ = 21.0 kN/m^3

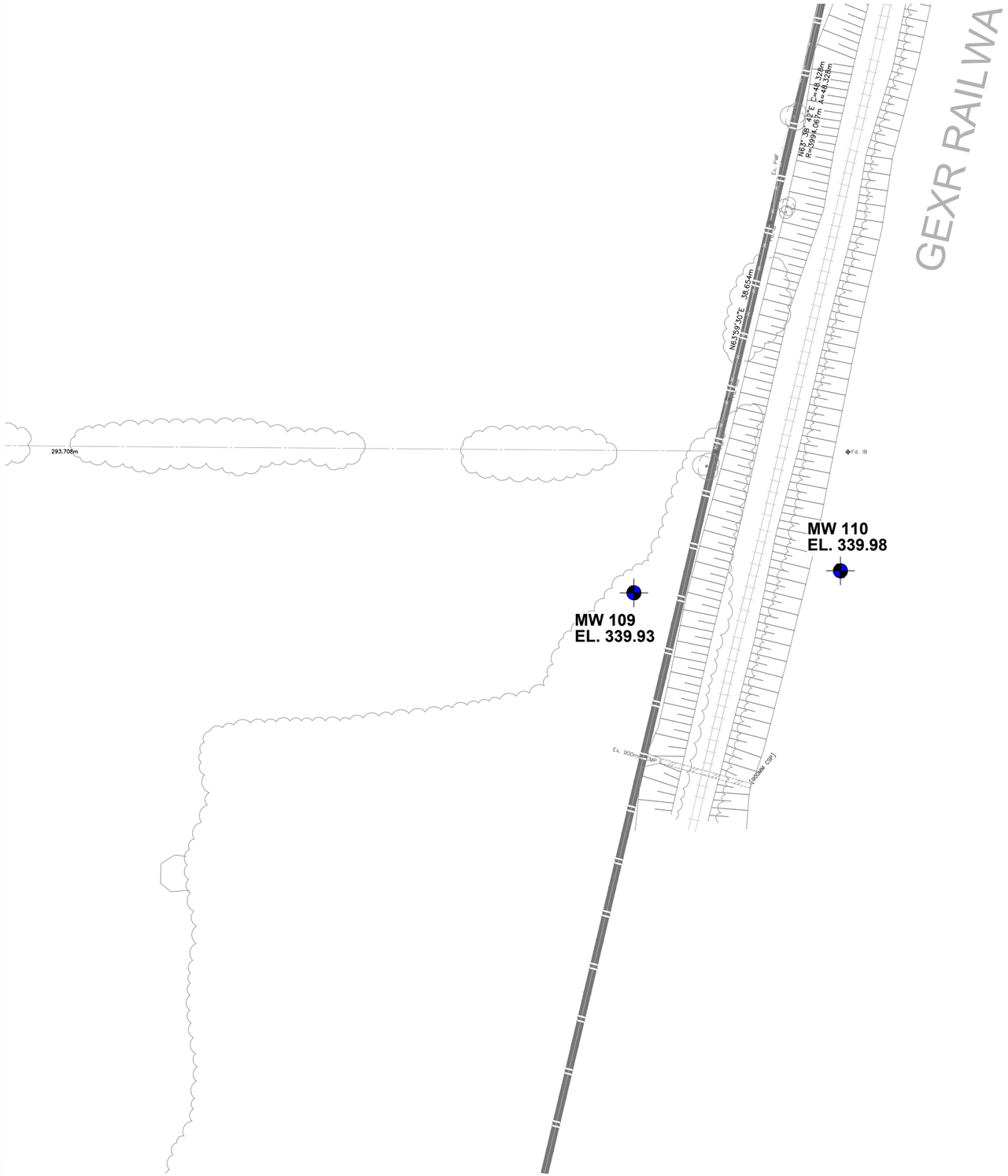
K = 0.33 (movement of retained soil acceptable)
0.50 (movement of adjacent structures/facilities unacceptable)

Peto MacCallum Ltd
CONSULTING ENGINEERS

LATERAL EARTH PRESSURE DISTRIBUTION

SINGLY–BRACED CUTS IN COHESIONLESS SOILS

DATE	JOB NUMBER	FIGURE NO.
FEB 2022	18KF031	3





KEY PLAN

LEGEND:

- BOREHOLE LOCATION
- MONITORING WELL LOCATION

REFERENCE:

BOREHOLE LOCATION PLAN REPRODUCED FROM DRAWING SUPPLIED BY CLIENT.

NOTE:

THE INFERRED STRATIGRAPHY REFERRED TO IN THE REPORT IS BASED ON THE DATA FROM THESE BOREHOLES SUPPLEMENTED BY GEOLOGICAL EVIDENCE. THE ACTUAL STRATIGRAPHY BETWEEN THE BOREHOLES MAY VARY.

WILMOT WOODS DEVELOPMENT INC.

PROPOSED WILMOT WOODS DEVELOPMENT

NEW HAMBURG

NEW HAMBURG, ONTARIO

BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	W. LOGHRIN	FEBRUARY 2022	AS SHOWN	18KF031	1
APPROVED	G. MITCHELL				

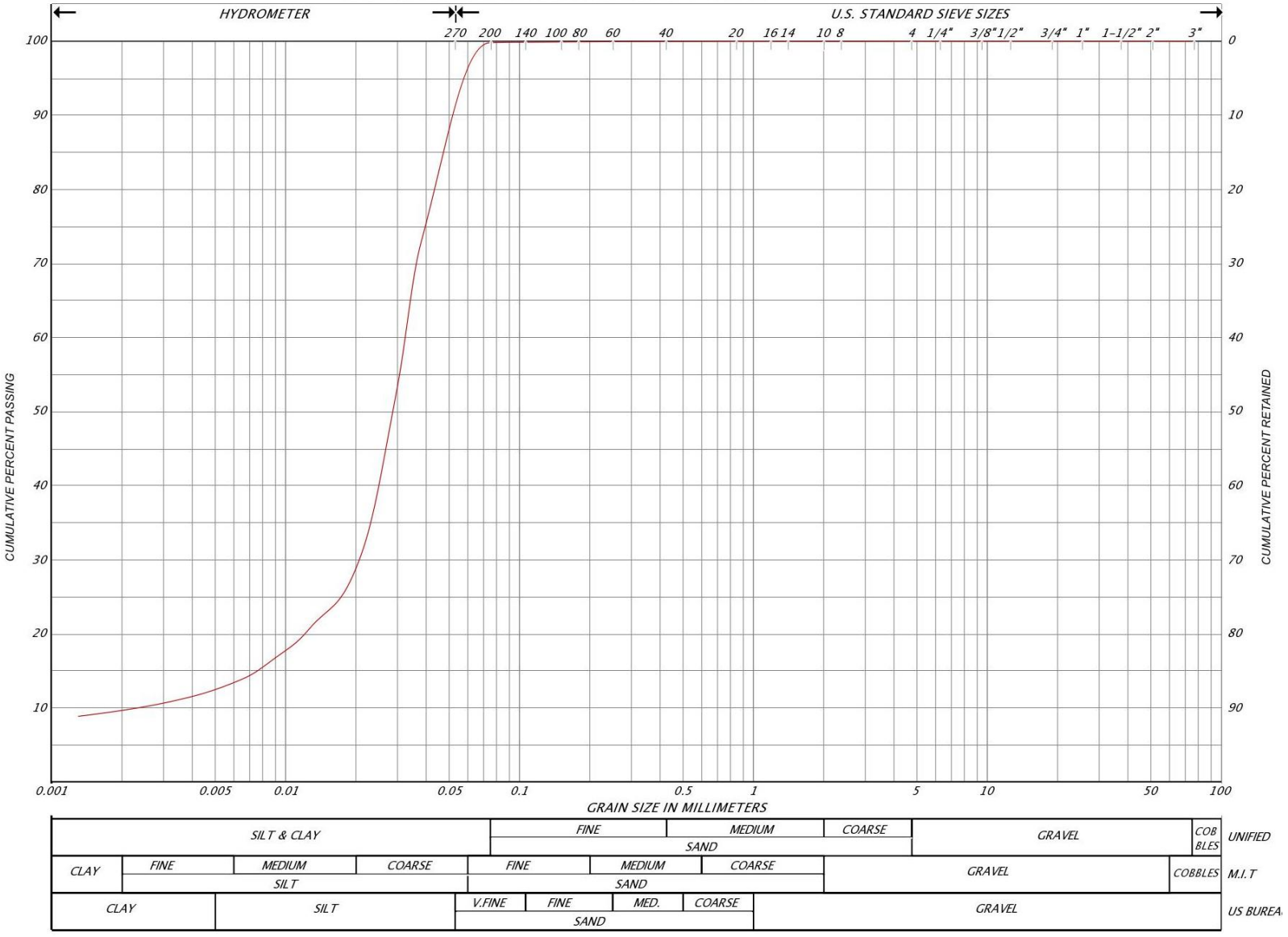
APPENDIX A

FIGURE 6 AND BOREHOLE LOGS 109 AND 110
FROM PREVIOUS REPORT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 18KF031
FIGURE NO. 6



REMARKS Borehole MW109, Sample SS11, Depth 9.1 to 9.6 m

CLAYEY SILT

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 109

17T 524441.1E 4803985N

PROJECT Wilmot Woods Development
PML REF. 18KF031
LOCATION New Hamburg, Ontario
BORING DATE August 2, 2018
ENGINEER H. Shinwary
BORING METHOD Continuous Flight Solid Stem Augers
TECHNICIAN K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.93			
0.0		TOPSOIL: Dark brown clayey silt, some sand, occasional rootlets, APL to WTPL	1	SS	5
0.85	339.08	CLAYEY SILT: Soft to firm brown clayey silt, trace sand, DTPL, numerous silt layers, occasional cobbles	2A 2B	SS	3
			3	SS	7
2.1	337.8	becoming stiff	4	SS	11
2.9	337.0	becoming WTPL	5	SS	15
			6	SS	13
			7	SS	9
			8	SS	14
			9	SS	10
			10	SS	10
			11	SS	12
10.1	329.8	becoming very stiff	12	SS	16
			13	SS	15
12.5	327.4	BOREHOLE TERMINATED AT 12.5 m			

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ○ Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-08-03	3.7	336.2
2018-11-07	0.1	339.8
2018-11-26	0.1	339.8

NOTES

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE/MONITORING WELL NO. 110

17T 524499.6E 4803961N

PROJECT Wilmot Woods Development — **PML REF.** 18KF031

LOCATION New Hamburg, Ontario — **BORING DATE** October 15, 2018 — **ENGINEER** H. Shinwary

BORING METHOD Continuous Flight Hollow Stem Augers — **TECHNICIAN** K. Pettitt

DEPTH (metres)	ELEV	DESCRIPTION	NUMBER	TYPE	"N" VALUES
		SURFACE ELEVATION 339.98			
0.0		TOPSOIL: Dark brown silt, trace sand, occasional rootlets, moist to wet	1	SS	3
0.36	339.62	CLAYEY SILT: Stiff brown clayey silt, some sand, DTPL, numerous silt layers			
0.70	339.28	becoming firm to stiff, occasional cobbles, WTPL	2	SS	10
1.0					
			3	SS	12
2.0					
			4	SS	16
2.9	337.1	becoming firm to stiff grey, trace sand, WTPL			
3.0			5	SS	8
4.0			6	SS	7
			7	SS	9
5.0					
			8	SS	9
6.0					
			9	SS	9
7.0	333.0	becoming very stiff, occasional silt layers			
			10	SS	18
8.0					
8.5	331.5	becoming stiff, numerous silt layers			
9.0					
			11	SS	12
10.0					
			12	SS	10
11.0					
			13	SS	13
12.6	327.4	BOREHOLE TERMINATED AT 12.6 m			
13.0					
14.0					
15.0					

SHEAR STRENGTH (kPa)
+FIELD VANE △TORVANE ○ Qu
▲POCKET PENETROMETER ● Q
50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
20 40 60 80

ELEVATION SCALE: 339, 338, 337, 336, 335, 334, 333, 332, 331, 330, 329, 328

PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L
WATER CONTENT (%)
10 20 30 40

UNIT WEIGHT kN/m³

GROUND WATER OBSERVATIONS AND REMARKS
GRAIN SIZE DISTRIBUTION (%) GR SA SI&CL

Stickup Well Protector Set in Concrete
50 mm pipe
Bentonite Seal
Filter Sand
Screen

Water Level Readings:

Date	Depth	Elev.
2018-10-15	DRY	----
2018-11-07	0.5	339.5
2018-11-26	0.2	339.8

NOTES

APPENDIX B

STATEMENT OF LIMITATIONS

STATEMENT OF LIMITATIONS

This report is prepared for and made available for the sole use of the client named. Peto MacCallum Ltd. (PML) hereby disclaims any liability or responsibility to any person or entity, other than those for whom this report is specifically issued, for any loss, damage, expenses, or penalties that may arise or result from the use of any information or recommendations contained in this report. The contents of this report may not be used or relied upon by any other person without the express written consent and authorization of PML.

This report shall not be relied upon for any purpose other than as agreed with the client named without the written consent of PML. It shall not be used to express or imply warranty as to the fitness of the property for a particular purpose. A portion of this report may not be used as a separate entity: that is to say the report is to be read in its entirety at all times.

The report is based solely on the scope of services which are specifically referred to in this report. No physical or intrusive testing has been performed, except as specifically referenced in this report. This report is not a certification of compliance with past or present regulations, codes, guidelines and policies.

The scope of services carried out by PML is based on details of the proposed development and land use to address certain issues, purposes and objectives with respect to the specific site as identified by the client. Services not expressly set forth in writing are expressly excluded from the services provided by PML. In other words, PML has not performed any observations, investigations, study analysis, engineering evaluation or testing that is not specifically listed in the scope of services in this report. PML assumes no responsibility or duty to the client for any such services and shall not be liable for failing to discover any condition, whose discovery would require the performance of services not specifically referred to in this report.

The findings an comments made by PML in this report are based on the conditions observed at the time of PML's site reconnaissance. No assurances can be made and no assurances are given with respect to any potential changes in site conditions following the time of completion of PML's field work. Furthermore, regulations, codes and guidelines may change at any time subsequent to the date of this report and these changes may effect the validity of the findings and recommendations given in this report.

STATEMENT OF LIMITATIONS

The results and conclusions with respect to site conditions are therefore in no way intended to be taken as a guarantee or representation, expressed or implied, that the site is free from any contaminants from past or current land use activities or that the conditions in all areas of the site and beneath or within structures are the same as those areas specifically sampled.

Any investigation, examination, measurements or sampling explorations at a particular location may not be representative of conditions between sampled locations. Soil, ground water, surface water, or building material conditions between and beyond the sampled locations may differ from those encountered at the sampling locations and conditions may become apparent during construction which could not be detected or anticipated at the time of the intrusive sampling investigation.

Budget estimates contained in this report are to be viewed as an engineering estimate of probable costs and provided solely for the purposes of assisting the client in its budgeting process. It is understood and agreed that PML will not in any way be held liable as a result of any budget figures provided by it.

The Client expressly waives its right to withhold PML's fees, either in whole or in part, or to make any claim or commence any action or bring any other proceedings, whether in contract, tort, or otherwise against PML in anyway connected with advice or information given by PML relating to the cost estimate or Environmental Remediation/Cleanup and Restoration or Soil and Ground Water Management Plan Cost Estimate.

Peto MacCallum Ltd.
CONSULTING ENGINEERS

February 24, 2022

PML Ref.: 18KF031
Report: 3 Revised

Mr. Adam Belksy
Wilmot Woods Development Inc.
310 Fairway Road South, P.O. Box 45016
Kitchener, Ontario
N2C 2R6

Dear Mr. Belksy

Monitoring Well Water Level Reading
Proposed Wilmot Woods Development
New Hamburg, Ontario

Peto MacCallum Ltd. is pleased to submit our report regarding the ground water monitoring program of Proposed Wilmot Woods Development, New Hamburg, Ontario.

A record of water monitoring completed since September 2018 to February 2021 is presented in Table 1, attached.

We trust that this report has been completed within our terms of reference, and is sufficient for your immediate requirements. If you have any questions, or require further information, please do not hesitate to contact our office

Sincerely

Peto MacCallum Ltd.

William Loghrin, P.Eng.
Manager, Engineering Services

WL:tm

Enclosure:
Table 1: Ground Water Level Readings in Monitoring Wells

Distribution:
1 cc: Wilmot Woods Development Inc.
1 cc: MTE Consultants Inc. (+ email – jcabral@mte85.com).
1 cc: PML Kitchener

16 Franklin Street South, Kitchener, Ontario N2C 1R4
Tel: (519) 893-7500 Fax: (519) 893-0654
E-mail: kitchener@petomaccallum.com
BARRIE, COLLINGWOOD, HAMILTON, KITCHENER, LONDON, TORONTO

TABLE 1

GROUND WATER LEVEL READINGS IN MONITORING WELLS

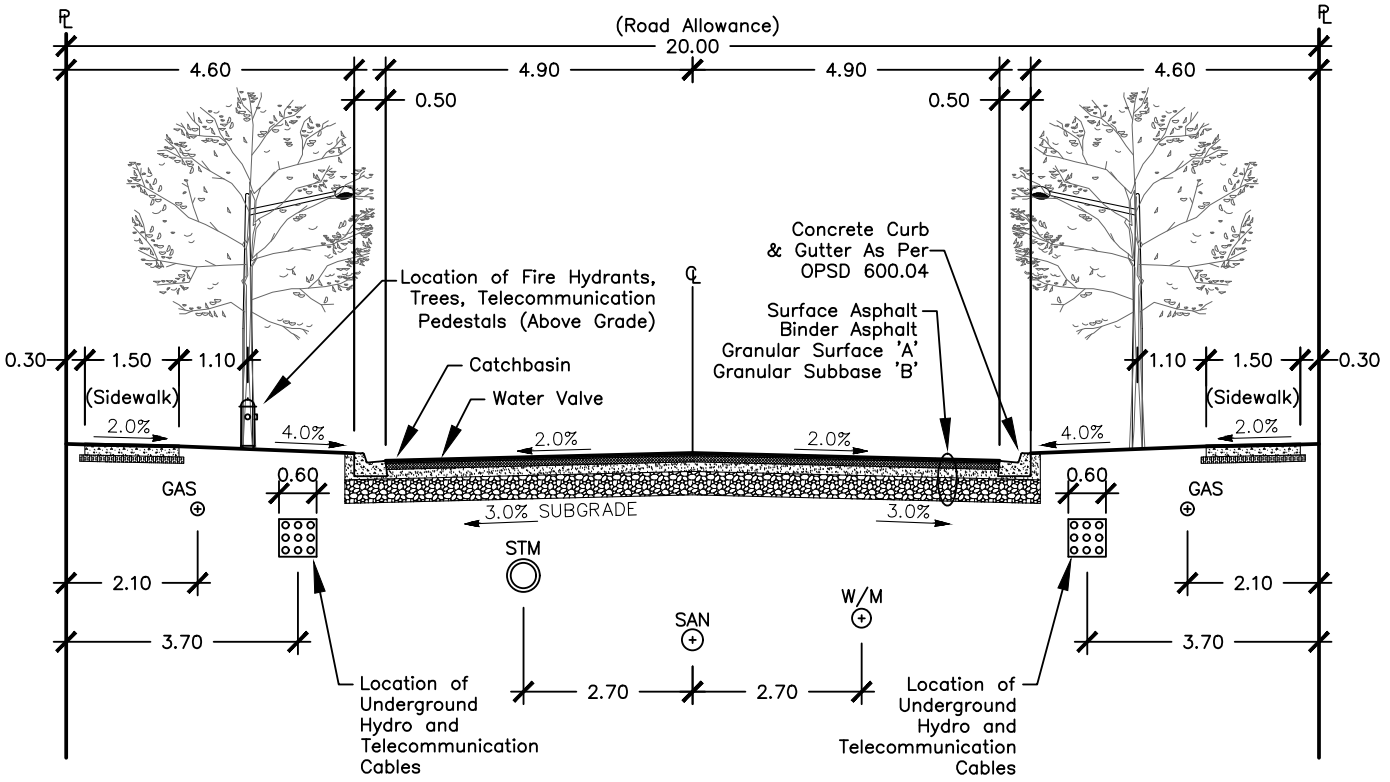
MONITORING WELL No.	GROUND SURFACE ELEVATION[1]	MID-SCREEN ELEVATION[2] (DEPH, m)	HYDROSTATIC GROUND WATER LEVEL ELEVATION (DEPTH, m) [2]								
			SEPTEMBER 19, 2018	OCTOBER 10, 2018	NOVEMBER 7, 2018	NOVEMBER 26, 2018	FEBRUARY 8, 2019	NOVEMBER 19, 2020	DECEMBER 18, 2020	JANUARY 30, 2021	FEBRUARY 26, 2021
101	339.0	333.8 (5.2)	337.2 (1.80)	337.7 (1.34)	338.2 (0.85)	337.8 (1.24)	338.1 (0.96)	337.572 (1.46)	337.832 (1.20)	337.172 (1.86)	337.152 (1.88)
102	340.0	334.8 (5.2)	338.3 (1.71)	338.5 (1.48)	338.8 (1.23)	338.8 (1.24)	338.6 (1.41)	338.404 (1.69)	338.594 (1.50)	338.484 (1.61)	338.794 (1.30)
103	343.2	338.0 (5.2)	340.0 (3.22)	340.6 (2.66)	340.9 (2.33)	341.3 (1.91)	341.5 (1.70)	340.326 (3.00)	340.666 (2.66)	341.466 (1.86)	340.746 (2.58)
104	344.9	339.7 (5.2)	341.8 (3.17)	342.5 (2.45)	343.5 (1.41)	344.1 (0.83)	343.9 (1.03)	341.708 (3.23)	343.168 (1.77)	343.678 (1.26)	343.358 (1.58)
105	341.1	335.9 (5.2)	339.7 (1.31)	340.0 (1.08)	340.1 (0.91)	340.3 (0.77)	340.2 (0.84)	339.874 (1.26)	340.024 (1.11)	340.554 (0.58)	339.284 (1.85)
106	343.0	337.8 (5.2)	340.9 (2.13)	341.7 (1.25)	341.7 (1.31)	341.8 (1.15)	341.3 (1.65)	339.523 (3.47)	341.303 (1.69)	341.753 (1.24)	342.283 (0.71)
107	347.0	341.8 (5.2)	343.9 (3.07)	-	344.7 (2.30)	344.6 (2.33)	344.8 (2.20)	341.475 (5.52)	343.175 (3.82)	346.415 (0.58)	346.245 (0.75)
108	345.3	340.1 (5.2)	339.4 (5.94)	-	339.6 (5.68)	339.9 (5.40)	339.7 (5.63)	339.387 (6.00)	Dry	344.877 (0.51)	344.647 (0.74)
109	339.9	330.8 (9.1)	339.4 (0.53)	339.4 (0.53)	339.7 (0.19)	339.9 (0.04)	339.7 (0.20)	327.355 (0.48)	327.495 (0.34)	327.185 (0.65)	327.375 (0.46)
110	340.0	328.4 (11.6)	-	-	339.8 (0.43)	339.8 (0.17)	339.7 (0.26)	332.442 (0.84)	332.282 (1.00)	332.652 (0.63)	332.782 (0.50)

Notes:

(1) Ground surface elevations at the monitoring well locations were surveyed by PML and are geodetic.
(2) Water levels measured using a Solinst flat tape water level reader.

Appendix C

Typical ROW Cross-Sections



UTILITY	MIN. COVER
SANITARY	2.8m
STORM	1.5m
WATER	2.0m
HYDRO	0.9m
BELL	0.75m
CABLE	0.75m
GAS	0.6m

ROAD STRUCTURE SHALL BE:	
HL3 SURFACE ASPHALT	35mm
HL4 BINDER ASPHALT	45mm
GRAN 'A' BASE COURSE	150mm
GRAN 'B' SUBBASE COURSE	600mm

APPENDIX C

Date: OCT.08/20
Scale: NTS

WILMOT WOODS

ROAD SECTION
URBAN 20.0m RIGHT-OF-WAY

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

February 18, 2022 — 10:32 a.m. — Plotted By: acressman

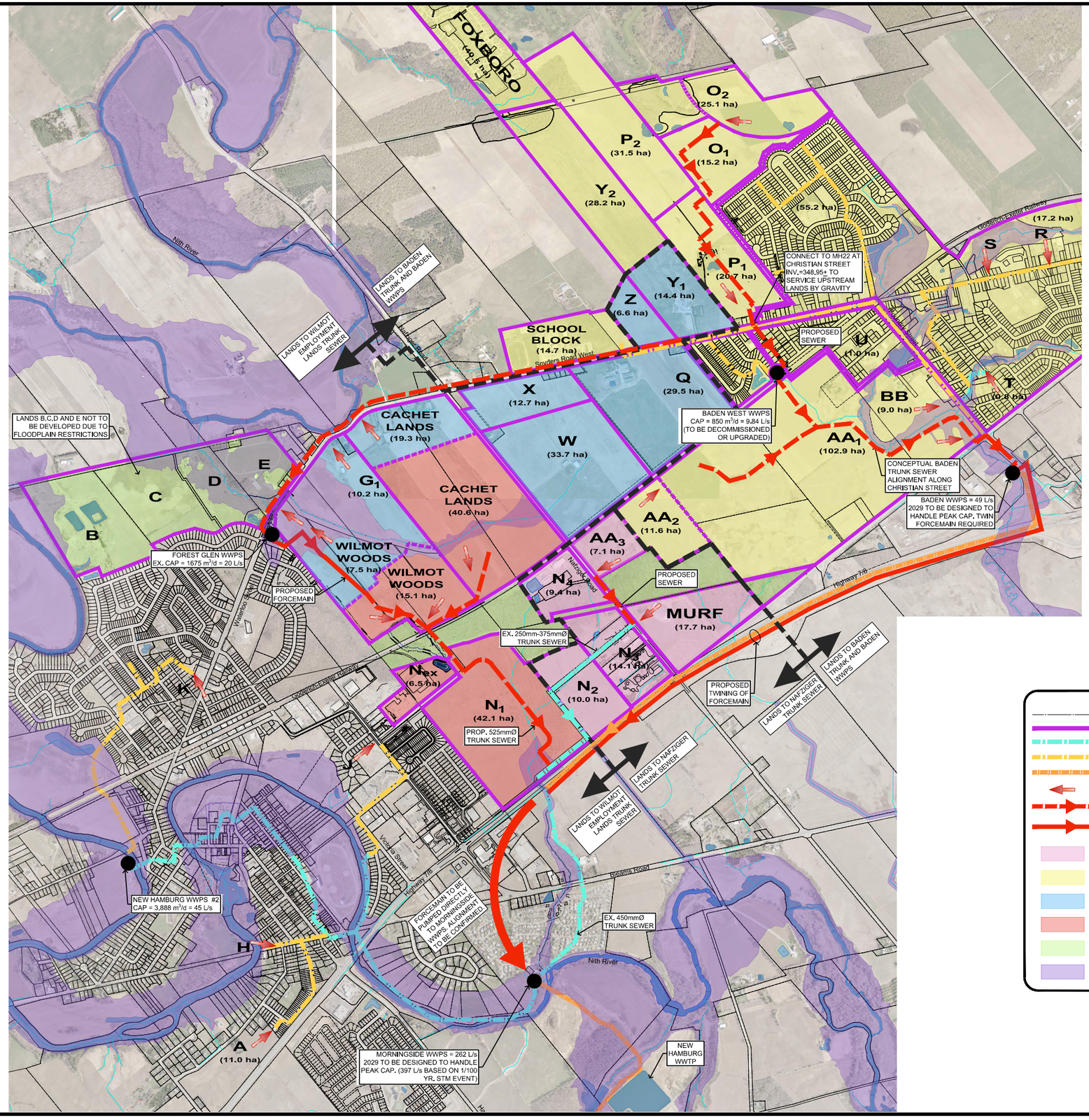
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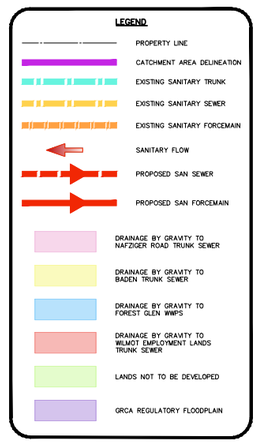
Appendix D

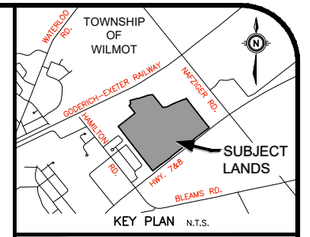
Proposed Sanitary Sewer Analysis

P:\P\34896\114\34896-114-SA2

January 31, 2022 - 9:38:23 AM - Plotted By: Alex Cressman







GEODETIC BM ELEV. = 342.487m

ONE STOREY RED BRICK BUILDING (HAHN BRASS CO.) ON THE NORTH SIDE OF HWY.7&8, BEING 0.6km SOUTH ALONG PEEL ST. EVANGELICAL UNITED CHURCH IN NEW HAMBURG. TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONC. FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 336.032m

CUT CROSS ON CONCRETE BOX CULVERT LOCATED WEST OF FIELD ENTRANCE.

NOTE TO CONTRACTOR :

DO NOT SCALE DRAWINGS.

CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND REPORT ANY DISCREPANCIES TO THE ENGINEER BEFORE PROCEEDING WITH THE WORK.

ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED OR REUSED WITHOUT THE ENGINEER'S WRITTEN PERMISSION.

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No.	REVISION	BY	YYYY-MM-DD
8.			
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1.	ISSUED FOR FIRST SUBMISSION	DFH	2021-11-19

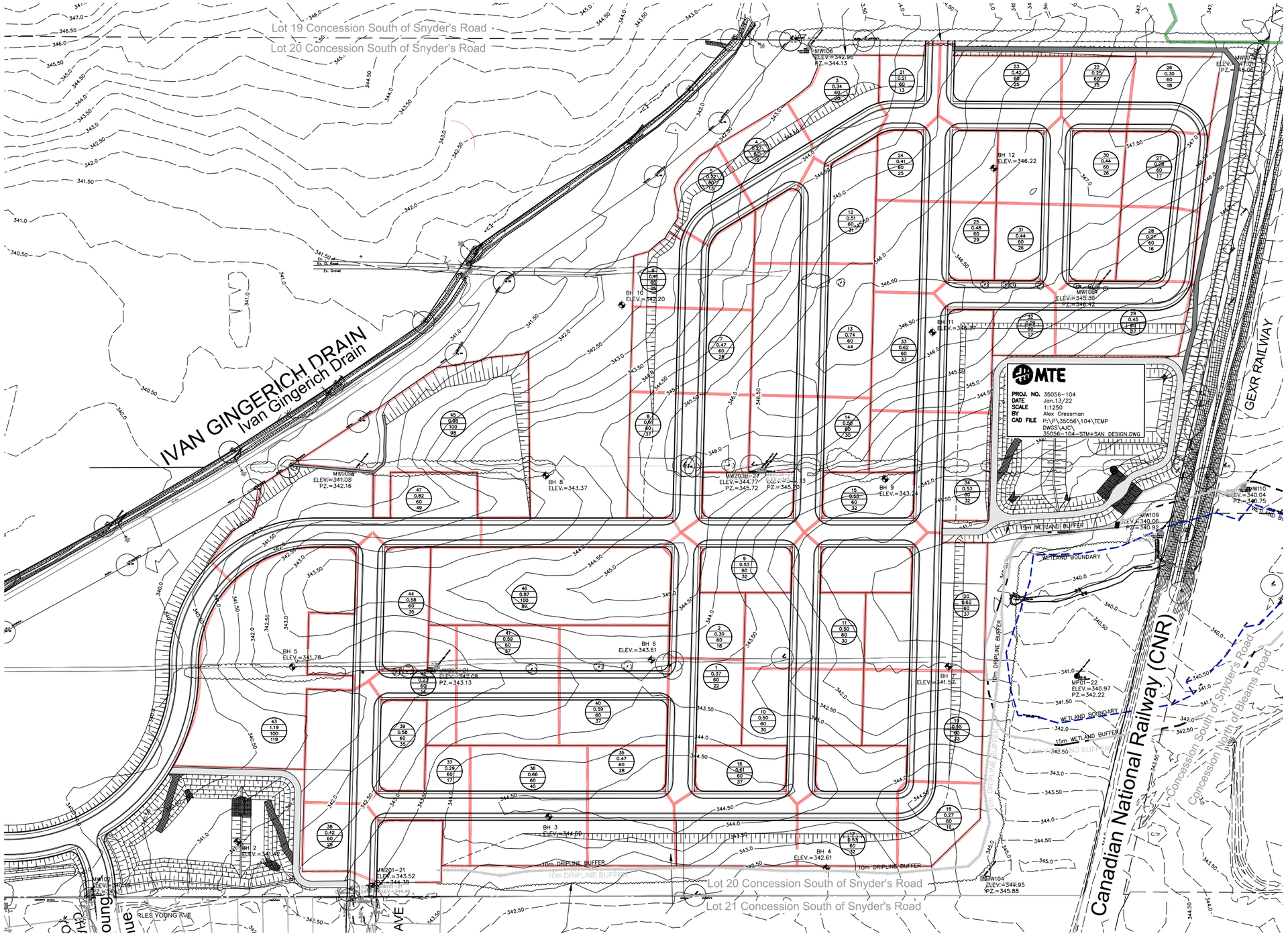
MTE
Engineers, Scientists, Surveyors
(519) 743-6500

OWNERS
BADENVIEW DEVELOPMENTS INC.
NEW HAMBURGLRS INC.

PROJECT
WILMOT EMPLOYMENT LANDS
New Hamburg

DRAWING
OVERALL CONCEPTUAL SANITARY DRAINAGE AREA PLAN

Project Manager	D.HICKS	Project No.	34896-114 39219-114
Design By	CJC	Checked By	GMK
Drawn By	KAT/AXH	Checked By	CJC
Surveyed By	MTE	Drawing No.	**SA1.2**
Date	Nov.18/21		
Scale	1:10000	Sheet	of


Lot 19 Concession South of Snyder's Road
Lot 20 Concession South of Snyder's Road
IVAN GINGERICH DRAIN
Ivan Gingerich Drain
GEXR RAILWAY
Canadian National Railway (CNR)
Concession South of Snyder's Road
Concession North of Beams Road
Lot 20 Concession South of Snyder's Road
Lot 21 Concession South of Snyder's Road
MTE
PROJ. NO. 35056-104
DATE Jan.13/22
SCALE 1:1250
BY Alex Cressman
CAD FILE P:\P\35056\104\TEMP DWGS\AJC\ 35056-104-STM+SAN_DESIGN.DWG
10m DRIPLINE BUFFER
15m WETLAND BUFFER
WETLAND BOUNDARY
MW105 ELEV.=342.96 PZ.=344.13
MW106 ELEV.=341.08 PZ.=342.16
MW107 ELEV.=345.36 PZ.=346.42
MW108 ELEV.=342.08 PZ.=343.13
MW109 ELEV.=340.96 PZ.=340.92
MW110 ELEV.=340.04 PZ.=340.75
MW104 ELEV.=344.95 PZ.=345.88
MW201-21 ELEV.=343.52 PZ.=344.38
MW20-38-27 ELEV.=344.77 PZ.=345.72
MW20-38-28 ELEV.=345.13 PZ.=345.20
MP01-22 ELEV.=340.97 PZ.=342.22
BH 1 ELEV.=341.46
BH 2 ELEV.=341.49
BH 3 ELEV.=344.66
BH 4 ELEV.=342.61
BH 5 ELEV.=341.78
BH 6 ELEV.=343.61
BH 7 ELEV.=341.52
BH 8 ELEV.=343.37
BH 9 ELEV.=343.24
BH 10 ELEV.=342.20
BH 11 ELEV.=345.37
BH 12 ELEV.=346.22
CHARLES YOUNG AVE

WILMOT WOODS

TOWNSHIP OF WILMOT, Ontario

Project Number: 35056-104
Date: January 13, 2022
Design By: AJC
Checked By:
File: Q:\35056\104\SAN\35056-104-Sanitary Sewer Design Sheet.xls

ULTIMATE BUILD OUT SANITARY SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Drainage Area Plan No: PRELIM-SA1.1

Design Parameters

Average Daily Flow
Residential 0.00353 L/s/c

Commercial 0.95 L/s/ha
Industrial 0.40 L/s/ha
Inst. / School 0.25 L/s/ha

Mannings "*n*" 0.0130
Min. Velocity 0.8 m/sec
Max. Velocity 3.0 m/sec
Residential Harmon Peaking Factor (F)

Residential Areas Infiltration 0.25 L/s/ha

LOCATION				RESIDENTIAL AREAS and POPULATION						SCHOOL, INSTITUTIONAL			COMMERCIAL			INDUSTRIAL				INFILTRATION			DESIGN					
STREET	AREA NO.	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	HECTARES OF EACH DENSITY 100	HECTARES OF EACH DENSITY 60	POPUL.	CUMUL POPUL.	PEAK FACTOR "F"	PEAK RES. FLOW	HECTARES AND FLOW OF EACH ZONING 0.25 L/s/ha AREA	CUMUL AREA	PEAK FLOW	0.95 L/s/ha AREA	CUMUL AREA	PEAK FLOW	0.40 L/s/ha AREA	CUMUL AREA	PEAK FLOW	TOTALS-C-I FLOW	AREA	CUMUL AREA	INFIL FLOW	TOTAL VOLUME FLOW	LENGTH	SLOPE	PIPE SIZE	CAPACITY	FULL FLOW VELOCITY
				ha	*ha*	*1000s*	*1000s*		*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*ha*	*ha*	*L/sec*	*L/sec*	*m*	*%*	*mm*	*L/sec*	*m/s*
1) WILMOT WOODS (+ CACHET) TO WEL BY GRAVITY																											
STREET FOUR	1			0.37		0.022	0.022	4.37	0.3428	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.37	0.37	0.0925	0.4353	56.0	1.00	200	32.7818	1.044
STREET FOUR	2			0.30		0.018	0.040	4.33	0.6149	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.30	0.67	0.1675	0.7824	81.0	0.60	200	25.3927	0.809
STREET SIX	3			0.34		0.020	0.020	4.38	0.3154	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.34	0.34	0.0850	0.4004	56.0	1.00	200	32.7818	1.044
STREET SIX	4			0.27		0.016	0.037	4.34	0.5608	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.27	0.61	0.1525	0.7133	53.0	0.60	200	25.3927	0.809
STREET SIX	5			0.22		0.013	0.050	4.32	0.7586	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.22	0.83	0.2075	0.9661	48.0	0.60	200	25.3927	0.809
STREET SIX	6			0.41		0.025	0.074	4.28	1.1232	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.41	1.24	0.3100	1.4332	53.0	0.60	200	25.3927	0.809
STREET SIX	7			0.47		0.028	0.103	4.24	1.5359	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.47	1.71	0.4275	1.9634	60.0	0.60	200	25.3927	0.809
STREET SIX	8			0.61		0.037	0.139	4.20	2.0645	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.61	2.32	0.5800	2.6445	90.0	0.60	200	25.3927	0.809
STREET TWO	9			0.53		0.032	0.211	4.14	3.0861	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.53	3.52	0.8800	3.9661	84.0	0.60	200	25.3927	0.809
STREET FIVE	10			0.50		0.030	0.030	4.35	0.4612	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.50	0.50	0.1250	0.5862	48.0	1.00	200	32.7818	1.044
STREET FIVE	11			0.50		0.030	0.060	4.30	0.9103	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.50	1.00	0.2500	1.1603	90.0	0.80	200	29.3209	0.934
STREET SEVEN	12			0.51		0.031	0.031	4.35	0.4703	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.51	0.51	0.1275	0.5978	74.0	1.00	200	32.7818	1.044
STREET SEVEN	13			0.74		0.044	0.075	4.28	1.1320	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.74	1.25	0.3125	1.4445	90.0	0.80	200	29.3209	0.934
STREET SEVEN	14			0.50		0.030	0.105	4.24	1.5708	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.50	1.75	0.4375	2.0083	90.0	0.80	200	29.3209	0.934
STREET TWO	15			0.53		0.032	0.408	4.02	5.7871	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.53	6.80	1.7000	7.4871	84.0	0.60	200	25.3927	0.809
STREET ONE	16			0.61		0.037	0.037	4.34	0.5608	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.61	0.61	0.1525	0.7133	84.0	1.00	200	32.7818	1.044
STREET ONE	17			0.53		0.032	0.068	4.29	1.0347	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.53	1.14	0.2850	1.3197	76.0	0.60	200	25.3927	0.809
STREET ONE	18			0.27		0.016	0.085	4.26	1.2731	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.27	1.41	0.3525	1.6256	12.0	0.60	200	25.3927	0.809
STREET ONE	19			0.55		0.033	0.118	4.22	1.7534	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.55	1.96	0.4900	2.2434	85.0	0.60	200	25.3927	0.809
STREET ONE	20			0.62		0.037	0.155	4.19	2.2878	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.62	2.58	0.6450	2.9328	90.0	0.60	200	25.3927	0.809
STREET SIX	21			0.21		0.013	0.013	4.40	0.1959	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.21	0.21	0.0525	0.2484	37.0	2.00	200	46.3604	1.476
STREET NINE	22			0.25		0.015	0.015	4.40	0.2328	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.25	0.25	0.0625	0.2953	52.0	1.00	200	32.7818	1.044
STREET NINE	23			0.42		0.025	0.040	4.33	0.6149	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.42	0.67	0.1675	0.7824	84.0	0.60	200	25.3927	0.809
CACHET LANDS	EXT			40.60		2.436	2.436	3.52	30.2492	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	40.60	40.60	10.1500	40.3992		0.40	300	61.1279	0.865
STREET EIGHT	24			0.41		0.025	2.513	3.51	31.1120	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.41	41.89	10.4725	41.5845	60.0	0.40	300	61.1279	0.865
STREET EIGHT	25			0.48		0.029	2.542	3.50	31.4321	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.48	42.37	10.5925	42.0246	60.0	0.40	300	61.1279	0.865
STREET NINE	26			0.30		0.018	0.018	4.39	0.2787	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.30	0.30	0.0750	0.3537	39.0	1.00	200	32.7818	1.044
STREET NINE						0.000	0.018	4.39	0.2787	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.00	0.30	0.0750	0.3537	16.0	0.60	200	25.3927	0.809
STREET NINE	27			0.28		0.017	0.035	4.34	0.5337	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.28	0.58	0.1450	0.6787	50.0	0.60	200	25.3927	0.809
STREET NINE	28			0.27		0.016	0.051	4.31	0.7765	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.27	0.85	0.2125	0.9890	54.0	0.60	200	25.3927	0.809
STREET NINE						0.000	0.051	4.31	0.7765	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.00	0.85	0.2125	0.9890	14.0	0.60	200	25.3927	0.809
STREET NINE	29			0.45		0.027	0.078	4.27	1.1762	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.45	1.30	0.3250	1.5012	74.0	0.60	200	25.3927	0.809
STREET TEN	30			0.44		0.026	0.026	4.36	0.4066	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.44	0.44	0.1100	0.5166	60.0	1.50	200	40.1493	1.279
STREET TEN	31			0.44		0.026	0.053	4.31	0.8033	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.44	0.88	0.2200	1.0233	60.0	1.00	200	32.7818	1.044
STREET NINE	32			0.29		0.017	0.148	4.19	2.1935	0.00	0.0000		0.00	0.0000		0.00	0.0000		0.0000	0.29	2.47	0.6175	2.8110	84.0	0.60	200	25.3927	0.809

STREET EIGHT	33				0.62	0.037	2.728	3.48	33.4808	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.62	45.46	11.3650	44.8458	82.0	0.40	300	61.1279	0.865
STREET EIGHT	34				0.53	0.032	2.759	3.47	33.8303	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.53	45.99	11.4975	45.3278	81.0	0.40	300	61.1279	0.865
OUTLET						**0.000**	**3.322**	**3.40**	**39.9255**	**0.00**	**0.0000**	**0.00**	**0.0000**	**0.00**	**0.0000**	**0.0000**	**0.00**	**55.37**	**13.8425**	**53.7680**					
2a) WILMOT WOODS TO WWPS																									
STREET ONE	35				0.47	0.028	0.028	4.36	0.4339	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.47	0.47	0.1175	0.5514	60.0	1.80	200	43.9814	1.401
STREET ONE	36				0.66	0.040	0.068	4.29	1.0258	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.66	1.13	0.2825	1.3083	80.0	1.80	200	43.9814	1.401
STREET ONE	37				0.29	0.017	0.085	4.26	1.2818	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.29	1.42	0.3550	1.6368	70.0	1.60	200	41.4660	1.321
INGOLD AVENUE	38				0.42	0.025	0.025	4.37	0.3884	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.42	0.42	0.1050	0.4934	48.0	1.00	200	32.7818	1.044
INGOLD AVENUE	39				0.58	0.035	0.145	4.20	2.1505	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.58	2.42	0.6050	2.7555	84.0	0.60	200	25.3927	0.809
STREET THREE	40				0.59	0.035	0.035	4.34	0.5427	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.59	0.59	0.1475	0.6902	63.0	1.20	200	35.9106	1.144
STREET THREE	41				0.59	0.035	0.071	4.28	1.0701	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.59	1.18	0.2950	1.3651	71.0	1.20	200	35.9106	1.144
STREET THREE	42				0.23	0.014	0.085	4.26	1.2731	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.23	1.41	0.3525	1.6256	60.0	1.20	200	35.9106	1.144
	43			1.19		0.119	0.119	4.22	1.7736	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	1.19	1.19	0.2975	2.0711	15.0	1.00	200	32.7818	1.044
INGOLD AVENUE	44				0.58	0.035	0.384	4.03	5.4582	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.58	5.60	1.4000	6.8582	101.0	0.60	200	25.3927	0.809
	45			0.98		0.098	0.098	4.25	1.4689	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.98	0.98	0.2450	1.7139	15.0	1.00	200	32.7818	1.044
	46			0.87		0.087	0.087	4.26	1.3082	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.87	0.87	0.2175	1.5257	15.0	1.00	200	32.7818	1.044
	47				0.82	0.049	0.234	4.12	3.4081	0.00	0.0000	0.00	0.0000	0.00	0.0000	0.0000	0.82	1.69	0.4225	3.8306	70.0	1.00	450	284.9614	1.793
	48		WWTP			**0.000**	**0.618**	**3.93**	**8.5604**	**0.00**	**0.0000**	**0.00**	**0.0000**	**0.00**	**0.0000**	**0.0000**	**0.00**	**7.29**	**1.8225**	**10.3829**	**48.0**	**0.60**	**200**	**25.3927**	**0.809**
2b) ADDITIONAL FUTURE LANDS TO WWPS																									
	Y				*14.42*	*0.865*	*0.865*	*3.84*	*11.7272*	*0.00*		*0.00*		*0.00*		*0.0000*	*14.42*	*14.42*	*3.6050*	*15.3322*					
	Z				*6.60*	*0.396*	*0.396*	*4.02*	*5.6255*	*0.00*		*0.00*		*0.00*		*0.0000*	*6.60*	*6.60*	*1.6500*	*7.2755*					
	Q				*29.54*	*1.772*	*1.772*	*3.63*	*22.6869*	*0.00*		*0.00*		*0.00*		*0.0000*	*29.54*	*29.54*	*7.3850*	*30.0719*					
	X				*12.72*	*0.763*	*0.763*	*3.87*	*10.4335*	*0.00*		*0.00*		*0.00*		*0.0000*	*12.72*	*12.72*	*3.1800*	*13.6135*					
	W				*33.70*	*2.022*	*2.022*	*3.58*	*25.5684*	*0.00*		*0.00*		*0.00*		*0.0000*	*33.70*	*33.70*	*8.4250*	*33.9934*					
	M & L				*19.29*	*1.157*	*1.157*	*3.76*	*15.3549*	*0.00*		*0.00*		*0.00*		*0.0000*	*19.29*	*19.29*	*4.8225*	*20.1774*					
TOTAL																				*130.8468*					

Appendix E

Proposed Water Distribution Analysis

Wilmot Woods

Preliminary Water Distribution Report

Project Location:
New Hamburg

Prepared for:
Wilmot Woods Developments Inc.
310 Fairway Road South
Kitchener ON N2C 2R6

Prepared by:
MTE Consultants Inc.
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

April 2022

MTE File No.: 35056-104

Engineers, Scientists, Surveyors.

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Appendix A Draft Plans of Subdivision (Reduced)
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Appendix C Usage Rates, Water Demands, and Design Values
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1.0 Introduction

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Wilmot Woods Developments Inc. to complete a Functional Servicing Report (FSR) in support of a Plan of Subdivision application for a proposed residential subdivision in the Township of Wilmot (Township).

The Wilmot Woods subdivision lands, herein referred to as the 'subject lands', are located in the Town of New Hamburg. The lands are generally bounded by Waterloo Street to the north, agricultural lands to the east, the CN railway corridor to the south, and the Forest Glen residential subdivision to the west. Refer to **Figure 1.1** for more details.

The subject lands comprise a total area of approximately 37.19ha. Development plans for the subject lands include the construction of street-oriented residential units, multiple residential blocks, park lands and stormwater management facilities with the required roads, municipal services (storm, sanitary, and water), and open space blocks. Portions of the lands are undevelopable, as they are within the floodplain limits of the Ivan Gingerich Municipal Drain (IGMD). A Draft Plan of Subdivision (dated January 25, 2022) for the proposed development has been prepared by MHBC Planning and forms the basis of this report. The reduced Draft Plan has been included in **Appendix A**.

The purpose of this Preliminary Water Distribution Analysis is to confirm that adequate pressure and water supply is available to support the proposed developments through connections to the existing and future water distribution network. This analysis will be used to determine the pipe sizes for the proposed internal water distribution network. The guidelines for the minimum and maximum pressures within the developments, under various demand scenarios including fire flows, are set out by the Ministry of the Environment, Conservation and Parks (MECP), the Township of Wilmot (Township), and the Region of Waterloo (Region).

1.2 Background Information

The subject site lies along the boundary of the New Hamburg Pressure Zone and the Baden Pressure Zone. The current New Hamburg/Baden Pressure Zone interface is defined by a pressure reducing valve (PRV) at Snyder's Road West and Nafziger Road. The current hydraulic grade line (HGL) of the New Hamburg Pressure Zone is approximately 390.00m, with a serviceability range of approximately 334.00m to 354.00m.

The New Hamburg system is fed from the reservoir located at the New Hamburg Water Treatment Plant (NHWTP), located on the south side of Fairview Street - approximately 0.2km south of the intersection of Bleams Road and Fairview Street.

Due to proposed site elevations, the HGL information has specified that any centerline of road elevation below 334.00m within the New Hamburg Pressure Zone and below 341.00m within the Baden Pressure Zone may require services to be connected to individual pressure reducing valves (PRVs), as specified in section B.2.4.7 of the *Region of Waterloo and Area Municipalities Design Guidelines and Supplemental Specifications for Municipal Services (DGSSMS) (RMOW, 2021)*. The proposed ground contours of the site range from approximately 342m to 348m, so no individual PRVs are anticipated.

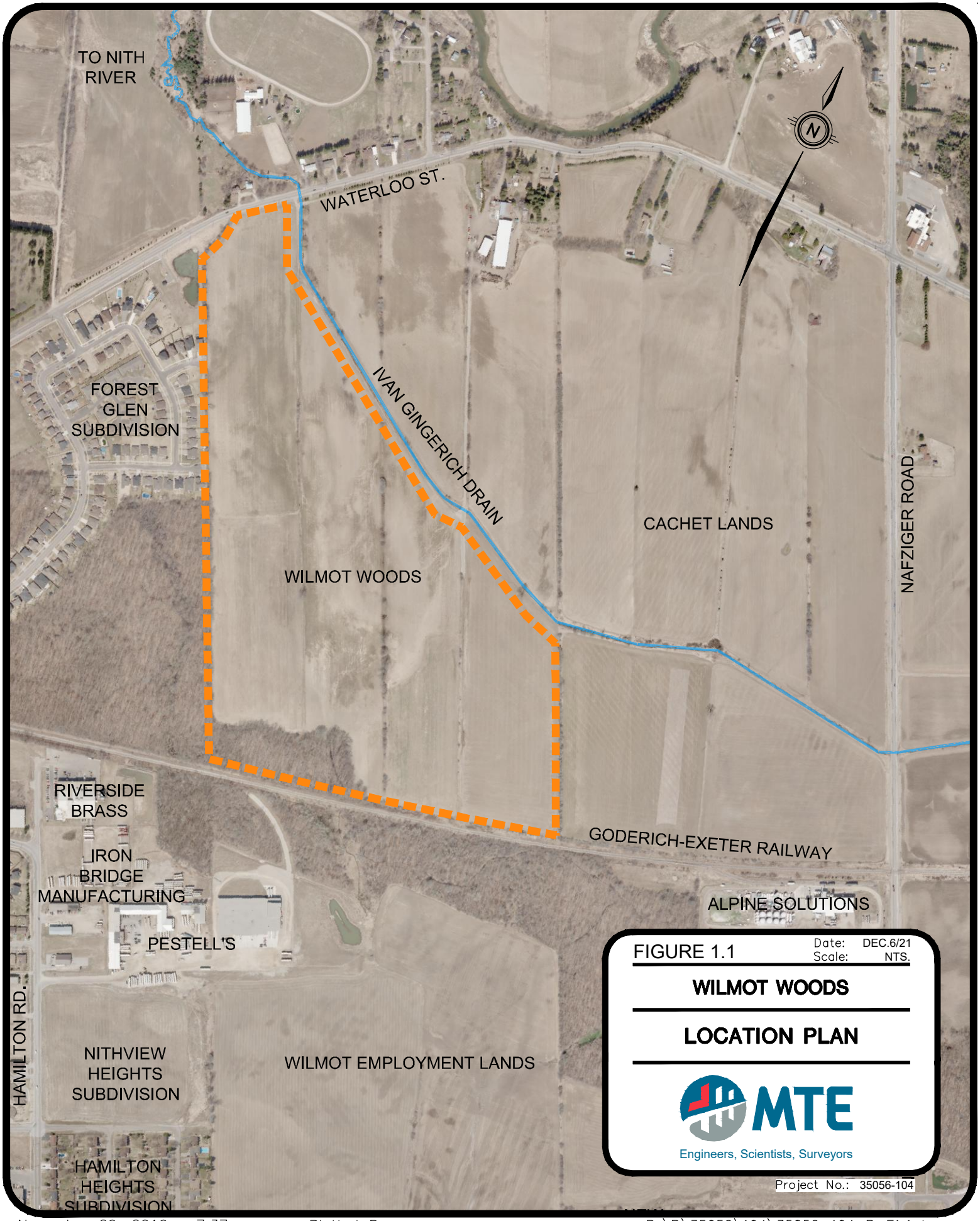


FIGURE 1.1

Date: DEC.6/21
Scale: NTS.

WILMOT WOODS

LOCATION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

November 29, 2019 — 7:37 a.m. — Plotted By: ccarre

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2.0 Analysis Methodology

2.1 Micro Water Distribution System Model Development

The Bentley water distribution system analysis program (WaterCAD Connect Edition) was utilized for the analysis of this study. The network for the analysis was developed by assigning physical parameters to each node and pipe. The model utilizes proposed demands for the build-out of the Wilmot Woods development. The study area consists of single family residential blocks, street-fronting townhome blocks, and multiple residential blocks. Refer to **Figure 2.1** for the proposed model of the water distribution network.

2.1.1 Network Connections

Water supply for the proposed Wilmot Woods Subdivisions has been modelled with two external connection points to the existing municipal water distribution system:

- 300mm diameter – Street Two and Waterloo Street
- 150mm diameter – Ingold Avenue

Demands for the subject lands are based on a proposed Draft Plans provided by MHBC (dated September 30, 2021), which includes a maximum of 440 street-fronting dwellings and 280 multiple residential units. Refer to **Appendix A** for more details.

2.1.2 System Pressure

The system pressure information for this analysis is based on the Region's nodal information provided by Mr. Kevin Dolishny on April 23, 2021 (**Appendix B**). The nodes used in the Region's model are described below:

- J172 – Waterloo Street and Site Boundary (Street Two)
- JCT_00033 – Ingold Avenue and Site Boundary

Refer to **Figure 2.1** for the location of the Regional nodes used in the model. Hydraulic grade lines were determined for the average day, maximum day, peak hour, minimum hour, and maximum day plus fire flow scenarios. **Table 2.1 and 2.2** provide a summary of the hydraulic grade lines used for the nodes in the analysis.

LEGEND

- SUBJECT LANDS
- Ex. WTM — EXISTING WATERMAIN
- 150mmØ WTM. — PROPOSED 150mmø WATERMAIN
- 200mmØ WTM. — PROPOSED 200mmø WATERMAIN
- 300mmØ WTM. — PROPOSED 300mmø WATERMAIN
- WATERMAIN CONTRIBUTING AREA
- PROPOSED HYDRANT
- J_172 — REGION OF WATERLOO PRESSURE NODE

N

J-1 J-2 J-3 J-4 J-5 J-6 J-7 J-8 J-9 J-10 J-11 J-12 J-13 J-14 J-15 J-16 J-17 J-18 J-19 J-20 J-201 J-202 J-203

J_172 J_00033

300mmØ WTM. STUB

150mmØ WTM. STUB

STREET ONE
STREET TWO
STREET THREE
STREET FOUR
STREET FIVE
STREET SIX
STREET SEVEN
STREET EIGHT
STREET NINE
STREET TEN

WATERLOO STREET
CHARLES YOUNG AVE
INGOLD AVE
GEXR RAILWAY

Blk.17 Multiple Residential 0.98 ha
Blk.19 Park 1.00 ha
Blk.20 Open Space 0.92 ha
Blk.21 Open Space 3.30 ha
Blk.22 Open Space 0.93 ha
Blk.23 SWM Facility 1.02 ha
Blk.34 Road Widening 0.03 ha
Blk. 7 Open Space 2.86 ha
EX. SWM FACILITY

WETLAND BOUNDARY
15m WETLAND BUFFER
10m PIPELINE BUFFER

FIGURE 2.1 — WATER DISTRIBUTION PLAN

Date: JAN.27/22
Scale: 1:3000

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

February 17, 2022 — 4:26 p.m. — Plotted By: acressman

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Table 2.1 – System Pressures for J172

Demand Scenario	Discharge (L/s)	HGL (m)	Head (m)
Initial	0.00	390.50	51.51
Minimum Hour	0.00	390.47	51.47
Average Day	0.00	390.21	51.21
Maximum Day	0.00	389.76	50.76
Peak Hour	0.00	386.33	47.33
Max Day + 20.0L/s Fire Flow	20.00	389.60	50.60
Max Day + 60.0L/s Fire Flow	60.00	387.60	48.60
Max Day + 100.0L/s Fire Flow	100.00	383.50	44.50
Max Day + 140.0L/s Fire Flow	140.00	377.90	38.90
Max Day + 180.0L/s Fire Flow	180.00	371.30	32.30
Max Day + 220.0L/s Fire Flow	220.00	363.50	24.50
Max Day + 222.9L/s Fire Flow	222.90	362.90	23.90

Table 2.2 – System Pressures for JCT_00033

Demand Scenario	Discharge (L/s)	HGL (m)	Head (m)
Initial	0.0	390.50	47.50
Minimum Hour	0.01	390.47	47.47
Average Day	0.01	390.21	47.21
Maximum Day	0.01	389.76	46.76
Peak Hour	0.01	386.32	43.32
Max Day + 20.0L/s Fire Flow	20.01	389.50	46.50
Max Day + 60.0L/s Fire Flow	60.01	387.50	44.50
Max Day + 100.0L/s Fire Flow	100.01	383.30	40.30
Max Day + 140.0L/s Fire Flow	140.01	377.50	34.50
Max Day + 180.0L/s Fire Flow	180.01	370.60	27.60
Max Day + 220.0L/s Fire Flow	220.01	362.60	19.60
Max Day + 221.4L/s Fire Flow	221.41	362.30	19.30

2.2 Design Criteria

The water network for the analysis was developed by assigning physical parameters to each node and pipe within the proposed ultimate build-out of the development. The model was run under five demand scenarios (average day, minimum hour, maximum day, peak hour, and maximum day plus fire flow) and each was checked against design guidelines for pressure, velocity, and fire flow availability. The parameters and criteria are outlined below.

2.2.1 Unit Count and Population

The population per unit modelled for the development was based on 3.25 persons per unit (medium density), 2.44 persons per unit (high density), and 1.77 persons per unit (apartment), as specified in the Region of Waterloo's *2020 Water and Wastewater Monitoring Report* (Region, 2020). These densities are listed below in **Table 2.33**.

Table 2.3 – Population Densities

Structure Type	PPU
Single, detached	3.25
Townhouse	2.44

The Draft Plans of Subdivision for the subject lands prepared by MHBC, were used to determine the number of residential and multi-residential units corresponding to each node in the model. The maximum unit counts were used to show a worst case scenario

The total unit count and appropriate densities listed above were used to estimate a combined maximum population of 2,255 people. Refer to the Demand Calculations in **Appendix C** for more details regarding the unit counts and population estimate.

2.2.2 System Demands

System demands for the proposed residential were based on water usage rates of 227.7L/person/day from the *Tri-City Water Distribution Master Plan Final Report* (AECOM, 2009). Using the usage rate, residential water demands were calculated from the number of units contributing to each node within the model, multiplied by the number of persons per unit, multiplied by 227.7L/p/d, and then converted to L/s. The usage rates and demand calculations for each node are provided in **Appendix C.**

2.2.3 Peaking Factors

Peaking factors were obtained from Chapter 33 of the *Design Guidelines for Drinking Water Systems* (MOE, 2008) for a population of 2,001-3,000. **Table 2.44** summarizes the peaking factors used based on the population estimates from the combined development plans.

Table 2.4 – Peaking Factors

Demand Scenario	Factor
Average Day	1.0
Maximum Day	2.25
Peak Hour	3.38
Minimum Hour	0.45

2.2.4 Fire Flow Requirements

Various guidelines and references exist for calculating the required water supply for firefighting purposes. In Ontario, two standards/guidelines are most often referenced. They are:

- Ontario Building Code (*OBC*) – Provincial codes and guidelines published by the Ministry of Municipal Affairs and Housing for the Province of Ontario.
- The Fire Underwriters Survey (*FUS*) – an insurance industry guideline.

Many municipalities in Ontario use both the *OBC* and the *FUS* fire flow requirements for assessing firefighting water supply requirements. Ideally, fire flow demands for new developments are calculated based on the *FUS* criteria, however, it is not reasonable to expect that the existing municipal watermain infrastructure always has the operational capacity to supply water at the rates prescribed in the *FUS* guidelines. As a result, at no time shall the available fire flow be less than that required by the Ontario Building Code.

The fire demand for the development was determined from the *Water Supply for Public Fire Protection, A Guide to Recommended Practice (1999), Fire Underwriters Survey (FUS)*. Based on the *FUS* manual, the required fire flow is as follows:

Residential:

- Medium-density, contiguous multi-block townhomes – 8,000L/min (133L/s)
- Medium-density, single family homes < 3.0m separation – 6,000L/min (100L/s)

Specific details are not currently available for the proposed and multi-residential blocks within the subject lands. As such, the fire flow values should be confirmed when the information becomes available. At this time, a fire flow value of 133L/s was used for the multi-residential blocks.

2.2.5 Friction Factors

As outlined in Section B2.3 of the *DGSSMS*, the watermain shall be designed using the Hazen-Williams friction C-factors listed in **Table 2.55**. A value of 150 for the PVC pipes was used in this analysis.

Table 2.5 – DGSSMS Hazen-Williams C-factors

Material	Factor
PVC/PVCO	150
DI	130
CPP	140
HDPE	140

2.2.6 Minor Losses

Minor Losses are caused by appurtenances and fittings along the length of the pipe in the system. For the purpose of this preliminary analysis, a conservative K-value of 1.0 was used for all pipes.

2.2.7 Pressure Requirements

As outlined in Section B2.4 of the *DGSSMS*, the pressure guidelines used for all demand scenarios are shown below in **Table 2.66**.

Table 2.6 – DGSSMS Pressure Guidelines

Demand Scenario	Pressure Guidelines (kPa)	
	Minimum	Maximum
Average Day	350	550
Maximum Day	350	550
Peak Hour	275	700
Minimum Hour	275	700
Max Day + Fire	140	700

The maximum static pressure in the watermain system should not exceed 700kPa (100psi) under any scenario.

2.2.8 Velocity Requirements

The *DGSSMS* recommends that velocities throughout the distribution system not exceed a maximum of 5.0m/s under all flow conditions.

3.0 Results

The model was run to analyze the pipe sizes, system pressures, and available flows according to the design criteria under the various demands and fire flow scenarios. **Appendix D** provides the proposed network and a series of tables summarizing the output results of the WaterCAD analysis. **Table 3.1** provides a summary of the model results for the scenarios analyzed, identifying the system pressures for each demand scenario, as well as the maximum pipe velocities for the fire flow scenarios.

3.1 Daily Demand Scenarios

As shown in **Table 3.1**, the proposed water distribution system will be able to adequately provide the required daily water demands within the *DGSSMS*'s recommended minimum and maximum pressure range guidelines of 350kPa to 550kPa for the average and maximum day demand scenarios, and 275kPa to 700kPa for the minimum and peak hour demand scenarios.

Based on these results, the implementation of pressure reducing valves (PRVs) is not required within the subject lands.

Watermains were sized to be 150mm, 200mm, and 300mm diameter for all streets within the subject lands. The fire flow analysis indicates instances where the pipe velocity exceeds the recommended maximum of 5.0m/s. However, the increase is mostly found in the service stubs used to model flow into the multiple residential blocks. As such, the pipe sizes have not been changed for the sole purpose of reducing the maximum velocity experienced under the rare fire flow condition, as this may create an environment for stagnant water conditions to arise under normal daily demands.

Table 3.1 – Modelling Results for the Ultimate Build-out

Node	Elevation (m)	Pressure (kPa)				Maximum Day + Fire Flow				
		Average Day	Maximum Day	Minimum Hour	Peak Hour	Fire Flow Required (L/s)	Available Fire Flow (L/s)	Residual Pressure (kPa)	Velocity of Max Pipe (m/s)	Pipe with Max Velocity
J-1	346.30	423.9	423.2	424.1	422.1	100.42	187.48	140.0	4.77	P-1
J-2	345.50	431.8	431.0	431.9	429.9	133.32	223.32	153.0	***5.01***	***P-29***
J-3	346.00	426.9	426.1	427.0	425.0	133.38	206.92	140.0	4.67	P-29
J-4	346.00	426.9	426.1	427.0	425.0	133.46	191.42	140.0	4.34	P-29
J-5	345.50	431.8	431.0	431.9	430.0	133.44	159.87	140.0	4.71	P-10
J-6	345.00	436.6	435.9	436.8	434.8	100.37	166.31	140.0	4.78	P-11
J-7	344.80	438.6	437.9	438.8	436.8	133.49	223.49	171.3	***5.01***	***P-29***
J-8	345.00	436.6	435.9	436.8	434.8	133.35	211.50	140.1	4.76	P-29
J-9	343.70	449.4	448.7	449.5	447.7	133.33	223.33	260.6	4.83	P-29
J-10	344.00	446.4	445.7	446.6	444.7	133.06	223.06	247.0	4.89	P-29
J-11	344.75	439.1	438.4	439.2	437.3	133.48	223.48	224.5	4.98	P-29
J-12	344.25	444.0	443.3	444.1	442.2	133.46	223.46	216.2	***5.01***	***P-29***
J-13	344.00	446.4	445.7	446.6	444.6	133.44	223.44	204.8	***5.02***	***P-29***
J-14	343.10	455.3	454.6	455.4	453.6	133.71	223.71	179.5	***5.54***	***P-29***
J-15	345.10	435.7	435.0	435.8	433.9	133.62	218.88	140.1	***5.09***	***P-29***
J-16	344.50	441.5	440.8	441.7	439.8	100.42	184.85	140.1	***5.84***	***P-20***
J-17	344.50	441.5	440.8	441.7	439.8	100.42	175.26	140.0	***5.95***	***P-21***
J-18	342.70	459.2	458.6	459.3	457.8	133.69	223.69	232.6	***6.50***	***P-29***
J-19	345.75	429.3	428.6	429.5	427.6	133.58	213.21	140.0	***5.15***	***P-29***
J-20	345.30	433.7	433.0	433.9	431.9	100.52	200.09	140.0	4.82	P-27
J-201	345.00	436.7	436.0	436.8	434.9	134.42	165.24	140.0	***9.35***	***P-201***
J-202	345.00	436.7	435.9	436.8	434.9	134.26	156.40	140.0	***8.85***	***P-202***
J-203	344.30	443.5	442.8	443.6	441.7	134.72	147.48	140.0	***8.35***	***P-203***

**Cells that are bold and italicized identify pipes in the model where the maximum recommended velocity of 5.0m/s is exceeded.*

4.0 Conclusions and Recommendations

Based on the preliminary water distribution analysis, it is concluded that:

- Direct connection to the proposed 300mm diameter watermain along Waterloo Street and the 150mm diameter watermain along Ingold Avenue will adequately service the proposed water distribution network for the Wilmot Woods Subdivision.
- The proposed water distribution network will adequately provide the required daily water demands within the *DGSSMS* recommended minimum and maximum pressure range guidelines of 350kPa to 550kPa for both the average and maximum day demand scenarios, and 275kPa to 700kPa for the minimum and peak hour demand scenarios for all junctions within the subject lands.
- The installation of pressure reducing valves is not required within the subject lands.
- The pipe sizing for the development is all 150mm, 200mm, and 300mm diameter. As such, pipe velocities were less than the *DGSSMS* maximum recommended 5.0m/s for some pipes under the fire flow conditions. However, pipe sizes were not increased for the sole purpose of reducing the maximum velocity experienced under the rare fire flow condition, as this may create an environment for stagnant water conditions to arise under normal daily demands.
- Water model results indicate that the proposed water distribution system will adequately provide the recommended *FUS* fire flows at the minimum MECP pressure of 140kPa.

All of which is respectfully submitted,

MTE Consultants Inc.



Alex Cressman, EIT
Designer
519-743-6500 ext. 1279
acressman@mte85.com

Jeff Martens, P.Eng.
Design Engineer
519-743-6500 ext. 1231
jmartens@mte85.com

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Appendix A

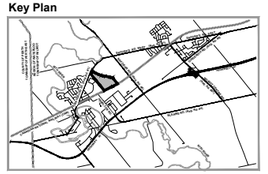
Draft Plans of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISION

Legal Description

PART OF LOT 20, CONCESSION SOUTH OF SNYDER'S ROAD
TOWNSHIP OF WILMOT
REGIONAL MUNICIPALITY OF WATERLOO

Key Plan



Subject Lands

north

SCALE: NTS

Source: SLRN, Region of Waterloo

Owner's Certificate

I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

DATE: January 12, 2022

Adam Belsky

Adam Belsky, Wilmot Woods Developments Inc.

Surveyor's Certificate

I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ON THIS PLAN AND THEIR RELATIONSHIP TO THE ADJACENT LANDS ARE ACCURATELY AND CORRECTLY SHOWN.

DATE: JAN. 14, 2022

Trevor D.A. McNeil, OLS (MTE OLS LTD.)

Additional Information Required Under Section 51(17) of the Planning Act
R.S.O. 1990, c.P.13 as Amended

A. AS SHOWN	B. AS SHOWN	C. AS SHOWN
D. RESIDENTIAL, MULTIPLE RESIDENTIAL, STORMWATER MANAGEMENT, PARK, OPEN SPACE		
E. AS SHOWN	F. AS SHOWN	G. AS SHOWN
H. MUNICIPAL WATER SUPPLY	I. SANDY LOAM/CLAY LOAM	J. AS SHOWN
K. ALL SERVICES AS REQUIRED	L. AS SHOWN	

Notes

1. ALL DIMENSIONS ARE IN METRES UNLESS OTHERWISE SHOWN.
2. BOUNDARY INFORMATION AND TOPOGRAPHICAL BASE INFORMATION PROVIDED BY MTE, May 31, 2021
3. ADJACENT PARCEL FABRIC IS APPROXIMATE.
4. LOTS/BLOCKS ON THE PLAN ARE RESIDENTIAL UNLESS OTHERWISE LISTED

■ ■ ■ DENOTES STAGE LIMITS (TO BE CONFIRMED AND SHOWN ON FINAL PLAN)

19/25 MINIMUM/MAXIMUM LOT YIELD PER BLOCK

Rev. No.	Date	Issued / Revision	By
2.	Jan. 25, 2022	Final Draft Plan for Distribution;	DGS
1.	Sept. 30, 2021	For pre-consultation meeting submission;	DGS

Area Schedule 30T-_____

	Stage 1		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
Residential*	1-15	57/113	2.68
Multiple Residential	16-18	120/304	3.04
Park	19		1.00
Open Space	20-22		4.99
Stormwater Management	23,24		2.54
Service Corridor	25		0.24
0.3m Reserve	26-33		0.01
Road Widening	34		0.03
Roads			3.04
Total	34	177/417	17.57

*Blks. 2,3,5,6,7,8,9,10,11,14,15 [street towns (6m) and small single detached lots (9m)]
Blk. 1 [small single detached lots (9m-12m)]
Blks. 4,12,13 [large single detached lots (9-13.76m)]
Blks. 16,17,18 [40 uph to 100 uph (Low=Towns High=Stacked Towns)]

	Stage 2		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-5	58/103	2.34
Open Space	6		0.38
Trail			
Walkway	7		0.02
0.3m Reserve	8		0.001
Roads			0.90
Total	8	58/103	3.64

*Blks. 3,4,5 [street towns (6m) and small single detached lots (9m)]
Blk. 2 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

	Stage 3		
Lots/Blocks	Units (min/max)*	Area (ha)	
1-5	66/98	2.77	
6		0.05	
7		0.001	
		1.02	
7	66/98	3.84	

*Blk. 1 [street towns (6m) and small single detached lots (9m)]
Blks. 2,3,4,5 [small single detached lots (9m-12m)]

	Stage 4		
Description	Lots/Blocks	Units (min/max)*	Area (ha)
*Residential	1-6	56/79	2.43
Open Space	7		2.86
Trail			
0.3m Reserve			
Roads			0.87
Total	7	56/79	6.16

*Blks. 1,2,3,4,5 [small single detached lots (9m-12m)]
Blk. 6 [large single detached lots (9-13.76m)]

	Stage 5		
Lots/Blocks	Units (min/max)*	Area (ha)	
1-9	79/138	3.47	
10-12		0.77	
13		0.001	
		1.74	
13	79/138	5.98	

*Blks. 2(part), 3,4,5,6,7(part) [street towns (6m) and small single detached lots (9m)]
Blks. 2(part), 7(part), 9 [small single detached lots (9m-12m)]
Blk. 1 [large single detached lots (9-13.76m)]

	Total		
Description	Lots/Blocks	Units (min/max)	Area (ha)
Residential	40	316/531	13.69
Multiple Residential	3	120/304	3.04
Park	1		1.00
Open Space	5		8.23
Stormwater Management	2		2.54
Trail	4		0.82
Walkway	1		0.02
Service Corridor	1		0.24
0.3m Reserve	11		0.01
Road Widening	1		0.03
Roads			7.57
Total	69	436/835	37.19

MHBC PLANNING URBAN DESIGN & LANDSCAPE ARCHITECTURE
200-540 BINGEMANS CENTRE DR. KITCHENER, ON, N2B 3X9 | P: 519.576.3650 F: 519.576.0121 | WWW.MHBCPLAN.COM

Approval Stamp

Date	January 25, 2022
File No.	2123A
Plan Scale	1:2,000 (24x36)
Drawn By	D.G.S.
Checked By	P.B.

Project Wilmot Woods

Applicant

Wilmot Woods Developments Inc.
310 Fairway Rd. S
P.O. Box 45016
Kitchener, ON. N2C 2R6
P: 519.570.2137

north

File Name DRAFT PLAN

Dwg No. 1 of 1

Scale Bar 0 10 25 50 100m

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Appendix B

Region of Waterloo Modelling Simulation Results

Region of Waterloo

TRANSPORTATION AND
ENVIRONMENTAL SERVICES
Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.region.waterloo.on.ca

Charles Carre, P. Eng.
MTE Consultants Inc.
520 Bingemans Center Drive
Kitchener, ON N2B 3X9
t. 519-743-6500 x1232
e. CCarre@mte85.com

Date: April 23, 2021
File #: E18-10/KI

Dear: Charles

Re: Pfenning Farm Water Modelling Request

Please find the results of the modeling simulations for boundary conditions requested on March 1, 2021. The results include a figure showing the location of the nodes from the Region's model.

As requested, the Region completed two modelling scenarios using average day and maximum day demands of 3.7 and 9.3 L/s, respectively, applied to the internal junction J174. Table 1 below summarized the model junction information and fire flow analysis results.

Table 1 – Model Junction Information and Results

Scenario	Pressure Zone	Node	Elevation	Location	Fire Flow Results	
					Design Flow (L/s)	Design Flow (L/s)
1	New Hamburg	J172	339.0	Waterloo St & Site Boundary	222.9	23.9
		JCT_00033	343.0	Ingold Ave & Site Boundary	221.4	19.3
2	Baden	J176	340.6	Internal Network	318.1	14.0

The diurnal 24 hour demand distribution accounts for the minimum hour and peak hour peaking factors. The minimum hourly demand on the average day represents the minimum hour, and the maximum hourly demand on the maximum day represents the peak hour.

A fire flow analysis shows the maximum flow available at a node with an associated design pressure during the maximum day scenario while maintaining the minimum design pressure of 14 m (140 kPa) at all nodes within the pressure zone.

If you have any questions, please contact me.



Kevin Dolishny P.Eng.
Senior Engineer, Water Services
c. 226.751.4551
kdolishny@regionofwaterloo.ca

cc Cody Scott, RMOW

J172 **Average Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.00	387.32	48.32
01:00 hrs	0.00	387.24	48.24
02:00 hrs	0.00	387.22	48.22
03:00 hrs	0.00	387.22	48.22
04:00 hrs	0.00	387.04	48.04
05:00 hrs	0.00	390.47	51.47
06:00 hrs	0.00	390.28	51.28
07:00 hrs	0.00	390.29	51.29
08:00 hrs	0.00	390.33	51.33
09:00 hrs	0.00	390.37	51.37
10:00 hrs	0.00	390.42	51.42
11:00 hrs	0.00	390.46	51.46
12:00 hrs	0.00	390.38	51.38
13:00 hrs	0.00	390.46	51.46
14:00 hrs	0.00	390.46	51.46
15:00 hrs	0.00	390.46	51.46
16:00 hrs	0.00	390.39	51.39
17:00 hrs	0.00	390.30	51.30
18:00 hrs	0.00	390.22	51.22
19:00 hrs	0.00	390.21	51.21
20:00 hrs	0.00	390.34	51.34
21:00 hrs	0.00	390.47	51.47
22:00 hrs	0.00	387.01	48.01
23:00 hrs	0.00	387.25	48.25

Average Day HGL:	389.44
Minimum Hour:	390.47

J172 **Maximum Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.00	387.11	48.11
01:00 hrs	0.00	386.91	47.91
02:00 hrs	0.00	386.85	47.85
03:00 hrs	0.00	386.87	47.87
04:00 hrs	0.00	386.38	47.38
05:00 hrs	0.00	389.90	50.90
06:00 hrs	0.00	389.81	50.81
07:00 hrs	0.00	389.82	50.82
08:00 hrs	0.00	389.85	50.85
09:00 hrs	0.00	389.87	50.87
10:00 hrs	0.00	389.89	50.89
11:00 hrs	0.00	389.90	50.90
12:00 hrs	0.00	389.87	50.87
13:00 hrs	0.00	389.90	50.90
14:00 hrs	0.00	389.90	50.90
15:00 hrs	0.00	389.90	50.90
16:00 hrs	0.00	389.88	50.88
17:00 hrs	0.00	389.83	50.83
18:00 hrs	0.00	389.76	50.76
19:00 hrs	0.00	389.76	50.76
20:00 hrs	0.00	389.85	50.85
21:00 hrs	0.00	389.90	50.90
22:00 hrs	0.00	386.33	47.33
23:00 hrs	0.00	386.92	47.92

Maximum Day HGL:	388.96
Peak Hour:	386.33

Available Flow (L/s)	Residual Pressure (m)
0.0	50.9
20.0	50.6
40.0	49.9
60.0	48.6
80.0	46.8
100.0	44.5
120.0	41.9
140.0	38.9
160.0	35.7
180.0	32.3
200.0	28.5
220.0	24.5
222.9	23.9

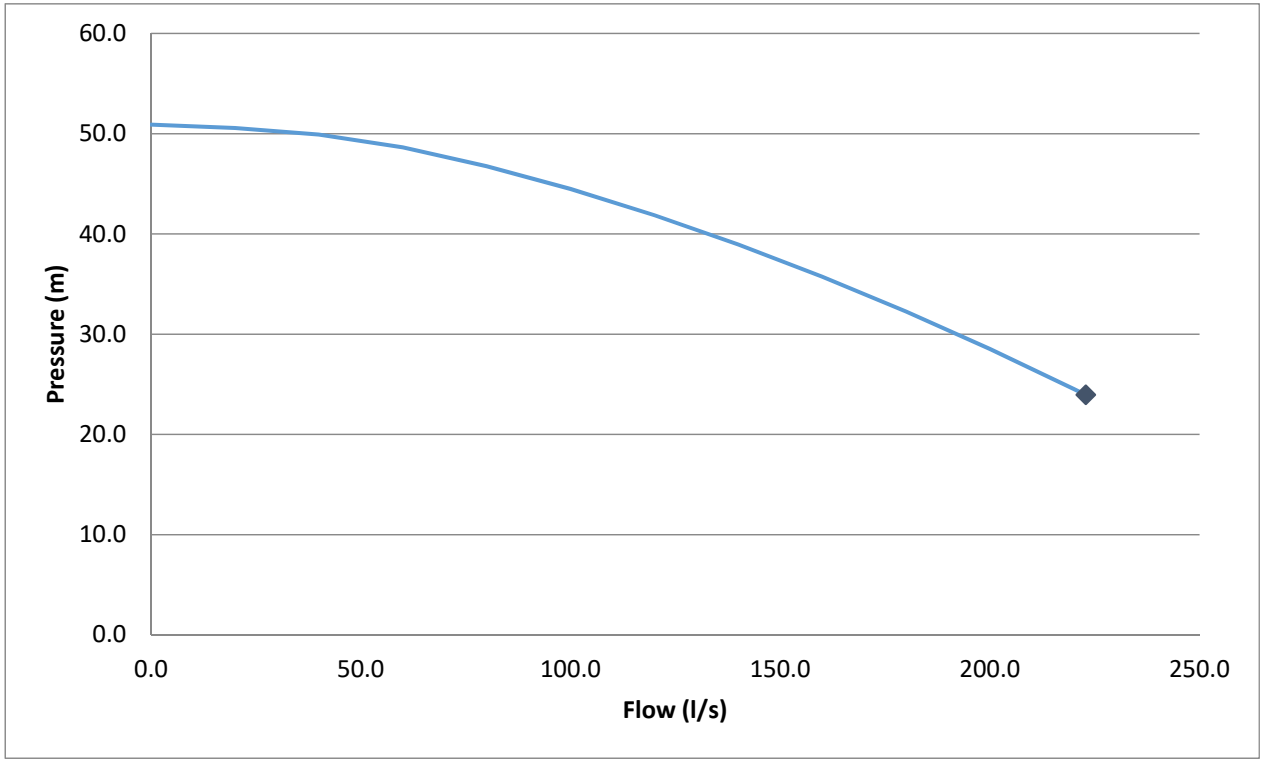
Fire Flow Analysis

Fire Flow Node:	J172
Design Flow (L/s):	222.9
Design Pressure (m):	23.9

Design Flow: *The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Design Pressure: *The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Critical Node ID: *The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.*



JCT_00033 **Average Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.00	387.32	44.32
01:00 hrs	0.00	387.24	44.24
02:00 hrs	0.00	387.22	44.22
03:00 hrs	0.00	387.22	44.22
04:00 hrs	0.01	387.04	44.04
05:00 hrs	0.01	390.47	47.47
06:00 hrs	0.01	390.28	47.28
07:00 hrs	0.01	390.29	47.29
08:00 hrs	0.01	390.33	47.33
09:00 hrs	0.01	390.37	47.37
10:00 hrs	0.01	390.42	47.42
11:00 hrs	0.01	390.46	47.46
12:00 hrs	0.01	390.38	47.38
13:00 hrs	0.01	390.46	47.46
14:00 hrs	0.01	390.46	47.46
15:00 hrs	0.01	390.46	47.46
16:00 hrs	0.01	390.39	47.39
17:00 hrs	0.01	390.30	47.30
18:00 hrs	0.01	390.22	47.22
19:00 hrs	0.01	390.21	47.21
20:00 hrs	0.01	390.34	47.34
21:00 hrs	0.01	390.47	47.47
22:00 hrs	0.01	387.01	44.01
23:00 hrs	0.00	387.24	44.24

Average Day HGL:	389.44
Minimum Hour:	390.47

JCT_00033 **Maximum Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.01	387.11	44.11
01:00 hrs	0.01	386.90	43.90
02:00 hrs	0.01	386.85	43.85
03:00 hrs	0.01	386.87	43.87
04:00 hrs	0.01	386.38	43.38
05:00 hrs	0.01	389.90	46.90
06:00 hrs	0.02	389.81	46.81
07:00 hrs	0.01	389.82	46.82
08:00 hrs	0.01	389.85	46.85
09:00 hrs	0.01	389.86	46.86
10:00 hrs	0.01	389.89	46.89
11:00 hrs	0.01	389.90	46.90
12:00 hrs	0.01	389.87	46.87
13:00 hrs	0.01	389.90	46.90
14:00 hrs	0.01	389.90	46.90
15:00 hrs	0.01	389.90	46.90
16:00 hrs	0.01	389.88	46.88
17:00 hrs	0.01	389.82	46.82
18:00 hrs	0.02	389.76	46.76
19:00 hrs	0.02	389.76	46.76
20:00 hrs	0.01	389.85	46.85
21:00 hrs	0.01	389.90	46.90
22:00 hrs	0.01	386.32	43.32
23:00 hrs	0.01	386.92	43.92

Maximum Day HGL:	388.95
Peak Hour:	386.32

Available Flow (L/s)	Residual Pressure (m)
0.0	46.9
20.0	46.5
40.0	45.9
60.0	44.5
80.0	42.6
100.0	40.3
120.0	37.6
140.0	34.5
160.0	31.2
180.0	27.6
200.0	23.7
220.0	19.6
221.4	19.3

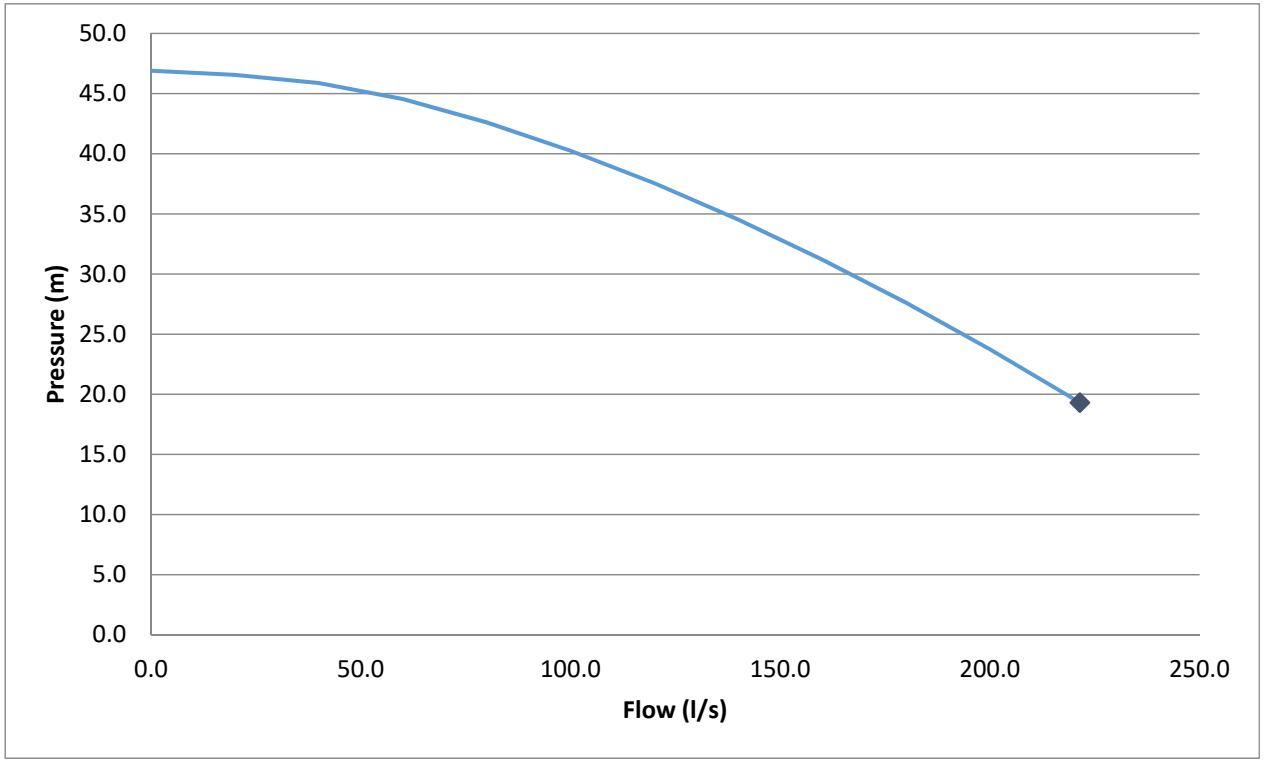
Fire Flow Analysis

Fire Flow Node:	JCT_00033
Design Flow (L/s):	221.4
Design Pressure (m):	19.3

Design Flow: *The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Design Pressure: *The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Critical Node ID: *The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.*



J176 **Average Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.00	398.50	57.90
01:00 hrs	0.00	398.38	57.78
02:00 hrs	0.00	398.25	57.65
03:00 hrs	0.00	398.11	57.51
04:00 hrs	0.00	397.96	57.36
05:00 hrs	0.00	398.13	57.53
06:00 hrs	0.00	398.27	57.67
07:00 hrs	0.00	398.42	57.82
08:00 hrs	0.00	398.56	57.96
09:00 hrs	0.00	398.70	58.10
10:00 hrs	0.00	398.84	58.24
11:00 hrs	0.00	399.00	58.40
12:00 hrs	0.00	399.04	58.44
13:00 hrs	0.00	398.91	58.31
14:00 hrs	0.00	398.77	58.17
15:00 hrs	0.00	398.64	58.04
16:00 hrs	0.00	398.51	57.91
17:00 hrs	0.00	398.38	57.78
18:00 hrs	0.00	398.23	57.63
19:00 hrs	0.00	398.06	57.46
20:00 hrs	0.00	398.04	57.44
21:00 hrs	0.00	398.17	57.57
22:00 hrs	0.00	398.33	57.73
23:00 hrs	0.00	398.45	57.85
Average Day HGL:		398.44	
Minimum Hour:		399.04	

J176 **Maximum Day 24 Hour Simulation**

Time	Demand (L/s)	Head (m)	Pressure (m)
00:00 hrs	0.00	398.60	58.00
01:00 hrs	0.00	398.71	58.11
02:00 hrs	0.00	398.80	58.20
03:00 hrs	0.00	398.87	58.27
04:00 hrs	0.00	398.94	58.34
05:00 hrs	0.00	398.94	58.34
06:00 hrs	0.00	399.01	58.41
07:00 hrs	0.00	398.81	58.21
08:00 hrs	0.00	398.53	57.93
09:00 hrs	0.00	398.27	57.67
10:00 hrs	0.00	398.01	57.41
11:00 hrs	0.00	397.96	57.36
12:00 hrs	0.00	398.03	57.43
13:00 hrs	0.00	398.08	57.48
14:00 hrs	0.00	398.14	57.54
15:00 hrs	0.00	398.22	57.62
16:00 hrs	0.00	398.29	57.69
17:00 hrs	0.00	398.34	57.74
18:00 hrs	0.00	398.35	57.75
19:00 hrs	0.00	398.34	57.74
20:00 hrs	0.00	398.33	57.73
21:00 hrs	0.00	398.36	57.76
22:00 hrs	0.00	398.42	57.82
23:00 hrs	0.00	398.40	57.80
Maximum Day HGL:		398.45	
Peak Hour:		397.96	

Available Flow (L/s)	Residual Pressure (m)
0.0	57.4
20.0	57.0
40.0	56.2
60.0	55.0
80.0	53.6
100.0	51.8
120.0	49.7
140.0	47.3
160.0	44.6
180.0	41.6
200.0	38.4
220.0	34.8
240.0	31.0
260.0	27.1
280.0	23.0
300.0	18.4
318.1	14.0

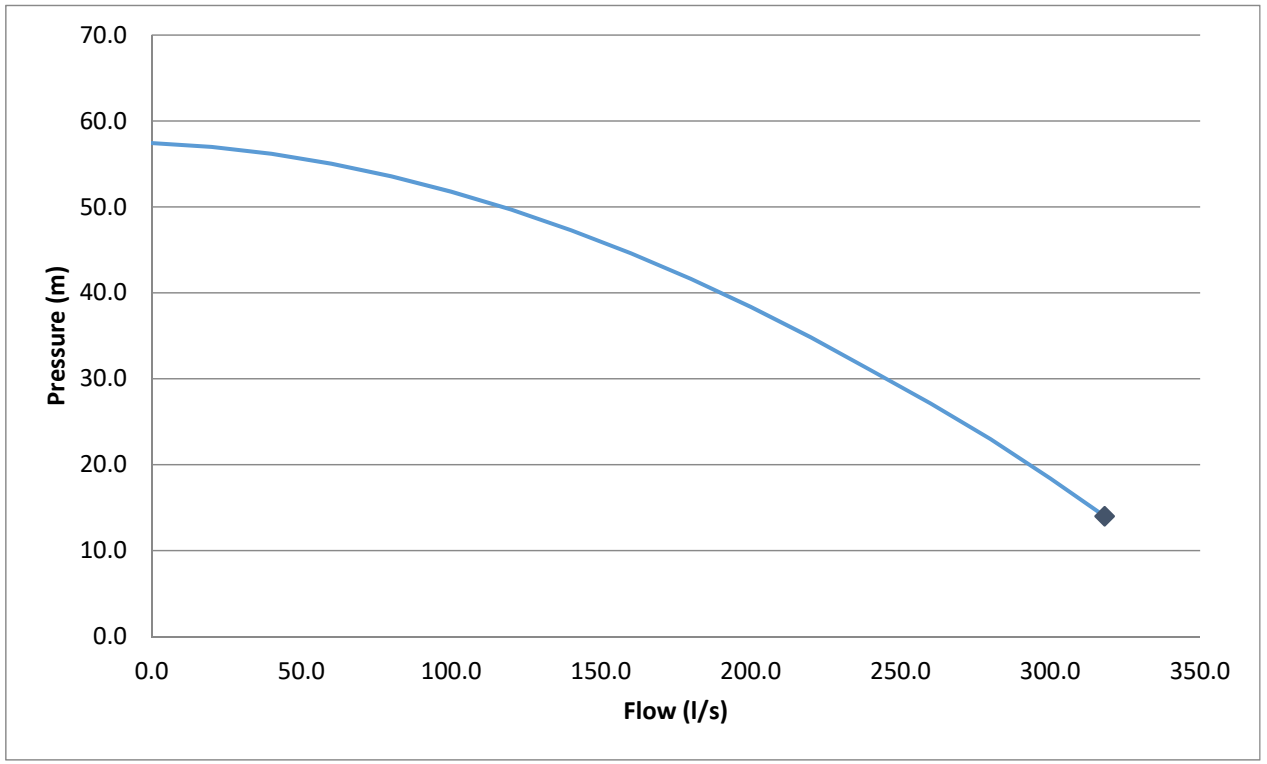
Fire Flow Analysis

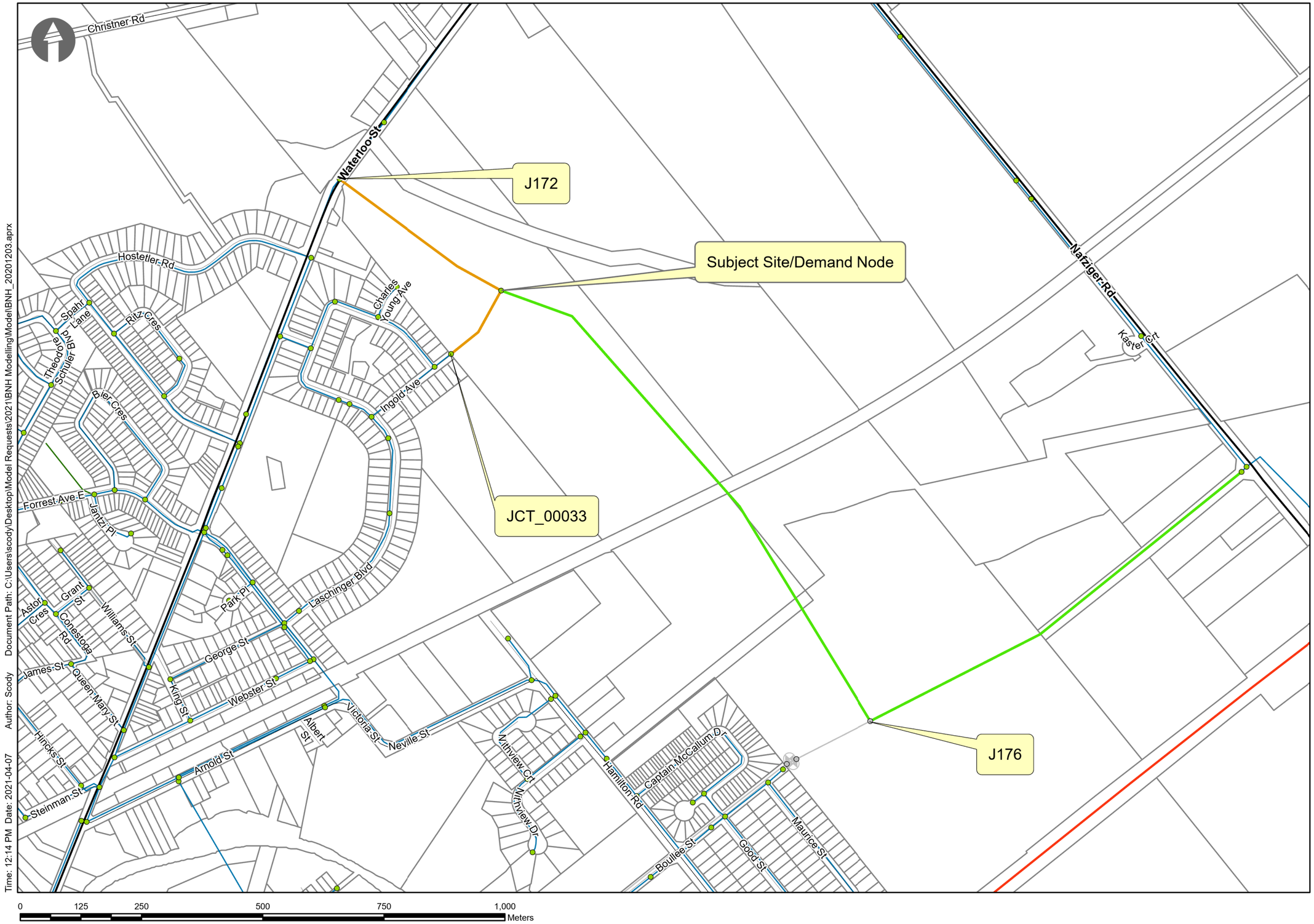
Fire Flow Node:	J176
Design Flow (L/s):	318.1
Design Pressure (m):	14.0

Design Flow: *The final adjusted flow at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Design Pressure: *The lowest allowable pressure at the node to maintain the minimum design pressure (14m (140 kPa)) at ALL locations within the pressure zone.*

Critical Node ID: *The constraining node within the pressure zone that drops to the minimum design pressure of (14m (140 kPa)) during the design flow.*





Time: 12:14 PM Date: 2021-04-07 Author: Scody Document Path: C:\Users\scody\Desktop\Model Requests\2021\BNH Modelling\Model\BNH_20201203.aprx

Region of Waterloo

TRANSPORTATION AND ENVIRONMENTAL SERVICES

Water Services

150 Frederick Street
Kitchener ON Canada N2G 4J3
Telephone: (519) 575-4426
Fax: (519) 575-4452
www.regionofwaterloo.ca

Junction
- Active
- Inactive

Pipe
- Active
- Inactive

Assessment Parcels (MPAC)

Scenario Pipes
- Baden Scenario Pipes
- New Hamburg Scenario Pipes

Pfenning Farms Site

Appendix C

Usage Rates, Water Demands, and Design Values

WILMOT WOODS

Community of New Hamburg

Project No: 35056-104

Date: January 13, 2022

By: AJC

Water Demand Calculations

Location	Node No.	Residential										Final Demand[4] (l/s)					Road Elevation (m)
		Medium Density (Single Family)			Medium Density (Block)				Street Townhomes			Avgerage Day Qavg	Maximum Day Qmax.day	Minimum Hour Qmin.hr	Peak Hour Qpeak	Max Day + Fire Flow[5] Qmax.d+fire	
		# units[1]	#persons[2] (3.25/unit)	Demand[3] (l/s)	Area (ha)	# units[1] (avg 100/ha)	#persons[2] (2.44/unit)	Demand[3] (l/s)	# units[1]	#persons[2] (2.44/unit)	Demand[3] (l/s)						
Street Six @ Street Seven	J-1	22	72	0.188								0.188	0.424	0.085	0.637	100.424	346.30
Street Six/Nine @ Street Eight	J-2	9	29	0.077					10	24	0.064	0.141	0.318	0.064	0.478	133.651	345.50
Street Nine @ Street Ten	J-3								26	63	0.167	0.167	0.376	0.075	0.565	133.710	346.00
Street Nine	J-4								32	78	0.206	0.206	0.463	0.093	0.696	133.796	346.00
Street Six	J-5	13	42	0.111					13	32	0.084	0.195	0.439	0.088	0.659	133.772	345.50
Street Seven	J-6	19	62	0.163								0.163	0.366	0.073	0.550	100.366	345.00
Street Eight @ Street Nine	J-7	20	65	0.171					7	17	0.045	0.216	0.487	0.097	0.731	133.820	344.80
Street Nine @ Street Ten	J-8								24	59	0.154	0.154	0.347	0.069	0.522	133.681	345.00
Street Two @ Ingold Avenue	J-9								23	56	0.148	0.148	0.333	0.067	0.500	133.666	343.70
Street Two	J-10								4	10	0.026	0.026	0.058	0.012	0.087	133.391	344.00
Street Two @ Street Four/Six	J-11	7	23	0.060					24	59	0.154	0.214	0.482	0.096	0.724	133.815	344.75
Street Two @ Street Five/Seven	J-12	12	39	0.103					16	39	0.103	0.206	0.463	0.093	0.695	133.796	344.25
Street Two @ Street One/Eight	J-13	17	55	0.146					8	20	0.051	0.197	0.443	0.089	0.666	133.777	344.00
Ingold Avenue @ Street Three	J-14								49	120	0.315	0.315	0.709	0.142	1.065	134.042	343.10
Street Four @ Street Three	J-15								43	105	0.277	0.277	0.622	0.124	0.935	133.955	345.10
Street Five	J-16	22	72	0.188								0.188	0.424	0.085	0.637	100.424	344.50
Street One	J-17	22	72	0.188								0.188	0.424	0.085	0.637	100.424	344.50
Ingold Avenue @ Street One	J-18	11	36	0.094					33	81	0.212	0.306	0.689	0.138	1.036	134.023	342.70
Street One @ Street Four	J-19	10	33	0.086					27	66	0.174	0.259	0.583	0.117	0.876	100.583	345.75
Street One @ Street Five	J-20	27	88	0.231								0.231	0.520	0.104	0.782	100.520	345.30
	J-201				0.98	98	239	0.630				0.630	1.418	0.284	2.130	134.751	345.00
	J-202				0.87	87	212	0.559				0.559	1.259	0.252	1.891	134.592	345.00
	J-203				1.13	119	290	0.765				0.765	1.722	0.344	2.586	135.055	344.30
Total		**211**	**686**	**1.807**	**2.98**	**304**	**742**	**1.955**	**339**	**827**	**2.180**	**5.942**	**13.369**	**2.674**	**20.084**	**135.055**	
								Total Population	**2255**								
								Total Units	**854**								

Table Notes:

1. Unit counts are based on the Draft Plan by MHBC, dated January 11, 2021.

2. Population Density	
Structure Type	**PPU**
Single and semi-detached	3.25
Townhouse	2.44
Apartment	1.77
Multiple Unit Types	2.11
Unspecified Unit Type	3.05

Reference: Region of Waterloo 2020 Water and Wastewater Monitoring Report (Region of Waterloo, May 2020)

3. Water Demand	
Residential	227.7 l/d/person
	0.0026 l/s/person
ICI	45 m^3/d/ha
	0.5208 l/s/ha
Institutional	1.000 l/s/ha

Reference: Water demand per capita from the *Tri-City Water Distribution Master Plan Final Report*, (AECOM, May 2009):
- Average ICI Demand: *Design Guidelines for Drinking-Water Systems*, (MOE, 2008) - Section 3.4.4: Industrial Water Demands

4. Peaking Factors	2,001-3,000
Average Day	1.00
Maximum Day	2.25
Minimum Hour	0.45
Peak Hour	3.38

Reference: *Design Guidelines for Drinking-Water Systems,* (MOE, 2008) - Table 3.1: Peaking Factors - Population 2,001 to 3,000

5. Fire Flow	
High Density	12,000 l/min
	200 l/s
Townhomes (contiguous)	8,000 l/min
	133 l/s
Single Family <3m separation	6,000 l/min
	100 l/s
Institutional (School)	10,000 l/min
	167 l/s
Commercial	12,000 l/min
	200 l/s

Reference: *Water Supply for Public Fire Protection* (FUS, 1991) - Detached dwellings, Commercial and F=220C(A)^1/2

WILMOT WOODS

Community of New Hamburg - New Hamburg Pressure Zone

Pump Curve Design Sheet

Project No.: 35056-104
Date: 9-Dec-21
Design By: AJC
File: Q:\35056\104\Water Distribution\35056-104_Region Pressures & Pump Curves.xlsx
Note: System pressure information is from correspondence to Charles Carré from Kevin Dolishny at the Region of Waterloo on April 23, 2021.

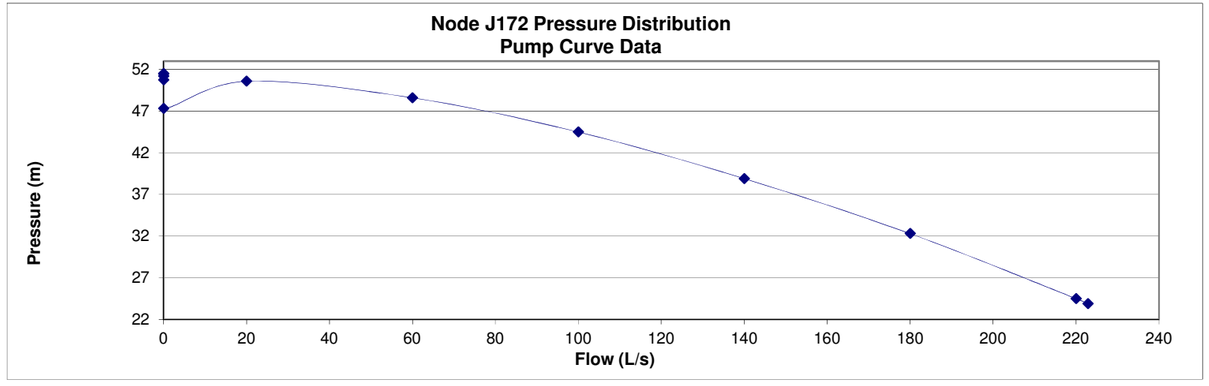
Node J172 ***Waterloo Street at Site Boundary***
Elevation = ***339.00*** **m**

Average Day					Maximum Day				
Time	Flow (L/s)	Head (m)	Residual Pressure (m)		Time	Flow (L/s)	Head (m)	Residual Pressure (m)	
00:00 hrs	0.00	387.32	48.32		00:00 hrs	0.00	387.11	48.11	
01:00 hrs	0.00	387.24	48.24		01:00 hrs	0.00	386.91	47.91	
02:00 hrs	0.00	387.22	48.22		02:00 hrs	0.00	386.85	47.85	
03:00 hrs	0.00	387.22	48.22		03:00 hrs	0.00	386.87	47.87	
04:00 hrs	0.00	387.04	48.04		04:00 hrs	0.00	386.38	47.38	
05:00 hrs	**0.00**	**390.47**	**51.47**	**Min Hr**	05:00 hrs	0.00	389.90	50.90	
06:00 hrs	0.00	390.28	51.28		06:00 hrs	0.00	389.81	50.81	
07:00 hrs	0.00	390.29	51.29		07:00 hrs	0.00	389.82	50.82	
08:00 hrs	0.00	390.33	51.33		08:00 hrs	0.00	389.85	50.85	
09:00 hrs	0.00	390.37	51.37		09:00 hrs	0.00	389.87	50.87	
10:00 hrs	0.00	390.42	51.42		10:00 hrs	0.00	389.89	50.89	
11:00 hrs	0.00	390.46	51.46		11:00 hrs	0.00	389.90	50.90	
12:00 hrs	0.00	390.38	51.38		12:00 hrs	0.00	389.87	50.87	
13:00 hrs	0.00	390.46	51.46		13:00 hrs	0.00	389.90	50.90	
14:00 hrs	0.00	390.46	51.46		14:00 hrs	0.00	389.90	50.90	
15:00 hrs	0.00	390.46	51.46		15:00 hrs	0.00	389.90	50.90	
16:00 hrs	0.00	390.39	51.39		16:00 hrs	0.00	389.88	50.88	
17:00 hrs	0.00	390.30	51.30		17:00 hrs	0.00	389.83	50.83	
18:00 hrs	0.00	390.22	51.22		**18:00 hrs**	**0.00**	**389.76**	**50.76**	**Max Day**
19:00 hrs	**0.00**	**390.21**	**51.21**	**Avg Day**	19:00 hrs	0.00	389.76	50.76	
20:00 hrs	0.00	390.34	51.34		20:00 hrs	0.00	389.85	50.85	
21:00 hrs	0.00	390.47	51.47		21:00 hrs	0.00	389.90	50.90	
22:00 hrs	0.00	387.01	48.01		**22:00 hrs**	**0.00**	**386.33**	**47.33**	**Peak Hr**
23:00 hrs	0.00	387.25	48.25		23:00 hrs	0.00	386.92	47.92	
Average =	**0.00**	389.44	50.44		**Max Day =**	**0.00**	388.96	49.96	
Minimum =	**0.00**	390.47	51.47		**Peak Hour =**	**0.00**	386.33	47.33	

Fire Flow Analysis		
Available Flow (L/s)	Head (m)	Residual Pressure (m)
0.0	389.90	50.90
20.0	389.60	50.60
40.0	388.90	49.90
60.0	387.60	48.60
80.0	385.80	46.80
100.0	383.50	44.50
120.0	380.90	41.90
140.0	377.90	38.90
160.0	374.70	35.70
180.0	371.30	32.30
200.0	367.50	28.50
220.0	363.50	24.50
222.9	362.90	23.90

Fire Flow Analysis Adjusted for Maximum Day Flows		
Available Flow (L/s)	Head (m)	Residual Pressure (m)
0.0	389.90	50.90
20.0	389.60	50.60
40.0	388.90	49.90
60.0	387.60	48.60
80.0	385.80	46.80
100.0	383.50	44.50
120.0	380.90	41.90
140.0	377.90	38.90
160.0	374.70	35.70
180.0	371.30	32.30
200.0	367.50	28.50
220.0	363.50	24.50
222.9	362.90	23.90

Node J172 - Pump Curve Pressure Distribution			
Demand Scenario	Discharge (L/s)	HGL (m)	Head (m)
0 (Est.)	0.00	390.50	51.50
Minimum Hour	0.00	390.47	51.47
Average Day	0.00	390.21	51.21
Maximum Day	0.00	389.76	50.76
Peak Hour	0.00	386.33	47.33
Max Day + 20 L/s Fire Flow	20.00	389.60	50.60
Max Day + 60 L/s Fire Flow	60.00	387.60	48.60
Max Day + 100 L/s Fire Flow	100.00	383.50	44.50
Max Day + 140 L/s Fire Flow	140.00	377.90	38.90
Max Day + 180 L/s Fire Flow	180.00	371.30	32.30
Max Day + 220 L/s Fire Flow	220.00	363.50	24.50
Max Day + 223 L/s Fire Flow	222.90	362.90	23.90



WILMOT WOODS
Community of New Hamburg - New Hamburg Pressure Zone
Pump Curve Design Sheet

Project No.: 35056-104
Date: 9-Dec-21
Design By: AJC
File: Q:\35056\104\Water Distribution\35056-104_Region Pressures & Pump Curves.xlsx
Note: System pressure information is from correspondence to Charles Carré from Kevin Dolishny at the Region of Waterloo on April 23, 2021.

Node 00033 Ingold Avenue at Site Boundary
Elevation = *343.00* m

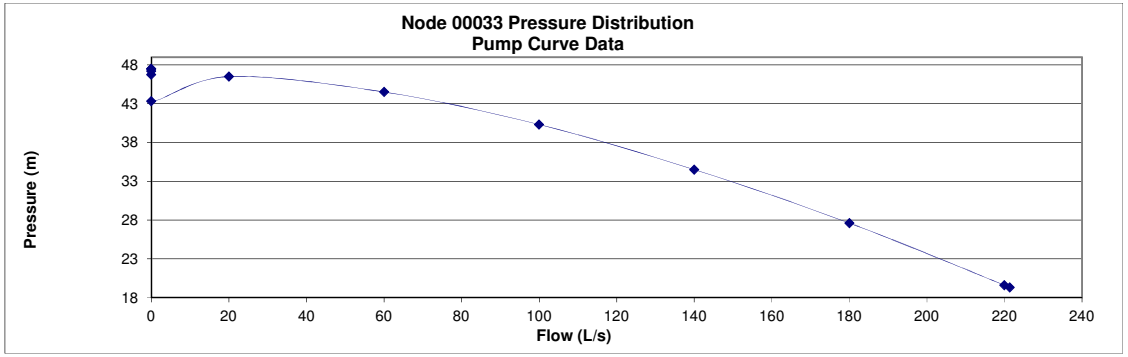
Average Day				
Time	Flow (L/s)	Head (m)	Residual Pressure (m)	
00:00 hrs	0.00	387.32	44.32	
01:00 hrs	0.00	387.24	44.24	
02:00 hrs	0.00	387.22	44.22	
03:00 hrs	0.00	387.22	44.22	
04:00 hrs	0.01	387.04	44.04	
05:00 hrs	**0.01**	**390.47**	**47.47**	**Min Hr**
06:00 hrs	0.01	390.28	47.28	
07:00 hrs	0.01	390.29	47.29	
08:00 hrs	0.01	390.33	47.33	
09:00 hrs	0.01	390.37	47.37	
10:00 hrs	0.01	390.42	47.42	
11:00 hrs	0.01	390.46	47.46	
12:00 hrs	0.01	390.38	47.38	
13:00 hrs	0.01	390.46	47.46	
14:00 hrs	0.01	390.46	47.46	
15:00 hrs	0.01	390.46	47.46	
16:00 hrs	0.01	390.39	47.39	
17:00 hrs	0.01	390.30	47.30	
18:00 hrs	0.01	390.22	47.22	
19:00 hrs	**0.01**	**390.21**	**47.21**	**Avg Day**
20:00 hrs	0.01	390.34	47.34	
21:00 hrs	0.01	390.47	47.47	
22:00 hrs	0.01	387.01	44.01	
23:00 hrs	0.00	387.24	44.24	
Average =	**0.01**	389.44	46.44	
Minimum =	**0.00**	390.47	47.47	

Maximum Day				
Time	Flow (L/s)	Head (m)	Residual Pressure (m)	
00:00 hrs	0.01	387.11	44.11	
01:00 hrs	0.01	386.90	43.90	
02:00 hrs	0.01	386.85	43.85	
03:00 hrs	0.01	386.87	43.87	
04:00 hrs	0.01	386.38	43.38	
05:00 hrs	0.01	389.90	46.90	
06:00 hrs	0.02	389.81	46.81	
07:00 hrs	0.01	389.82	46.82	
08:00 hrs	0.01	389.85	46.85	
09:00 hrs	0.01	389.86	46.86	
10:00 hrs	0.01	389.89	46.89	
11:00 hrs	0.01	389.90	46.90	
12:00 hrs	0.01	389.87	46.87	
13:00 hrs	0.01	389.90	46.90	
14:00 hrs	0.01	389.90	46.90	
15:00 hrs	0.01	389.90	46.90	
16:00 hrs	0.01	389.88	46.88	
17:00 hrs	0.01	389.82	46.82	
18:00 hrs	**0.02**	**389.76**	**46.76**	**Max Day**
19:00 hrs	0.02	389.76	46.76	
20:00 hrs	0.01	389.85	46.85	
21:00 hrs	0.01	389.90	46.90	
22:00 hrs	**0.01**	**386.32**	**43.32**	**Peak Hr**
23:00 hrs	0.01	386.92	43.92	
Max Day =	**0.01**	388.96	45.96	
Peak Hour =	**0.02**	386.32	43.32	

Fire Flow Analysis		
Available Flow (L/s)	Head (m)	Residual Pressure (m)
0.0	389.90	46.90
20.0	389.50	46.50
40.0	388.90	45.90
60.0	387.50	44.50
80.0	385.60	42.60
100.0	383.30	40.30
120.0	380.60	37.60
140.0	377.50	34.50
160.0	374.20	31.20
180.0	370.60	27.60
200.0	366.70	23.70
220.0	362.60	19.60
221.4	362.30	19.30

Fire Flow Analysis Adjusted for Maximum Day Flows		
Available Flow (L/s)	Head (m)	Residual Pressure (m)
0.0	389.90	46.90
20.0	389.50	46.50
40.0	388.90	45.90
60.0	387.50	44.50
80.0	385.60	42.60
100.0	383.30	40.30
120.0	380.60	37.60
140.0	377.50	34.50
160.0	374.20	31.20
180.0	370.60	27.60
200.0	366.70	23.70
220.0	362.60	19.60
221.4	362.30	19.30

Node 00033 - Pump Curve Pressure Distribution			
Demand Scenario	Discharge (L/s)	HGL (m)	Head (m)
0 (Est.)	0.00	390.50	47.50
Minimum Hour	0.01	390.47	47.47
Average Day	0.01	390.21	47.21
Maximum Day	0.01	389.76	46.76
Peak Hour	0.01	386.32	43.32
Max Day + 20 L/s Fire Flow	20.01	389.50	46.50
Max Day + 60 L/s Fire Flow	60.01	387.50	44.50
Max Day + 100 L/s Fire Flow	100.01	383.30	40.30
Max Day + 140 L/s Fire Flow	140.01	377.50	34.50
Max Day + 180 L/s Fire Flow	180.01	370.60	27.60
Max Day + 220 L/s Fire Flow	220.01	362.60	19.60
Max Day + 221 L/s Fire Flow	221.41	362.30	19.30



Appendix D

WaterCAD Output Files

Active Scenario: New Hamburg - Avg Day

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	346.30	0.19	389.62	423.9
J-2	345.50	0.14	389.62	431.8
J-3	346.00	0.17	389.62	426.9
J-4	346.00	0.21	389.62	426.9
J-5	345.50	0.20	389.62	431.8
J-6	345.00	0.16	389.62	436.6
J-7	344.80	0.22	389.62	438.6
J-8	345.00	0.15	389.62	436.6
J-9	343.70	0.15	389.62	449.4
J-10	344.00	0.03	389.62	446.4
J-11	344.75	0.21	389.62	439.1
J-12	344.25	0.21	389.62	444.0
J-13	344.00	0.20	389.62	446.4
J-14	343.10	0.32	389.62	455.3
J-15	345.10	0.28	389.62	435.7
J-16	344.50	0.19	389.62	441.5
J-17	344.50	0.19	389.62	441.5
J-18	342.70	0.31	389.62	459.2
J-19	345.75	0.26	389.62	429.3
J-20	345.30	0.23	389.62	433.7
J-00033	343.00	0.00	389.63	456.3
J-172	339.00	0.00	389.62	495.5
J-201	345.00	0.63	389.62	436.7
J-202	345.00	0.56	389.62	436.7
J-203	344.30	0.77	389.62	443.5

Active Scenario: New Hamburg - Max Day

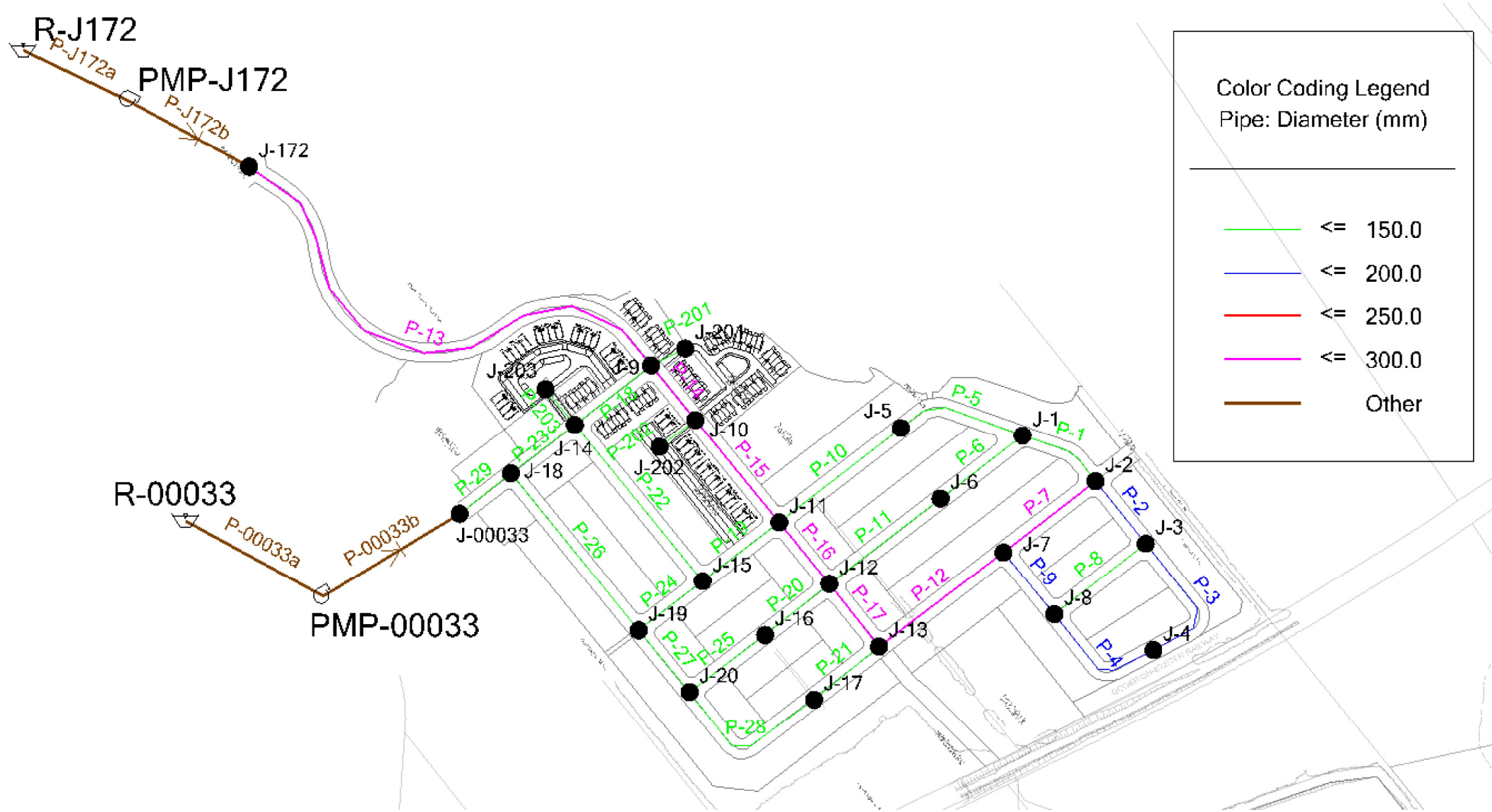
Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	346.30	0.42	389.54	423.2
J-2	345.50	0.32	389.54	431.0
J-3	346.00	0.38	389.54	426.1
J-4	346.00	0.46	389.54	426.1
J-5	345.50	0.44	389.54	431.0
J-6	345.00	0.37	389.54	435.9
J-7	344.80	0.49	389.54	437.9
J-8	345.00	0.35	389.54	435.9
J-9	343.70	0.33	389.55	448.7
J-10	344.00	0.06	389.55	445.7
J-11	344.75	0.48	389.54	438.4
J-12	344.25	0.46	389.54	443.3
J-13	344.00	0.44	389.54	445.7
J-14	343.10	0.71	389.55	454.6
J-15	345.10	0.62	389.54	435.0
J-16	344.50	0.42	389.54	440.8
J-17	344.50	0.42	389.54	440.8
J-18	342.70	0.69	389.56	458.6
J-19	345.75	0.58	389.54	428.6
J-20	345.30	0.52	389.54	433.0
J-00033	343.00	0.00	389.60	456.1
J-172	339.00	0.00	389.58	495.0
J-201	345.00	1.42	389.55	436.0
J-202	345.00	1.26	389.54	435.9
J-203	344.30	1.72	389.54	442.8

Active Scenario: New Hamburg - Max Day + Fire

Label	Fire Flow (Needed) (L/s)	Fire Flow (Available) (L/s)	Flow (Total Needed) (L/s)	Flow (Total Available) (L/s)	Pressure (Calculated Residual) (kPa)	Pressure (Calculated System Lower Limit) (kPa)	Junction w/ Minimum Pressure (System)	Hydraulic Grade (m)	Pipe w/ Maximum Velocity	Velocity of Maximum Pipe (m/s)
J-1	100.00	187.06	100.42	187.48	140.0	204.2	J-6	389.54	P-1	4.77
J-2	133.00	223.00	133.32	223.32	153.0	152.4	J-3	389.54	P-29	5.01
J-3	133.00	206.54	133.38	206.92	140.0	155.2	J-4	389.54	P-29	4.67
J-4	133.00	190.96	133.46	191.42	140.0	191.3	J-3	389.54	P-29	4.34
J-5	133.00	159.43	133.44	159.87	140.0	261.5	J-1	389.54	P-10	4.71
J-6	100.00	165.94	100.37	166.31	140.0	243.2	J-1	389.54	P-11	4.78
J-7	133.00	223.00	133.49	223.49	171.3	159.9	J-4	389.54	P-29	5.01
J-8	133.00	211.15	133.35	211.50	140.1	143.2	J-4	389.54	P-29	4.76
J-9	133.00	223.00	133.33	223.33	260.6	237.5	J-1	389.55	P-29	4.83
J-10	133.00	223.00	133.06	223.06	247.0	226.5	J-1	389.55	P-29	4.89
J-11	133.00	223.00	133.48	223.48	224.5	209.5	J-1	389.54	P-29	4.98
J-12	133.00	223.00	133.46	223.46	216.2	197.9	J-1	389.54	P-29	5.01
J-13	133.00	223.00	133.44	223.44	204.8	185.8	J-4	389.54	P-29	5.02
J-14	133.00	223.00	133.71	223.71	179.5	167.8	J-203	389.55	P-29	5.54
J-15	133.00	218.26	133.62	218.88	140.1	215.3	J-19	389.54	P-29	5.09
J-16	100.00	184.43	100.42	184.85	140.1	238.8	J-20	389.54	P-20	5.84
J-17	100.00	174.84	100.42	175.26	140.0	267.0	J-20	389.54	P-21	5.95
J-18	133.00	223.00	133.69	223.69	232.6	271.8	J-19	389.56	P-29	6.50
J-19	133.00	212.63	133.58	213.21	140.0	212.2	J-20	389.54	P-29	5.15
J-20	100.00	199.57	100.52	200.09	140.0	212.4	J-16	389.54	P-27	4.82
J-00033	133.00	223.00	133.00	223.00	310.8	360.5	J-19	389.60	P-29	3.66
J-172	133.00	223.00	133.00	223.00	345.7	286.3	J-1	389.58	P-29	4.10
J-201	133.00	163.82	134.42	165.24	140.0	314.5	J-1	389.55	P-201	9.35
J-202	133.00	155.14	134.26	156.40	140.0	318.6	J-1	389.54	P-202	8.85
J-203	133.00	145.76	134.72	147.48	140.0	325.3	J-14	389.54	P-203	8.35

Active Scenario: New Hamburg - Min Hour

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	346.30	0.09	389.63	424.1
J-2	345.50	0.06	389.63	431.9
J-3	346.00	0.08	389.63	427.0
J-4	346.00	0.09	389.63	427.0
J-5	345.50	0.09	389.63	431.9
J-6	345.00	0.07	389.63	436.8
J-7	344.80	0.10	389.63	438.8
J-8	345.00	0.07	389.63	436.8
J-9	343.70	0.07	389.63	449.5
J-10	344.00	0.01	389.63	446.6
J-11	344.75	0.10	389.63	439.2
J-12	344.25	0.09	389.63	444.1
J-13	344.00	0.09	389.63	446.6
J-14	343.10	0.14	389.63	455.4
J-15	345.10	0.12	389.63	435.8
J-16	344.50	0.09	389.63	441.7
J-17	344.50	0.09	389.63	441.7
J-18	342.70	0.14	389.63	459.3
J-19	345.75	0.12	389.63	429.5
J-20	345.30	0.10	389.63	433.9
J-00033	343.00	0.00	389.63	456.4
J-172	339.00	0.00	389.63	495.6
J-201	345.00	0.28	389.63	436.8
J-202	345.00	0.25	389.63	436.8
J-203	344.30	0.34	389.63	443.6

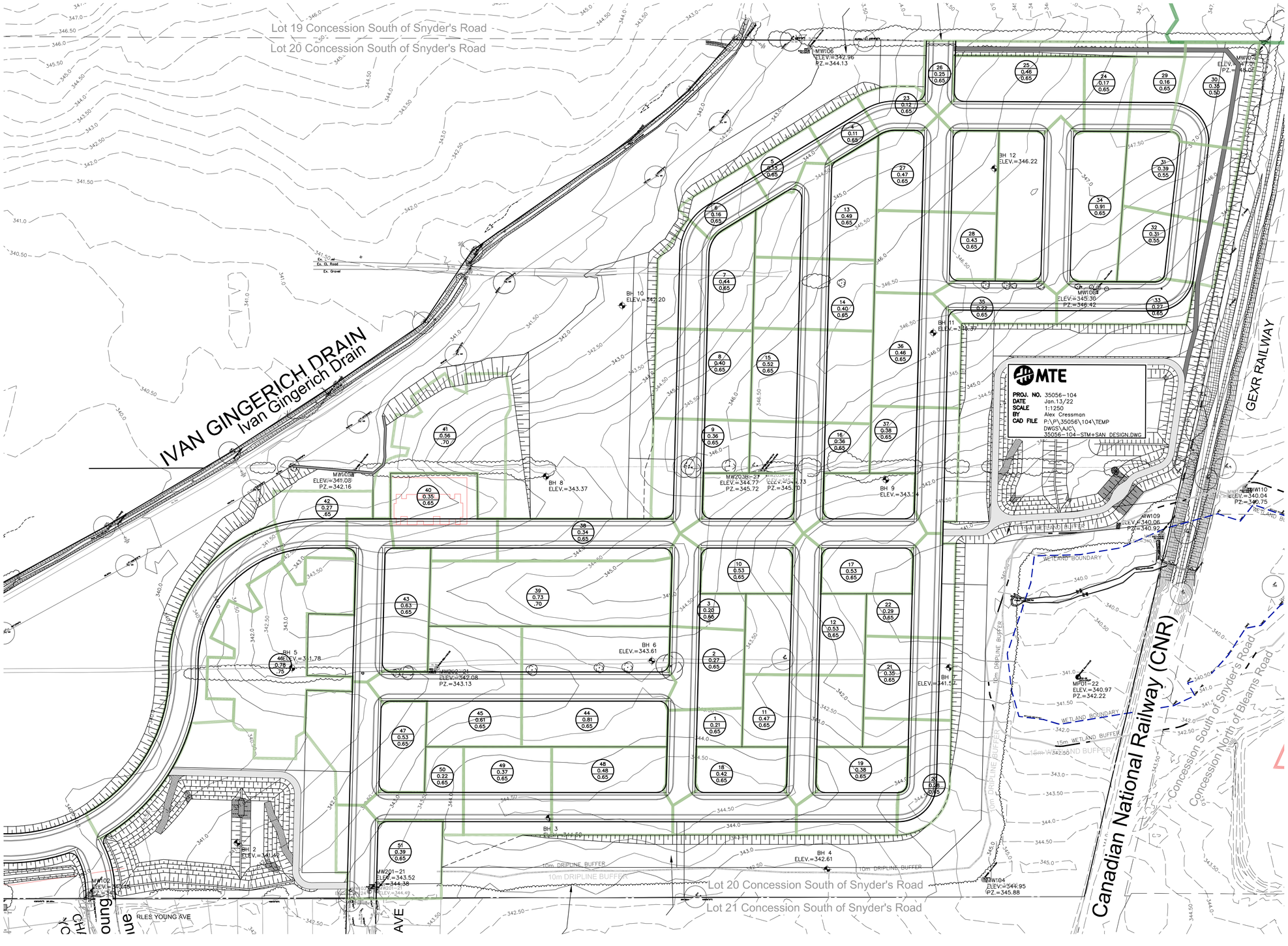

R-J172
P-J172a
PMP-J172
P-J172b
J-172
P-13
P-201
J-201
J-203
J-9
P-203
P-18
P-17
J-10
P-233
J-14
P-200
J-202
P-15
P-10
J-5
P-5
J-1
P-1
P-29
J-18
P-22
P-6
J-6
J-2
R-00033
P-00033a
P-00033b
J-00033
P-26
J-11
P-16
P-11
P-7
P-2
J-3
P-14
J-15
J-12
J-7
P-24
P-20
P-17
P-12
P-9
P-8
P-3
J-19
J-16
J-13
J-8
P-27
P-25
P-21
P-4
J-4
J-20
J-17
P-28
PMP-00033
Color Coding Legend
Pipe: Diameter (mm)
<= 150.0
<= 200.0
<= 250.0
<= 300.0
Other

Active Scenario: New Hamburg - Peak Hour

Label	Elevation (m)	Demand (L/s)	Hydraulic Grade (m)	Pressure (kPa)
J-1	346.30	0.64	389.43	422.1
J-2	345.50	0.48	389.43	429.9
J-3	346.00	0.57	389.43	425.0
J-4	346.00	0.70	389.43	425.0
J-5	345.50	0.66	389.43	430.0
J-6	345.00	0.55	389.43	434.8
J-7	344.80	0.73	389.43	436.8
J-8	345.00	0.52	389.43	434.8
J-9	343.70	0.50	389.45	447.7
J-10	344.00	0.09	389.44	444.7
J-11	344.75	0.72	389.44	437.3
J-12	344.25	0.70	389.43	442.2
J-13	344.00	0.67	389.43	444.6
J-14	343.10	1.07	389.44	453.6
J-15	345.10	0.94	389.44	433.9
J-16	344.50	0.64	389.43	439.8
J-17	344.50	0.64	389.43	439.7
J-18	342.70	1.04	389.48	457.8
J-19	345.75	0.88	389.44	427.6
J-20	345.30	0.78	389.43	431.9
J-00033	343.00	0.00	389.57	455.8
J-172	339.00	0.00	389.51	494.3
J-201	345.00	2.13	389.44	434.9
J-202	345.00	1.89	389.44	434.9
J-203	344.30	2.59	389.44	441.7

Appendix F

Proposed Storm Sewer Analysis


Lot 19 Concession South of Snyder's Road
Lot 20 Concession South of Snyder's Road
IVAN GINGERICH DRAIN
Ivan Gingerich Drain
GEXR RAILWAY
Canadian National Railway (CNR)
Concession South of Snyder's Road
Concession North of Bleams Road
Lot 20 Concession South of Snyder's Road
Lot 21 Concession South of Snyder's Road
WETLAND BOUNDARY
10m DRIPLINE BUFFER
15m WETLAND BUFFER
MTE
PROJ. NO. 35056-104
DATE Jan.13/22
SCALE 1:1250
BY Alex Cressman
CAD FILE P:\P\35056\104\TEMP DWGS\AJC\ 35056-104-STM+SAN_DESIGN.DWG
MW108 ELEV.=342.96 PZ.=344.13
MW107 ELEV.=347.71 PZ.=349.02
MW106 ELEV.=341.08 PZ.=342.16
MW110 ELEV.=340.04 PZ.=340.75
MW109 ELEV.=340.06 PZ.=340.92
MW104 ELEV.=346.95 PZ.=345.88
MW102 ELEV.=340.15
MPBT-22 ELEV.=340.97 PZ.=342.22
BH 1 ELEV.=341.42
BH 2 ELEV.=341.45
BH 3 ELEV.=344.50
BH 4 ELEV.=342.61
BH 5 ELEV.=341.78
BH 6 ELEV.=343.61
BH 7 ELEV.=341.52
BH 8 ELEV.=343.37
BH 9 ELEV.=343.74
BH 10 ELEV.=342.20
BH 11 ELEV.=345.37
BH 12 ELEV.=346.22

WILMOT WOODS

TOWNSHIP OF WILMOT, Ontario

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 35056-104
Date: Jan. 13/2022
Design By: AJC
Checked By:
File: Q:\35056\104\STM\35056-104-Storm Sewer Design Sheet.xlsx

Drainage Area Plan No: PRELIM-ST1.1

Design Parameters

5 YEAR STORM

Q=kAIR, k=0.00278
Intensity (I) = a/(tc+b)^{c}
a = 1395
b = 12.7
c = 0.839

Manning's "n" 0.013
Min. Velocity 0.800 m/s
Max. Velocity 6.000 m/s

LOCATION				STORMWATER FLOW								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	CONCENTRATION TIME IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	PIPE FULL
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*%*
Area to South SWMF																	
STREET FOUR	1			0.21	0.65	0.1365	0.1365	10.0000	0.3358	101.59411	38.55192	300	26.0	1.00	96.70076	1.3680	39.87
STREET FOUR	2			0.27	0.65	0.1755	0.3120	10.3358	0.6858	100.34999	87.03956	375	50.0	0.50	123.97713	1.1225	70.21
STREET FOUR	3			0.20	0.65	0.1300	0.4420	11.0216	0.6299	97.91020	120.30813	450	50.0	0.50	201.60049	1.2676	59.68
STREET FOUR				0.00	0.00	0.0000	0.4420	11.6515	0.1773	95.78097	117.69183	450	14.0	0.50	201.60049	1.2676	58.38
								11.8288									
STREET SIX	4			0.11	0.65	0.0715	0.0715	10.0000	0.5398	101.59411	20.19386	300	35.0	1.00	96.70076	1.3680	20.88
STREET SIX	5			0.13	0.65	0.0845	0.1560	10.5398	0.8470	99.61037	43.19903	300	52.0	0.50	68.37776	0.9673	63.18
STREET SIX	6			0.16	0.65	0.1040	0.2600	11.3869	0.7499	96.66303	69.86803	375	52.0	0.50	123.97713	1.1225	56.36
STREET SIX				0.00	0.65	0.0000	0.2600	12.1368	0.2031	94.20836	68.09381	375	14.0	0.50	123.97713	1.1225	54.92
STREET SIX	7			0.44	0.65	0.2860	0.5460	12.3399	0.7963	93.56674	142.02308	450	60.0	0.40	180.31696	1.1338	78.76
STREET SIX	8			0.40	0.65	0.2600	0.8060	13.1361	0.7251	91.14127	204.21843	525	60.0	0.40	271.99526	1.2565	75.08
STREET SIX	9			0.36	0.65	0.2340	1.0400	13.8612	0.6996	89.04914	257.45887	525	60.0	0.40	271.99526	1.2565	94.66
STREET SIX				0.00	0.65	0.0000	1.0400	14.5608	0.2337	87.12780	251.90389	525	20.0	0.40	271.99526	1.2565	92.61
								14.7945									
STREET TWO	10			0.53	0.65	0.3445	1.8265	14.7945	0.7211	86.50603	439.24908	750	65.0	0.30	609.76693	1.3802	72.04
STREET TWO				0.00	0.65	0.0000	1.8265	15.5157	0.2118	84.64724	429.81077	750	19.0	0.30	609.76693	1.3802	70.49
								15.7274									
STREET FIVE	11			0.47	0.65	0.3055	0.3055	10.0000	0.4851	101.59411	86.28286	300	45.0	1.00	96.70076	1.3680	89.23
STREET FIVE	12			0.53	0.65	0.3445	0.6500	10.4851	0.8720	99.80783	180.35275	450	81.0	0.60	220.84227	1.3886	81.67
STREET FIVE				0.00	0.65	0.0000	0.6500	11.3571	0.1749	96.76347	174.85159	525	14.0	0.40	271.99526	1.2565	64.28
								11.5320									
STREET SEVEN	13			0.49	0.65	0.3185	0.3185	10.0000	0.6436	101.59411	89.95447	300	60.0	1.00	96.70076	1.3680	93.02
STREET SEVEN	14			0.40	0.65	0.2600	0.5785	10.6436	0.4978	99.23863	159.59854	450	48.0	0.70	238.53691	1.4998	66.91
STREET SEVEN	15			0.52	0.65	0.3380	0.9165	11.1415	0.5929	97.49706	248.40983	525	60.0	0.60	333.12480	1.5389	74.57
STREET SEVEN	16			0.36	0.65	0.2340	1.1505	11.7344	0.6684	95.50835	305.47295	600	61.0	0.40	388.33500	1.3735	78.66
STREET SEVEN				0.00	0.65	0.0000	1.1505	12.4028	0.1981	93.37007	298.63391	600	18.0	0.40	388.33500	1.3735	76.90
								12.6009									
STREET TWO	17			0.53	0.65	0.3445	3.9715	15.7274	0.6116	84.11790	928.72637	900	65.0	0.30	991.54825	1.5586	93.66
STREET TWO				0.00	0.65	0.0000	3.9715	16.3390	0.1852	82.62895	912.28726	900	21.0	0.35	1070.99452	1.6835	85.18
								16.5242									
STREET ONE	18			0.42	0.65	0.2730	0.2730	10.0000	0.7461	101.59411	77.10383	300	68.0	1.00	96.70076	1.3680	79.73

LOCATION				STORMWATER FLOW								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	CONCENTRATION TIME IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	PIPE FULL
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*%*
STREET ONE	19			0.38	0.65	0.2470	0.5200	10.7461	1.1929	98.87459	142.93311	450	90.0	0.40	180.31696	1.1338	79.27
STREET ONE				0.00	0.65	0.0000	0.5200	11.9390	0.2405	94.84229	137.10402	450	18.0	0.40	180.31696	1.1338	76.04
STREET ONE	20			0.28	0.65	0.1820	0.7020	12.1795	0.6302	94.07258	183.58829	525	51.0	0.40	271.99526	1.2565	67.50
STREET ONE	21			0.35	0.65	0.2275	0.9295	12.8097	0.6471	92.11883	238.03599	525	55.0	0.40	271.99526	1.2565	87.51
STREET ONE	22			0.29	0.65	0.1885	1.1180	13.4568	0.6129	90.20296	280.35440	600	55.0	0.40	388.33500	1.3735	72.19
STREET ONE				0.00	0.65	0.0000	1.1180	14.0697	0.1455	88.46695	274.95881	600	13.0	0.40	388.33500	1.3735	70.80
								14.2152									
STREET SIX	23			0.12	0.65	0.0780	0.0780	10.0000	0.5888	101.59411	22.02967	300	43.0	1.30	110.25583	1.5598	19.98
STREET SIX				0.00	0.65	0.0000	0.0780	10.5888	0.2617	99.43467	21.56141	300	19.0	1.30	110.25583	1.5598	19.56
								10.8505									
STREET NINE	24			0.17	0.65	0.1105	0.1105	10.0000	0.4920	101.59411	31.20869	300	36.0	1.00	96.70076	1.3680	32.27
STREET NINE	25			0.46	0.65	0.2990	0.4095	10.4920	1.0998	99.78259	113.59350	375	84.0	0.50	123.97713	1.1225	91.62
STREET NINE				0.00	0.65	0.0000	0.4095	11.5919	0.1842	95.97815	109.26248	375	14.0	0.50	123.97713	1.1225	88.13
								11.7761									
STREET EIGHT	26			0.26	0.65	0.1690	0.1690	10.0000	0.1222	101.59411	47.73094	300	10.0	1.00	96.70076	1.3680	49.36
								10.1222									
STREET EIGHT	27			0.47	0.65	0.3055	0.9620	11.7761	0.5406	95.37175	255.05838	525	55.0	0.60	333.12480	1.5389	76.57
STREET EIGHT	28			0.43	0.65	0.2795	1.2415	12.3167	0.6043	93.63943	323.18434	600	61.0	0.50	434.17173	1.5356	74.44
STREET EIGHT				0.00	0.65	0.0000	1.2415	12.9210	0.1890	91.78297	316.77700	600	19.0	0.50	434.17173	1.5356	72.96
								13.1100									
STREET NINE	29			0.16	0.65	0.1040	0.1040	10.0000	0.4584	101.59411	29.37289	300	33.0	1.00	96.70076	1.3680	30.38
STREET NINE	30			0.35	0.50	0.1750	0.2790	10.4584	0.3150	99.90402	77.48755	375	24.0	0.60	135.81014	1.2296	57.06
STREET NINE	31			0.39	0.50	0.1950	0.4740	10.7735	0.5766	98.77796	130.16169	450	50.0	0.60	220.84227	1.3886	58.94
STREET NINE	32			0.31	0.50	0.1550	0.6290	11.3501	0.6426	96.78710	169.24387	450	59.0	0.60	220.84227	1.3886	76.64
STREET NINE				0.00	0.65	0.0000	0.6290	11.9927	0.1750	94.66929	165.54061	450	16.0	0.60	220.84227	1.3886	74.96
STREET NINE	33			0.27	0.65	0.1755	0.8045	12.1677	0.9372	94.10994	210.47783	525	78.0	0.40	271.99526	1.2565	77.38
								13.1049									
STREET TEN	34			0.91	0.65	0.5915	0.5915	10.0000	0.7952	101.59411	167.05830	375	90.0	1.10	183.88780	1.6649	90.85
STREET TEN				0.00	0.65	0.0000	0.5915	10.7952	0.2364	98.70114	162.30120	450	20.0	0.50	201.60049	1.2676	80.51
								11.0317									
STREET NINE	35			0.22	0.65	0.1430	1.5390	13.1049	0.6934	91.23384	390.33668	675	64.0	0.35	497.29865	1.3897	78.49
STREET NINE				0.00	0.65	0.0000	1.5390	13.7983	0.1523	89.22664	381.74903	675	14.0	0.35	497.29865	1.3897	76.76
								13.9506									
STREET EIGHT	36			0.46	0.65	0.2990	3.0795	13.9506	0.6866	88.79859	760.20558	825	74.0	0.35	849.21519	1.5886	89.52
STREET EIGHT	37			0.38	0.65	0.2470	3.3265	14.6372	0.6404	86.92359	803.84064	900	71.0	0.35	1070.99452	1.6835	75.06
STREET EIGHT				0.00	0.65	0.0000	3.3265	15.2776	0.1721	85.25106	788.37371	900	19.0	0.35	1070.99452	1.6835	73.61
								15.4497									
			SWMF	0.00	0.00	0.0000	8.4160	16.5242	0.3493	82.18945	1922.94386	1050	58.0	0.60	2115.21065	2.4428	90.91
Area to North SWMF																	
STREET TWO	38			0.34	0.65	0.2210	0.2210	10.0000	0.3210	101.59411	62.41739	300	28.0	1.00	96.70076	1.3680	64.55

LOCATION				STORMWATER FLOW								DESIGN					
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	RUNOFF COEFF. (C)	A x C	CUMUL. A x C	CONCENTRATION TIME TOTAL	CONCENTRATION TIME IN PIPE	RAIN INTENSITY (I)	FLOW (Q)	PIPE SIZE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	PIPE FULL
				ha		*ha*	*ha*	*min*	*min*	*mm/hr*	*L/s*	*mm*	*m*	*%*	*L/s*	*m/s*	*%*
								10.3210									
	39			0.73	0.75	0.5475	0.5475	10.0000	0.1395	101.59411	154.63131	375	15.0	1.00	175.33014	1.5875	88.19
								10.1395									
STREET TWO	40			0.35	0.65	0.2275	0.9960	10.3210	0.5651	100.40430	278.00745	525	54.0	0.50	304.09995	1.4048	91.42
								10.8861									
	41			0.56	0.70	0.3920	0.3920	10.0000	0.1489	101.59411	110.71319	375	15.0	1.00	175.33014	1.5875	63.15
								10.1489									
STREET TWO	42			0.27	0.65	0.1755	0.1755	10.0000	0.5813	101.59411	49.56675	300	48.0	1.00	96.70076	1.3680	51.26
								10.5813									
INGOLD AVENUE	43			0.63	0.65	0.4095	1.9730	10.8861	0.7175	98.38211	539.61998	675	81.0	0.50	594.38558	1.6610	90.79
INGOLD AVENUE				0.00	0.65	0.0000	1.9730	11.6035	0.1333	95.93949	526.22233	675	15.0	0.50	594.38558	1.6610	88.53
								11.7368									
STREET THREE	44			0.81	0.65	0.5265	0.5265	10.0000	0.7735	101.59411	148.70025	375	86.0	1.10	183.88780	1.6649	80.86
STREET THREE	45			0.61	0.65	0.3965	0.9230	10.7735	0.7112	98.77789	253.45814	450	90.0	1.10	299.02184	1.8801	84.76
STREET THREE				0.00	0.65	0.0000	0.9230	11.4846	0.2024	96.33512	247.19014	525	19.0	0.50	304.09995	1.4048	81.29
								11.6870									
	46			0.78	0.75	0.5850	0.5850	10.0000	0.1345	101.59411	165.22249	450	15.0	1.00	285.10614	1.7926	57.95
								10.1345									
INGOLD AVENUE	47			0.53	0.65	0.3445	3.8255	11.7368	0.5822	95.50021	1015.63423	900	71.0	0.40	1144.94130	1.7997	88.71
INGOLD AVENUE				0.00	0.65	0.0000	3.8255	12.3190	0.1562	93.63225	995.76865	900	19.0	0.40	1144.94130	1.7997	86.97
								12.4752									
STREET ONE	48			0.48	0.65	0.3120	0.3120	10.0000	0.7633	101.59411	88.11866	300	74.0	1.10	101.42061	1.4348	86.88
STREET ONE	49			0.37	0.65	0.2405	0.5525	10.7633	0.4326	98.81388	151.77318	375	60.0	1.90	241.67592	2.1882	62.80
STREET ONE	50			0.22	0.65	0.1430	0.6955	11.1959	0.4328	97.31066	188.14918	375	60.0	1.70	228.60254	2.0698	82.30
STREET ONE				0.00	0.65	0.0000	0.6955	11.6287	0.2202	95.85628	185.33716	450	19.0	0.50	201.60049	1.2676	91.93
								11.8489									
SWMF	51			0.39	0.65	0.2535	4.7745	12.4752	0.4947	93.14454	1236.31773	1050	53.0	0.25	1365.36260	1.5768	90.55
BYPASS FOREBAY				0.71	0.50	0.3550	0.3550		0.0000	165.37996	163.21348	375		1.00	175.33014	1.5875	93.09

Appendix G

Railway Compliance Guidelines Memo

Technical Memorandum

Project Name: Wilmot Woods Subdivision

MTE File No.: 35056-104

To: Adam Belskey, Capital Homes

Date: April 5, 2022

cc: Paul Britton, MHBC

From: Jeff Martens, P.Eng.
Alex Cressman, E.I.T

RE: Wilmot Woods Subdivision
Screening of Compliance with Railway Proximity Guidelines
Township of Wilmot

MTE has been retained by Wilmot Woods Developments Inc. to confirm the development proposed by the Plan of Subdivision (the Proposed Development) complies with the Proximity Guidelines. Outlined in this technical memorandum are the relevant sections of the Proximity Guidelines in italics, and a response from MTE as to the means by which the Proposed Development has met the guideline requirements. Attached is **MTE Drawing 35056-104-MS11** referred to throughout this letter report, which illustrates the development and various applicable "setback" lines from the CN Principal Main Line.

3.3 BUILDING SETBACKS FOR NEW DEVELOPMENTS

3.3.1 Guidelines

The standard recommended building setbacks for new residential development in proximity to railway operations are as follows:

- *Freight Rail Yard: 300 metres*
- *Principal Main Line: 30 metres*
- *Secondary Main Line: 30 metres*
- *Principal Branch Line: 15 metres*
- *Secondary Branch Line: 15 metres*
- *Spur Line: 15 metres*

Setback distances must be measured from the mutual property line to the building face. This will ensure that the entire railway right-of-way is protected for potential rail expansion in the future.

Policy Recommendation

Municipalities should establish minimum setback requirements through a zoning bylaw amendment.

MTE Response

The CN rail line in the vicinity of the Proposed Development is a Principal Main Line. Attached is MTE Drawing 35056-104-MS11 illustrating the 30m setbacks from the mutual property line. No new residential house construction is being proposed within 30m of the mutual property line of the CN Principal Main Line as illustrated on the attached plan. Generally open space abuts the CP right-of-way. Accordingly, the Proposed Development complies with the building setback guidelines in section 3.3 of the Proximity Guidelines.

3.4 NOISE MITIGATION
3.4.1 Guidelines

Since rail noise is site-specific in nature, the level and impact of noise on a given site should be accurately assessed by a qualified acoustic consultant through the preparation of a noise impact study. The objective of the noise impact study is to assess the impact of all noise sources affecting the subject lands and to determine the appropriate layout, design, and required control measures. Noise studies should be undertaken by the proponent early in the development process, and should be submitted with the initial proposal.

MTE Response

Reference document – Environmental Noise and Vibration Feasibility Assessment – Proposed Residential Development - Wilmot Woods Development Community, Township of Wilmot (February 2022) prepared by RJ Burnside & Associates Limited (Feasibility Assessment).

The Proximity Guidelines recommend that a minimum noise influence area of 300 metres measured from a Principal Main Line be used in undertaking noise studies. Noise and Vibration Procedures and Criteria are contained in Appendix C of the Proximity Guidelines, which provide procedures and criteria to be applied in undertaking noise assessments, including the development of noise mitigation measures. The Noise Assessment assessed the impact of railway noise based on railway traffic volumes provided by CP, using a 2.5% growth rate, as required by the Proximity Guidelines. We confirm that the Noise Assessment complies with all of the recommended procedures and criteria set out in the Proximity Guidelines, including those in Appendix C. The Noise Assessment also complies with *NPC-300: Environmental Noise Guideline: Stationary and Transportation Sources – Approval and Planning (MOE, 2013)* in accordance with Regional requirements.

The Noise Assessment recommends that for development within certain setback limits, specified noise mitigation measures be applied to address potential noise impacts from the CP railway line, to ensure compliance with the criteria in the Proximity Guidelines and NPC 300, including the following:

- a noise attenuation barrier.
- noise warning clauses of varying types for certain lots/blocks as described in the Noise Assessment.
- forced air heating and provision for the future installation of central air conditioning on certain lots/blocks.
- brick veneer or masonry equivalent construction on exterior walls for buildings on certain lots/block.

Based on the above, the Proposed Development fully complies with the noise mitigation guidelines set out in the Proximity Guidelines.

3.4.1.1 Avoiding Adverse Noise Impacts through Good Design

Many of the adverse impacts of railway noise can be avoided or minimized through good design practices. Careful consideration of the location and orientation of buildings, as well as their internal layout can minimize the exposure of sensitive spaces to railway noise. Site design should take into consideration the location of the rail corridor, existing sound levels, topography, and nearby buildings. Noise barriers, acoustic shielding from other structures, and the use of appropriate windows, doors, ventilation, and façade materials can all minimize the acoustic impacts of railway operations.

MTE Response

The subdivision was designed having regard for the CN rail line. *The Environmental Noise and Vibration Feasibility Assessment* completed to support the Draft Plan of Subdivision application assessed the noise exposure of sensitive land uses to the rail line based on railway location, topography, and existing features. This Feasibility Assessment guided the design of the subdivision and also made recommendations to mitigate impacts. To this end, residential lots and blocks are well separated from the CN rail line by environmental features, related setbacks, roads and other infrastructure including a planned stormwater management facility directly adjacent to the CN rail line. As such, this guideline has been satisfied.

3.4.1.2 Noise Barriers

A noise barrier can effectively reduce outdoor rail noise by between 5dBA and 15dBA, although the largest noise reductions are difficult to achieve without very high barriers. Noise barriers provide significant noise reductions only when they block the line of sight between the noise source and the receiver. Minimum noise barrier heights vary by the classification of the neighbouring rail line.

MTE Response

The Feasibility Assessment established a setback distance between the rail line and a point of assessment at a noise sensitive receiver that would require a noise barrier to meet outdoor noise limits. This setback limit Stage 5 Block 2 (S5B2) is illustrated within the Feasibility Assessment. The development proposes to construct a berm and barrier such that noise levels meet the requirements of NPC-300.

3.4.1.4 Podiums

Outdoor rail noise can be substantially reduced by building residential apartments on top of a podium or commercial building space. If the residential tower is set back, then the podium acts to provide increased distance from the railway corridor, thus reducing the noise from the corridor and providing extra shielding to the lower apartments.

MTE Response

The proposed development does not include high rise style buildings. As such, this guideline is not relevant.

3.4.1.5 Balconies

Providing enclosed balconies can be an effective means of reducing the noise entering a building. Where enclosed balconies are used, acoustic louvres and possibly a fan to move air into and out of the balcony space may be installed to address ventilation requirements.

MTE Response

The proposed development does not include high rise style buildings. As such, this guideline is not relevant.

3.4.1.6 Vegetation

While vegetation such as trees and shrubs does not actually limit the intrusion of noise, it has been shown to create the perception of reduced noise levels. Vegetation is also valuable for improving the aesthetics of noise barriers and for reducing the potential for visual intrusion from railway operations.

MTE Response

Generally, there is an existing woodlot and wetland, a proposed SWM facility, and a proposed crash berm, along the southern property line between the CN corridor and the proposed residential lots. Although not all of it is planned vegetation, the desired outcome is the same in that the existing woodlot and proposed facilities provide a visual screen of the rail line/trains. As such, the intent of this guideline is meet.

3.4.1.7 to 3.4.1.9 Walls, Windows and Doors

MTE Response

Reference document – Environmental Noise and Vibration Feasibility Assessment – Proposed Residential Development - Wilmot Woods Development Community, Township of Wilmot (February 2022) prepared by RJ Burnside & Associates Limited.

The Feasibility Assessment established that EW5 brick veneer is required for the exterior walls of the first row of dwellings adjacent to the rail line if they are within 100m of the rail line. Special Building Component analysis is not required for the balance of the subject lands.

3.5 VIBRATION MITIGATION

3.5.1 Guidelines

• Since vibration is site-specific in nature, the level and impact of vibration on a given site can only be accurately assessed by a qualified acoustic or vibration consultant through the preparation of a vibration impact study. It is highly recommended that an acoustic or vibration consultant be obtained by the proponent early in the design process, as mitigation can be difficult. It is recommended that the consultant be used to determine whether vibration mitigation measures are necessary and what options are available given the particular conditions of the development site in question. The consultant will employ measurements to characterize the vibration affecting the site in question. In the absence of a future rail corridor not yet operating,
estimates based on soil vibration testing are required, although such sites are quite rare.

• The recommended minimum vibration influence area to be considered is 75 metres from a railway corridor or rail yard.

• See AC.2.5 for recommended procedures for the preparation of vibration impact studies. These should be observed.

MTE Response

Reference document – Environmental Noise and Vibration Feasibility Assessment – Proposed Residential Development - Wilmot Woods Development Community, Township of Wilmot (February 2022) prepared by RJ Burnside & Associates Limited.

The Feasibility Assessment considered the potential impact of vibration from railway operations within 140m of the railway right-of-way. The Assessment concluded that standard and custom vibration mitigation measures are required for dwellings within the defined setback lines. As the exact location of the dwelling footprints are not known at this time, mitigation measures will have to be determined during detailed design of the subject lands.

3.6 SAFETY BARRIERS

3.6.1 Guidelines

3.6.1.1 Berms

• Where full setbacks are provided, safety barriers are constructed as berms, which are simple earthen mounds compacted to 95% modified proctor. Setbacks and berms should typically be provided together in order to afford a maximum level of mitigation. Berms are to be constructed adjoining and parallel to the railway right-of-way with returns at the ends and to the following specifications:

Principal Main Line:	*2.5 metres above grade with side slopes not steeper than 2.5 to 1*
Secondary Main Line:	*2.0 metres above grade with side slopes not steeper than 2.5 to 1*
Principal Branch Line:	*2.0 metres above grade with side slopes not steeper than 2.5 to 1*
Secondary Branch Line:	*2.0 metres above grade with side slopes not steeper than 2.5 to 1*
Spur Line:	*no requirement*

N.B. Berms built to the above specifications will have a full width of as many as 15 metres.

• Berm height is to be measured from grade at the property line. Reduced berm heights are possible where larger setbacks are proposed.
• Steeper slopes may be possible in tight situations, and should be negotiated with the affected railway.
• Where the railway line is in a cut of equivalent depth, no berm is required.
• There is no requirement for the proponent to drop back to grade on the side of the berm facing the subject development property. The entire grade of the development could be raised to the required height, or could be sloped more gradually. This may be desirable to avoid creating unusable backyard space, due to the otherwise steep slope of the berm.
• Marginal reductions in the recommended setback of up to 5 metres may be achieved through a reciprocal increase in the height of the berm.
• If applicable to the site conditions, in lieu of the recommended berm, a ditch or valley between the railway and the subject new development property that is generally equivalent to or greater than the inverse of the berm could be considered (e.g. a ditch that is 2.5 metres deep and approximately 14 metres wide in the case of a property adjacent to a Principal Main Line).
• Where the standard berm and setback are not technically or practically feasible, due for example, to site conditions or constraints, then a Development Viability Assessment should be undertaken by the proponent to evaluate the conditions specific to the site, determine its suitability for development, and suggest alternative safety measures such as crash walls or crash berms.

MTE Response

Reference document - MTE Drawing 35056-104-MS11

The Proximity Guidelines require that due to the elevated nature of the CN corridor relative to the subject lands, a 2.5 m high berm with slopes not steeper than 2.5:1 be constructed adjacent to the CN corridor. Refer to MTE Drawing 35056-104-MS11 for a depiction of the crash berm.

3.7 SECURITY FENCING

Trespassing onto a railway corridor can have dangerous consequences given the speed and frequency of trains, and their extremely large stopping distances, and every effort should be made to discourage it. This will save lives, reduce emergency whistling, and minimize disruptions to rail service.

3.7.1 GUIDELINES

• At a minimum, all new residential developments in proximity to railway corridors must include a 1.83 metre high chain link fence along the entire mutual property line, to be constructed by the owner entirely on private property. Other materials may also be considered, in consultation with the relevant railway and the municipality. Noise barriers and crash walls are generally acceptable substitutes for standard fencing, although additional standard fencing may be required in any location with direct exposure to the rail corridor in order to ensure there is a continuous barrier to trespassing.

MTE Response

Reference document - MTE Drawing 35056-104-MS11

MTE Drawing 35056-104-MS11 illustrates a 1.83m high chain link fence along the perimeter of the Proposed Development. It should be noted that along much of the railway corridor, the Plan of Subdivision is separated from the corridor by open space lands that are owned by the Township. The Proposed Development will comply with guideline 3.7.1 regarding security fencing.

3.8 STORMWATER MANAGEMENT AND DRAINAGE

3.8.1 GUIDELINES

- *The proponent should consult with the affected railway regarding any proposed development that may have impacts on existing drainage patterns. Railway corridors/properties with their relative flat profile are not typically designed to handle additional flows from neighbouring properties, and so development should not discharge or direct stormwater, roof water, or floodwater onto a railway corridor.*
- *Any proposed alterations to existing rail corridor drainage patterns must be substantiated by a suitable drainage report, as appropriate.*
- *Any development-related changes to drainage must be addressed using infrastructure and/or other means located entirely within the confines of the subject development site.*
- *Stormwater or floodwater flows should be designed to:*
  - *» maintain the structural integrity of the railway corridor infrastructure;*
  - *» avoid scour or deposition; and*
  - *» prevent obstruction of the railway corridor as a result of stormwater or flood debris.*
- *Drainage systems should be designed so that stormwater is captured on site for reuse or diverted away from the rail corridor to a drainage system, ensuring that existing drainage is not overloaded.*
- *Building design should ensure that gutters and balcony overflows do not discharge into rail infrastructure. Where drainage into the railway corridor is unavoidable due to site characteristics, discussion should be held early on with the railway. If upgrades are required to the drainage system solely due to nearby development, the costs involved should reasonably be met by the proponent. All disturbed surfaces must be stabilized.*
- *Similarly, railways should consult with municipalities where facility expansions or changes may impact drainage patterns.*

MTE Response

Reference document – Wilmot Woods Subdivision – Preliminary Stormwater Management Report (April 2022)

Refer to the Preliminary Stormwater Management for an analysis of the SWM and drainage towards the existing CN corridor and associated culvert.

Storm water runoff from the development lands are directed to stormwater management facilities which outlet to drainage features that are outside of the railway corridor. The southern SWM facility (referred to as SWMF2) outlets towards the existing wetland and ditch adjacent to the CN corridor, and ultimately under the corridor via an existing 900mm culvert. Under post-development conditions, peak flows are reduced, and the Proposed Development complies with the requirements of guideline 3.8.1 regarding stormwater management and drainage.

3.9 WARNING CLAUSES AND OTHER LEGAL AGREEMENTS

3.9.1 GUIDELINES

- *Municipalities are encouraged to promote the use of appropriate specific rail operations warning clauses, if feasible, in consultation with the appropriate railway, to ensure that those who may acquire an interest in a subject property are notified of the existence and nature of the rail operations, the potential for increased rail activities, the potential for annoyance or disruptions, and that complaints should not be directed to the railways. Such warning clauses should be registered on title if possible and be inserted into all agreements of purchase and sale or lease for the affected lots/units.*
- *Municipalities are encouraged to pursue the minimum influence areas outlined in the report when using warning clauses or other notification mechanisms.*
- *Appropriate legal agreements and restrictive covenants registered on title are also recommended to be used, if feasible, to secure the construction and maintenance of any required mitigation measures, as well as the use of warning clauses and any other notification requirements.*
- *Municipalities are encouraged to require appropriate signage/documentation at development marketing and sales centres that:*
    - *identifies the lots or blocks that have been identified by any noise and vibration studies and which may experience noise and vibration impacts;*
    - *identifies the type and location of sound barriers and security fencing;*
    - *identifies any required warning clause(s); and*
    - *contains a statement that railways can operate on a 24 hour a day basis, 7 days a week.*

- *Additionally, studies undertaken to assess and mitigate noise, vibration, and other emissions should be released to potential purchasers for review in order to enhance their understanding of the site constraints and to help minimize future conflict.*
- *Where title agreements, restrictive covenants, and/or warning clauses are not currently permitted, appropriate legislative amendments are recommended. This may require coordination at the provincial level to provide appropriate and/or improved direction to stakeholders.*
- *Warnings and easements provide notice to purchasers, but are not to be used as a complete alternative to the installation of mitigation measures.*

MTE Response

Reference document – Environmental Noise and Vibration Feasibility Assessment – Proposed Residential Development - Wilmot Woods Development Community, Township of Wilmot (February 2022) prepared by RJ Burnside & Associates Limited.

The noise warning clauses in the Feasibility Assessment include the appropriate warning clauses as outlined in Section 3.9.1.

3.10 CONSTRUCTION ISSUES

Planning for construction of new developments in proximity to railway corridors requires unique considerations that should aim to maintain safety while avoiding disruptions to rail service. The efficiency of the operation of railway services should be maintained and no adverse impacts on the corridor or railway operations should occur during the design and construction of a new development located in proximity to a railway corridor.

3.10.1 GUIDELINES

• Prior to the start of construction of a new development, rail corridor-related infrastructure must be identified and plans adjusted as required to ensure that these features are not adversely affected by the proposed construction. Rail corridor-related infrastructure may include, but is not limited to:

- *trackage;*
- *fibre optic cables;*
- *retaining walls;*
- *bridge abutments; and,*
- *signal bridge footings.*

• No entry upon, below, or above the rail corridor shall be permitted without prior consent from the railway.
• Appropriate permits and flagging are required for work immediately adjacent to railway corridors. The proponent is responsible for any related costs.
• Temporary fencing / hoarding is required, as appropriate, to discourage unauthorized access to the rail corridor. Plans illustrating proposed fencing / hoarding locations as well as any other construction related infrastructure, should be submitted to the approval authority and the relevant railway.
• Cranes, concrete pumps, and other equipment capable of moving into or across the airspace above railway corridors may cause safety and other issues if their operation is not strictly managed. This type of equipment must not be used in airspace over the rail corridor without prior approval from the railway.
• Existing services and utilities under a rail corridor must be protected from increased loads during the construction and operation of the development.
• Construction must not obstruct emergency access to the railway corridor.

MTE Response

Construction will comply with the requirements of 3.10.1. Crossing-related work within the corridor will be undertaken in accordance with plans approved by CN in accordance with an agreement with CN.

Overall Conclusion

Based on the above analysis for the Hallman development plans, MTE concludes that these development plans are in compliance with the *Guidelines for New Development in Proximity to Railway Operations (May 2013)*.

MTE FILE PATH: P:\P\35056\104\35056-104-P-MS11.DWG

March 15, 2022 - 12:26:09 PM - Plotted By: Alex Cressman

IVAN GINGERICH DRAIN

PROP 1.83m HIGH CHAIN LINK FENCE

PROP 1.83m HIGH CHAIN LINK FENCE

PROP 1.83m HIGH CHAIN LINK FENCE

300m RAILWAY OFFSET

100m RAILWAY OFFSET

30m RAILWAY OFFSET

CN RAILWAY

STREET NINE

STREET SIX

STREET SEVEN

STREET EIGHT

STREET TEN

STREET NINE

STREET NINE

Blk.20 Open Space 0.92 ha

Blk.19 Park 1.00 ha

Blk.17 Multiple Residential 0.98 ha

Blk.18 Multiple Residential 1.19 ha

Blk.21 Open Space 3.30 ha

Blk.34 Road Widening 0.03 ha

Blk.22 Open Space 0.93 ha

Blk.23 SWM Facility 1.02 ha

Blk. 16 Multiple Residential 0.87 ha

Blk. 6 Trail 0.05 ha

Blk. 10 Trail 0.03 ha

Blk. 13 0.3m Reserve 0.001 ha

Blk. 7 0.19 ha

Blk. 8 0.31 ha

Blk. 5 0.21 ha

Blk. 3 0.34 ha

Blk. 4 0.68 ha

Blk. 9 0.72 ha

Blk. 2 0.52 ha

Blk. 1 0.58 ha

Blk. 11 0.19 ha

Blk. 12 0.19 ha

Blk. 13 0.19 ha

Blk. 7 Open Space 2.86 ha

Blk. 7 0.29 ha

Blk. 8 0.18 ha

Blk. 9 0.13 ha

Blk. 6 0.26 ha

Blk. 3 0.13 ha

Blk. 4 0.51 ha

Blk. 5 0.19 ha

Blk. 3 0.51 ha

Blk. 2 0.51 ha

Blk. 1 0.19 ha

Blk. 5 0.12 ha

Blk. 2 0.32 ha

Blk. 3 0.32 ha

Blk. 4 0.32 ha

Blk. 6 0.19 ha

Blk. 1 0.21 ha

Blk. 4 0.18 ha

Blk. 5 0.49 ha

Walkway 0.02 ha

Blk. 6 Open Space 1.08 ha

Blk. 7 Open Space 2.86 ha

WETLAND BOUNDARY

WETLAND BOUNDARY

WETLAND BOUNDARY

15m WETLAND BUFFER

10m DRIPLINE BUFFER

10m DRIPLINE BUFFER

10m DRIPLINE BUFFER

WATERLOO STREET

EX. SWM FACILITY

CHARLES YOUNG AVE

INGOLD AVE

A

A

352 351 350 349 348 347 346 345 344 343 342 341

STREET NINE R.O.W.

RAILWAY EASEMENT

LIMIT OF SUBDIVISION

STREET NINE

CN RAILWAY

1.83m CLF

PROPOSED GRADE

3.0m M.U.T.

EXISTING GRADE

SECTION A-A

SCALE H-1:1000 V-1:200

LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS (526.0)
- EXISTING EMBANKMENT (SLOPE AS NOTED) (TOP) (BOTTOM)
- EXISTING DRIPLINE
- DRIPLINE BUFFER
- WETLAND BUFFER
- EXISTING WETLAND
- PROPOSED CONTOURS (336.0)
- EXISTING CN RAILWAY
- 30m RAILWAY OFFSET
- 100m RAILWAY OFFSET
- 300m RAILWAY OFFSET

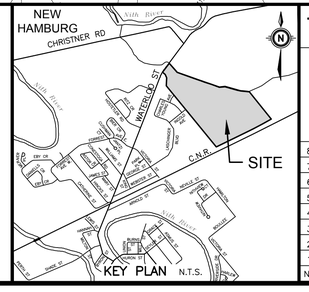
NOTE TO CONTRACTOR :

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TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
7.			
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GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
CN RAIL PROXIMITY GUIDELINES PLAN

MTE
Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager J.CABRAL	Project No. 35056-104
Design By AJC	Checked By VAL
Drawn By AXH	Checked By AJC
Surveyed By RLK/KPW	Drawing No. MS11
Date Mar.07/22	
Scale 1:1500	Sheet of

MTE FILE PATH: P:\P\35056\104\35056-104-P-EC1.DWG

LEGEND

- SITE BOUNDARY
- EXISTING DIRECTION OF DRAINAGE/SWALE
- EXISTING CONTOURS (GENERATED BY MTE)
- EXISTING CONTOURS (PROVIDED BY REGION OF WATERLOO GIS)
- EXISTING DRIPLINE
- EXISTING SANITARY SEWER (Ex. 300mmø SAN, Ex. SAN MH)
- EXISTING STORM SEWER (Ex. 600mmø STM, Ex. STM MH)
- EXISTING WATERMAIN (Ex. 200mmø WTM, Ex. HYD, SET)
- REGULATORY FLOODPLAIN (100 YR)
- EXISTING WETLAND
- WETLAND BUFFER
- DRIPLINE BUFFER
- PROPOSED RIGHT OF WAY
- EXISTING WATERCOURSE
- EXISTING RAILWAY
- EXISTING BOREHOLE (Ex. BH10, Elev=311.64)
- EXISTING MONITORING WELL (MW8, Ground Elev=313.50, Top of Casing=314.45)
- EXISTING TEST PIT (Test Pit#19, Elev=314.728)
- EXISTING BOREHOLE/ MONITORING WELL (BH/MW302-0, Ground Elev=313.50, Top of Casing=314.45)

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. 1750mm CSP
SE. INV.=337.54
NW. INV.=337.48

EX. 2.4m x 1.2m
BOX CULVERT
SE. INV.=338.09
NW. INV.=338.04

EX. 900mmø CSP
CULVERT
N. INV.=339.503
S. INV.=339.304

EX. SWM FACILITY

PRESSURE TRANSDUCER
STAKE ELEV.=338.84
WATER LEVEL=337.56

MW101 ELEV.=339.20 PZ.=340.12
MW102 ELEV.=340.15 PZ.=341.11
MW105 ELEV.=341.08 PZ.=342.16
MW106 ELEV.=342.96 PZ.=344.13
MW107 ELEV.=347.01 PZ.=348.06
MW108 ELEV.=345.30 PZ.=346.42
MW109 ELEV.=340.06 PZ.=340.92
MW110 ELEV.=340.04 PZ.=340.75
MW104 ELEV.=344.95 PZ.=345.88
MW201-21 ELEV.=343.52 PZ.=344.36
MW202-21 ELEV.=342.08 PZ.=343.13
MW203B-21 ELEV.=344.77 PZ.=345.72
MW2034-21 ELEV.=344.73 PZ.=345.70
MP01-22 ELEV.=340.97 PZ.=342.22

BH 1 ELEV.=339.37
BH 2 ELEV.=341.42
BH 3 ELEV.=344.50
BH 4 ELEV.=342.61
BH 5 ELEV.=341.78
BH 6 ELEV.=343.61
BH 7 ELEV.=341.57
BH 8 ELEV.=343.37
BH 9 ELEV.=343.24
BH 10 ELEV.=342.20
BH 11 ELEV.=346.37
BH 12 ELEV.=346.22

15m WETLAND BUFFER
WETLAND BOUNDARY
10m DRIPLINE BUFFER

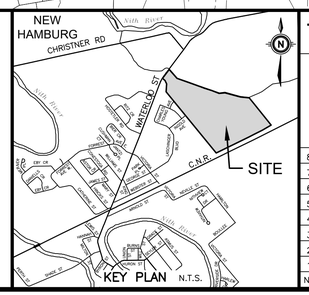
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TOWNSHIP OF WILMOT

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GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
EXISTING CONDITIONS PLAN

MTE
Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager: J.CABRAL	Project No.: 35056-104
Design By: AJC	Checked By: VAL
Drawn By: RXB	Checked By: AJC
Surveyed By: RLK/KPW	Drawing No.: EC1.1
Date: Jan.31/18	
Scale: 1:1500	Sheet of

March 15, 2022 - 10:00:05 AM - Plotted By: Alexander Henderson

SWM Facility
1.43 ha

WILMOT WOODS
SUBDIVISION

Service Corridor
0.24 ha

CN RAIL

GODERICH-EXETER RAILWAY

RECEIVING PIT
(6.0mx3.0m)

10.0m DRIPLINE
SETBACK LIMIT

PROPOSED 450mmØ SANITARY TRUNK

6.2m WIDE SAN
EASEMENT

15.0m WETLAND
SETBACK LIMIT

SURVEYED EX.
WETLAND BOUNDARY

EX. DRIPLINE

SURVEYED EX. WETLAND BOUNDARY

EX. DRIPLINE

EXISTING
900mmø
CULVERT

EX. WATERCOURSE

SURVEYED EX. WETLAND BOUNDARY

15.0m WETLAND
SETBACK LIMIT

EX. DRIPLINE

WILMOT EMPLOYMENT
LANDS

SENDING PIT
(6.0mx3.0m)

PROPOSED
CONVEYANCE
CHANNEL

EX. DRIPLINE

STREET ONE

EXISTING
SWM
FACILITY

PESTELL'S

53.5m–525mmØ SAN. @ 0.50%

77.2m–200mmØ SAN. @ 0.50%

MH5A

CHAINAGE 1+625 1+650 1+675 1+700 1+725 1+750 1+775 1+800 1+825 1+850 1+875 1+900

345
344
343
342
341
340
339
338
337
336

GEXR RAILWAY

LIMIT OF SUBDIVISION/
RAILWAY CORRIDOR
PVI STA= 1+699.65
ELEV= 340.355

LIMIT OF RAILWAY
CORRIDOR
PVI STA= 1+729.97
ELEV= 340.095

EXISTING
GRADE

RECEIVING PIT
(6.0mx3.0m)

800mmØ STEEL
CASING PIPE

SENDING PIT
(6.0mx3.0m)

220m TRENCHLESS CONSTRUCTION

SAN. SEWER INVERT	50.0m–450mmØ SAN. @ 0.60%	NW338.325	50.0m–450mmØ SAN. @ 0.60%	NW338.025	50.0m–450mmØ SAN. @ 0.60%	NW337.725	50.0m–450mmØ SAN. @ 0.60%	NW337.425	50.0m–450mmØ SAN. @ 0.60%	NW337.125	50.0m–450mmØ SAN. @ 0.60%	NW336.825

LEGEND

- SITE BOUNDARY
- EXISTING EMBANKMENT (SLOPE AS NOTED) (TOP) / (BOTTOM)
- EXISTING CONTOURS 326.0
- EXISTING DRIPLINE
- EXISTING WETLAND
- EXISTING WATERCOURSE (GRCA)
- PROPOSED CONTOURS 326.0
- SANITARY SEWER 90.0m–375mmØ SAN. @ 1.00%
- PROPOSED EMBANKMENT (SLOPE AS NOTED) (TOP) / (BOTTOM)

MS5.1

Date: MAY 21/21
Scale: 1:500

SANITARY TRUNK EXTENSION - CN CROSSING

MTE
Engineers, Scientists, Surveyors

Project No.: 35056-104

March 7, 2022 10:49 a.m. Plotted By: acressman

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MTE FILE PATH: P:\P\35056\104\35056-104-P-QU1.DWG

March 15, 2022 - 3:58:26 PM - Plotted By: Alex Cressman

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

CHARLES YOUNG AVE

INGOLD AVE

EX. SWM FACILITY

Blk.18 Multiple Residential 1.19 ha

Blk.19 Park 1.00 ha

Blk.20 Open Space 0.92 ha

Blk.21 Open Space 3.30 ha

Blk.22 Open Space 0.93 ha

Blk.23 SWM Facility 1.02 ha

Blk.34 Road Widening 0.03 ha

Blk. 7 Open Space 2.86 ha

Blk. 6 Open Space 0.38 ha

Blk. 7 Open Space 2.86 ha

Blk. 16 Multiple Residential 0.87 ha

Blk. 17 Multiple Residential 0.98 ha

Blk. 1 0.21 ha

Blk. 2 0.17 ha

Blk. 3 0.13 ha

Blk. 4 0.51 ha

Blk. 5 0.19 ha

Blk. 6 0.26 ha

Blk. 1 0.29 ha

Blk. 2 0.52 ha

Blk. 3 0.58 ha

Blk. 4 0.68 ha

Blk. 5 0.72 ha

Blk. 6 0.31 ha

Blk. 7 0.34 ha

Blk. 8 0.18 ha

Blk. 9 0.72 ha

Blk. 10 0.09 ha

Blk. 11 0.19 ha

Blk. 12 0.19 ha

Blk. 13 0.3m Reserve 0.001 ha

Blk. 14 0.19 ha

Blk. 15 0.19 ha

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Blk. 111 0.19 ha

Blk. 112 0.19 ha

Blk. 113 0.19 ha

Blk. 114 0.19 ha

Blk. 115 0.19 ha

Blk. 116 0.19 ha

Blk. 117 0.19 ha

Blk. 118 0.19 ha

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LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS (526.0)
- EXISTING EMBANKMENT (SLOPE AS NOTED) (TOP) (BOTTOM)
- EXISTING DRIPLINE
- DRIPLINE BUFFER
- WETLAND BUFFER
- EXISTING WETLAND
- PROPOSED CONTOURS (536.0)
- MAJOR OVERLAND FLOW ROUTE

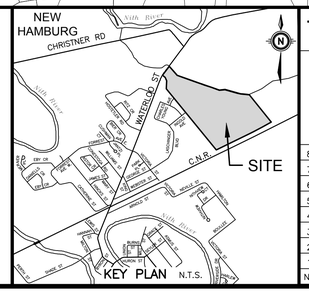
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KEY PLAN N.T.S.

TOWNSHIP OF WILMOT

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.			
3.			
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GEODETIC BM ELEV. = 342.487m
TABLET IS SET HORIZONTALLY IN SOUTH FACE OF CONCRETE FOUNDATION, BEING 62m NORTH OF CENTRELINE OF HIGHWAY; 2.26m EAST OF SOUTHWEST CORNER AND 24cm BELOW THE FIRST COURSE OF BRICKWORK.

SITE BENCHMARK ELEV. = 339.773m
CUT CROSS SOUTHWEST CORNER CONCRETE BOX CULVERT ON SOUTH SIDE OF WATERLOO STREET PNO 9059

OWNER
WILMOT WOODS DEVELOPMENTS INC.
310 FAIRWAY ROAD SOUTH KITCHENER

PROJECT
WILMOT WOODS
NEW HAMBURG

DRAWING
FINISHED GRADE CONTOUR PLAN

MTE
Engineers, Scientists, Surveyors
(519) 743-6500 www.mte85.com

Project Manager J.CABRAL	Project No. 35056-104
Design By AJC	Checked By VAL
Drawn By RXB	Checked By AJC
Surveyed By RLK/KPW	Drawing No. QU1.1
Date Nov.15/21	
Scale 1:1500	Sheet of

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MTE FILE PATH:

March 7, 2022 - 11:02:23 AM - Plotted By: Alex Cressman

LEGEND

- SITE BOUNDARY
- EXISTING DIRECTION OF DRAINAGE/SWALE
- 323 EXISTING CONTOURS
- 342.0 HIGH GROUNDWATER CONTOURS
- EXISTING DRIPLINE
- Ex. BH10 Elev=311.64 EXISTING BOREHOLE
- MW8 Ground Elev=313.50 Top of Casing=314.45 EXISTING MONITORING WELL
- Test Pit#19 Elev=314.728 EXISTING TEST PIT
- BH/MW302-D Ground Elev=313.50 Top of Casing=314.45 EXISTING BOREHOLE/ MONITORING WELL
- 0.03 GROUNDWATER SEPARATION CONTOUR, RED TICKS REPRESENT AREAS WHERE SEPARATION REQUIREMENT IS NOT MET
- 0.09 GROUNDWATER SEPARATION CONTOUR, GREEN TICKS REPRESENT AREAS WHERE SEPARATION REQUIREMENT IS MET
- 0.00 GROUNDWATER SEPARATION CONTOUR, CYAN TICKS REPRESENT AREAS WHERE SEPARATION FROM USF IS EXACTLY 0.60m
- IVAN GINGERICH MUNICIPAL DRAIN FLOODPLAIN
- EXISTING WETLAND
- WETLAND BUFFER
- DRIPLINE BUFFER

IVAN GINGERICH DRAIN

CN RAILWAY

WATERLOO STREET

INGOLD AVE

CHARLES YOUNG AVE

EX. SWM FACILITY

PRESSURE TRANSDUCER STAKE ELEV=338.84 WATER LEVEL=337.56

MW101 ELEV=339.20 PZ=340.12

BH 1 ELEV=339.37

BH 2 ELEV=341.49

BH 5 ELEV=341.78

BH 8 ELEV=343.37

BH 10 ELEV=342.20

MW105 ELEV=341.08 PZ=342.15

MW202-21 ELEV=342.08 PZ=343.13

MW203A-21 ELEV=344.73 PZ=345.70

MW203B-21 ELEV=344.77 PZ=345.72

MW106 ELEV=342.96 PZ=344.13

BH 12 ELEV=346.22

BH 11 ELEV=345.02

MW108 ELEV=345.30 PZ=345.42

BH 9 ELEV=343.44

BH 6 ELEV=343.61

BH 7 ELEV=341.56

BH 3 ELEV=344.50

BH 4 ELEV=342.67

MW201-21 ELEV=343.52 PZ=344.58

MW202 ELEV=343.05 PZ=343.41

MW104 ELEV=344.95 PZ=345.88

MW110 ELEV=340.04 PZ=340.75

MW109 ELEV=340.06 PZ=340.92

MP01-22 ELEV=340.97 PZ=342.22

WETLAND BOUNDARY

WETLAND BUFFER

10m DRIPLINE BUFFER

30m DRIPLINE BUFFER

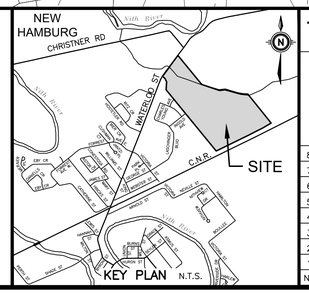
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