190-216 Arkell Road
Guelph, Ontario

Functional Servicing Report

Project Location:

190 - 216 Arkell Road
Guelph, Ontario

Prepared for:

Crescent Homes
3-180 Frobisher Drive
Waterloo, ON N2V 2A2

Prepared by:

MTE Consultants
520 Bingemans Centre Drive
Kitchener, ON N2B 3X9

May 4, 2023
Revised: June 28, 2024

MTE File No.: 42063-104

Engineers, Scientists, Surveyors.

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1.0 INTRODUCTION

1.1 Overview

MTE Consultants Inc. (MTE) was retained by Crescent Homes to prepare a Functional Servicing Report in support of a Draft Plan of Subdivision Application. The lands that comprise the Draft Plan of Subdivision are made up of several properties, including: 190, 202, 210, and 216 Arkell Road, located in the City of Guelph. These lands are herein referred to as the 'Subject Lands'.

The Subject Lands are approximately 2.58ha. Refer to **Figure 1.1** for the location of the Subject Lands. The proposed development plan for the Subject Lands is a residential subdivision with a municipal road bisecting the property. The proposed right-of-way will connect to the existing Dawes Avenue northeast of the Subject Lands and to Arkell Road at its intersection with Summerfield Drive. There are three residential blocks, one with eleven townhouse units fronting onto a municipal right-of-way, and other two are stacked multiple residential blocks. The rest of the Subject Lands is proposed to be divided into the SWM Block, road widening, servicing corridor and an open space block. The open space block is approximately one third of the Subject Lands and it cannot be developed due to the existing wetland and its setbacks. Refer to the Draft Plan of Subdivision prepared by MHBC, dated May 13, 2024, in **Appendix A** for more details.

This report presents comprehensive servicing strategy for the proposed development. This report should be read in conjunction with the *190-216 Arkell Road – Preliminary SWM Report*, prepared by MTE (June, 2024).

1.2 Background Information

The original Functional Servicing Report, prepared by MTE and dated October 10, 2018, was submitted to the City of Guelph (City) as part of a Site Plan approval process. After discussions with City staff, it was determined that the proposed road connections through the Subject Lands would establish a municipal right-of-way, thereby warranting a Draft Plan of Subdivision Application. As such, various departments within the City have reviewed the original submission and provided comments to be addressed prior to Draft Plan approval.

The revised Functional Servicing Report was submitted dated April 7, 2020, following by the December 3, 2021 and the latest May 4, 2023 re-submissions. Comments for the most recent submission were received from the City of Guelph on August 18th, 2023.

This revised Functional Servicing Report is revised based on the abovementioned comments, and consequent discussions with the City.

1.3 Purpose of Study

The purpose of this report is to address the most recent City comments and develop a comprehensive servicing strategy for the subdivision which outlines how the subdivision can be developed with full municipal services, including sanitary sewage collection, domestic water supply, storm drainage, and utilities.

FIGURE 1.1 Date: DEC.12/23 Scale: N.T.S.

LOCATION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104

April 9, 2024 — 11:50 a.m. — Plotted By: TBerry

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2.0 EXISTING CONDITIONS

The Subject Lands consist of approximately 2.58ha and are generally bounded by an existing wetland to the northwest, an existing residential development to the northeast, the Arkell Road right-of-way to the southeast, and an existing single family residential property to the southwest. The Subject Lands are legally described as Part of Lot 6, Puslinch Concession 8 in the City of Guelph. They are currently comprised of four residential properties. Municipal addresses for the individual lots are 190, 202, 210, and 216 Arkell Road. The existing homes will be vacated and demolished prior to development.

MTE conducted a detailed topographical survey of the Subject Lands in November 2016. Existing site conditions and topography for the Subject Lands are shown in **Figure 2.1**, as well as the enclosed **MTE Drawing 42063-104-EC1.1**.

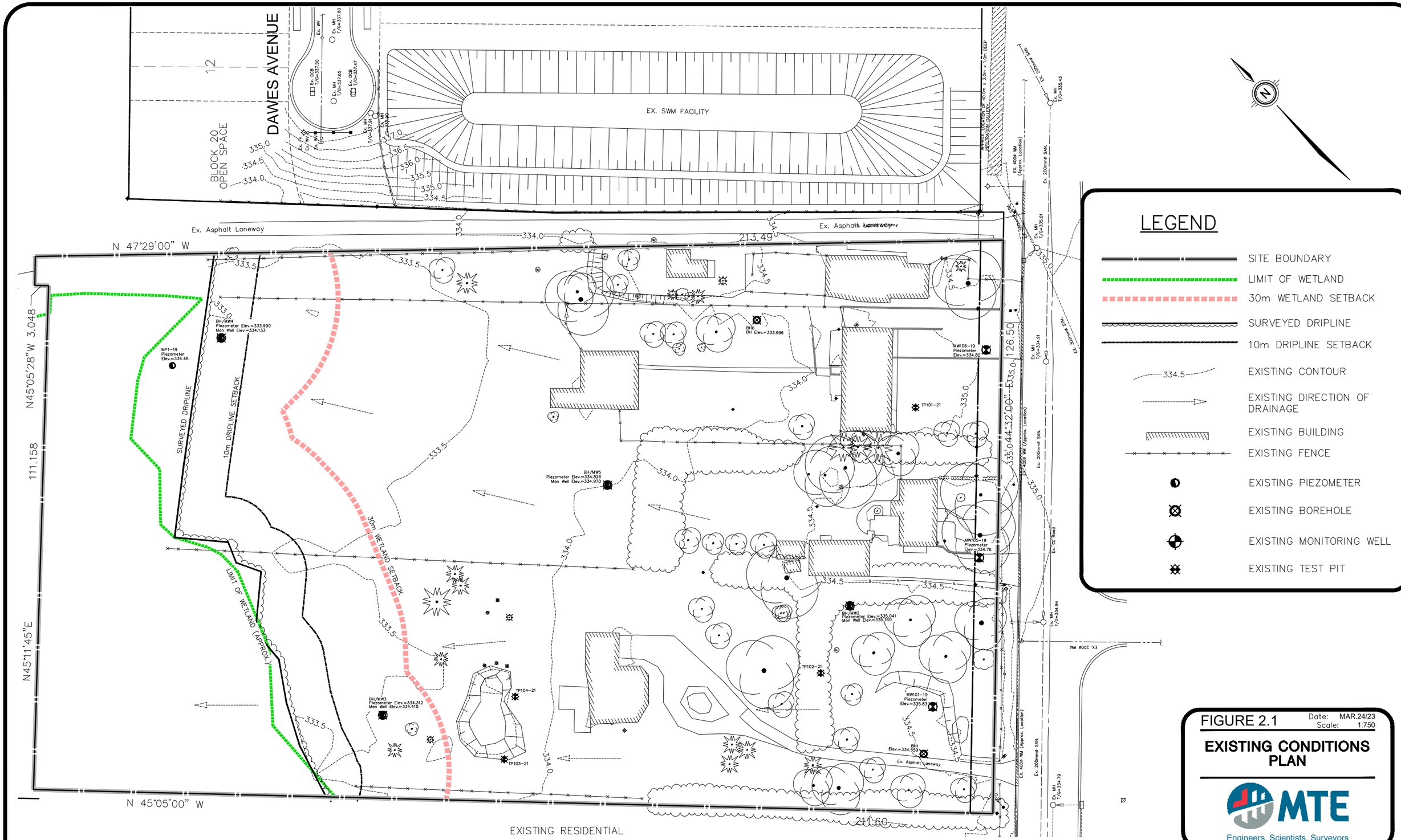
The Subject Lands are relatively flat, with slopes generally ranging from 0.5% to 1.5%. Existing elevations within the lands range from 333.3m along the wetland boundary to approximately 335.0m along Arkell Road. Under pre-development conditions, surface runoff from the Subject Lands flows northwesterly towards the Torrance Creek wetland complex.

The Subject Lands are located within the Torrance Creek Subwatershed. The western portion of the property is comprised of the Torrance Creek Wetland, which lies at the headwaters of a tributary to Torrance Creek. Approximately one-third of the Subject Lands either lies within the wetland complex or within the required 30m wetland setback.

The proposed service connections for the Subject Lands will be from Arkell Road. There is an existing 200mm diameter sanitary sewer fronting the Subject Lands along Arkell Road, with a manhole located approximately at the centreline of Street A, draining southwesterly towards Gordon Street. There is an existing 200mm diameter sanitary stub installed at 0.35% from the aforementioned manhole up to the 190 Arkell Road property line. This stub will serve as the sanitary connection for the Subject Lands.

A 400mm diameter watermain exists along the northern side of Arkell Road and will service the Subject Lands.

There is an existing 300mm diameter storm sewer fronting a portion of the Subject Lands southwest of Summerfield Drive. This storm sewer conveys runoff from the Arkell Road right-of-way to an existing stone energy dissipator, approximately 60.0m southwest of the southwestern limit of the Subject Lands. This energy dissipator outlets into the adjacent portion of the Torrance Creek wetland complex. Additionally, there is an existing 300mm diameter storm sewer fronting Arkell Road, northwest of Summerfield Drive. This sewer conveys runoff to the existing 40.0m long x 3.0m wide x 1.0m deep infiltration gallery located in the boulevard adjacent to the Arkell Meadows subdivision stormwater management facility.



LEGEND

- SITE BOUNDARY
- LIMIT OF WETLAND
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- 334.5 EXISTING CONTOUR
- EXISTING DIRECTION OF DRAINAGE
- EXISTING BUILDING
- EXISTING FENCE
- EXISTING PIEZOMETER
- EXISTING BOREHOLE
- EXISTING MONITORING WELL
- EXISTING TEST PIT

FIGURE 2.1

Date: MAR.24/23
Scale: 1:750

EXISTING CONDITIONS PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104

March 23, 2023 — 9:10 a.m. — Plotted By: TBerry

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3.0 PROPOSED DEVELOPMENT

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

- Multi-residential blocks (Blocks 1-3);
- Stormwater Management facility (Block 4);
- Open Space block (Block 5);
- Servicing corridor (Block 6);
- Future road widening (Arkell Road) (Block 7); and
- Municipal right-of-way (20.0m width) (Street A).

Refer to **Appendix A** for the Draft Plan of Subdivision prepared by MHBC (dated May 13, 2024).

3.1 Municipal Right-of-Ways

As shown on the Draft Plan, the proposed development is serviced by a single local road from Arkell Road at Summerfield Drive to the existing Dawes Avenue in the neighbouring Arkell Meadows subdivision. The roadway will be constructed to an urban cross-section, including: asphalt pavement, concrete curb and gutters, concrete sidewalks, roadway illumination, and boulevard landscaping. The proposed 20.0m wide right-of-way is to match the existing cross-section design of Dawes Avenue. Refer to **Appendix B** for more details regarding the City's typical 20.0m right-of-way cross-section, utilizing the 10m roadway.

The connection of the proposed right-of-way to existing Dawes Avenue will require the removal of the temporary cul-de-sac and the completion of Dawes Avenue within the adjacent Arkell Meadows subdivision. Centreline road grades within the cul-de-sac at the Dawes Avenue connection will be maintained. It should be noted that the proposed vertical alignment of Dawes Avenue south of the cul-de-sac within the adjacent development will be slightly adjusted from what was initially shown within Arkell Meadows Subdivision plan and profile drawing H-003 (dated May 10, 2017). The proposed road connection at Dawes will use vertical curvature for proper transition from the existing cul-de-sac to the proposed Street A road grades. The high point will shift north from what is shown on Drawing H-003. The existing major overland flow routes in the adjacent development will be maintained. All additional drainage towards the proposed SWMF is accounted for.

It should also be noted that the existing Arkell Road right-of-way is proposed to undergo a widening in the future, and the road widening block provided includes provisions for a future sidewalk. The sidewalk connection between the proposed Street A and Arkell Road will need to be coordinated at the time of development. The future sidewalk will extend to the existing bus pad approximately 60m north of the subject lands, shown on **MTE Drawings 42063-104-AG1.1 and GP1.1**.

A geotechnical investigation for the Subject Lands was completed by Peto MacCallum Ltd. (Peto), dated October 1, 2018. The proposed pavement structure outlined in the report is summarized in **Table 3.1** below. Additionally, a Road Details design drawing (No. H-5) for the Arkell Meadows subdivision provides a detailed cross-section design for Dawes Avenue. This drawing specifies the pavement structure used for Dawes Avenue; which is also tabulated below. MTE proposes that the proposed pavement structure matches the existing Dawes Avenue, meetings the minimum requirements of the Peto report. Refer to **Appendix E** for the Peto report.

Table 3.1 – Proposed Pavement Structure

Pavement Structure	Depth (mm) – Per the Peto report	Depth (mm) – Recommended Arkell Meadows Design
Asphalt Surface	80	90
Granular 'A' Base	150	175
Granular 'B' Sub-base	350	350

3.2 Watercourses

As previously mentioned, the Subject Lands are located within the Torrance Creek Subwatershed. The western portion of the property is comprised of a section of the Torrance Creek wetland complex, which lies at the headwaters of a tributary to Torrance Creek. Approximately one third of the Subject Lands either lies within the wetland complex or its 30.0m setback. Under the existing conditions, surface runoff generated onsite is directed towards the wetland. As such, the proposed development strategy will ensure that surface water inputs to the wetland complex are maintained.

4.0 PROPOSED GRADING

4.1 Considerations

While developing the preliminary grading design of the Subject Lands, the following is a list of considerations which influenced and/or governed the conceptual design:

- Match centreline elevations of existing road grades;
- Match existing and proposed boundary grades around the perimeter of the Subject Lands;
- Ensure major storm event overland flows are directed towards the proposed stormwater management facility wherever feasible;
- Comply with municipal standards for minimum/maximum road and landscaped area grades;
- Ensure adequate cover is provided, where feasible, over municipal services;
- Ensure adequate groundwater separation with infiltration measures and basement floor elevations;
- Minimize impacts to the surrounding natural environmentally sensitive features; and
- Minimize the cut/fill deficit for the Subject Lands.

4.2 Lot Grading

The proposed Street A will be extended from the limit of Dawes Avenue to the intersection of Arkell Road and Summerfield Drive. Dawes Avenue is currently approximately 4.0m higher in elevation than the adjacent existing grades on the Subject Lands. To match into these existing Dawes Avenue grades, significant fill will be required onsite. The proposed Street A will tie into Dawes Avenue adjacent to the 30m wetland setback, where 3:1 side slopes from the road will be required within the wetland setback to match back into existing grades.

Utilizing the proposed road layout, preliminary slopes for centreline of road ranging from 0.5% (minimum) to 6.0% (maximum) were used to complete the preliminary road grading design. Typical preliminary lot grades range from 2.0% (minimum) to 5.0% (maximum). Block 2 is proposed to be walkout units in order to match into the existing grades along the wetland setback.

Preliminary finished grades are designed to minimize the earthmoving (cutting and filling) required for road and lot construction, while maintaining serviceability. The considerations listed above were incorporated into the overall preliminary grading design, which is illustrated in **MTE Drawing 42063-104-AG1.1**.

It should be noted that the proposed finished basement floor elevations have been set to achieve a minimum 1.0m separation from the seasonal high groundwater present in the Subject Lands, per City of Guelph standards. Please refer to **Appendix F** for a figure depicting the Subject Lands' seasonal high groundwater contours.

4.2.1 Future Trail Block

The proposed grading design also incorporates future conceptual trail grading within the future trail block adjacent to the Subject Lands to the east. The trail is to match the existing grades adjacent to Arkell Road as well as the proposed Street A grades adjacent to the existing cul-de-sac. The trail is designed to the Guelph Master Trail Plan and Facility Accessibility Design Manual standards. A detail of the trail grading is provided within **MTE Drawing 42063-104-AG1.1**.

5.0 MUNICIPAL SERVICING

Please note that the layout of any storm sewer, sanitary sewer, and watermain within Blocks 1 and 3 will have to be confirmed and finalized during the Site Plan Application process. Stub sewer and watermain connections are provided as part of this Draft Plan of Subdivision application. Conceptual sewer layouts within these Blocks is provided in **MTE Drawing 42063-104-GP1.1,** and corresponding conceptual grading to accommodate the servicing in these blocks is provided in **MTE Drawing 42063-104-AG1.1**.

5.1 Sanitary Servicing

The existing 200mm diameter sanitary stub fronting the property along Arkell Road, near the centreline of the proposed Street A, will be extended through the Subject Lands. The stub is connected to an existing manhole along the Arkell Road sanitary sewer.

The proposed street-fronting townhouses will have individual 100mm diameter service connections from the 200mm diameter sanitary sewer through the Subject Lands. Additionally, 200mm diameter sanitary sewers will be provided to the multiple residential blocks (Blocks 1 and 3). Refer to **Figure 5.1** for more details regarding the sanitary servicing design.

A Sanitary Capacity Assessment was completed by MTE in 2016, which noted capacity constraints 2.63km downstream of the Subject Lands. At the time of the assessment, the City was undertaking a flow monitoring program and each newly proposed development was being evaluated on a case-by-case basis. However, in comments provided by City staff on April 25, 2019, it was confirmed that there does not appear to be any downstream sanitary capacity issues to accommodate the proposed development.

Basement floor elevations were set to provide positive drainage from the sanitary service connections and sewers within the multiple residential blocks, and 2.7m of cover is provided.

It should be noted that the minimum recommended sanitary sewer cover of 2.7m per the City's Design Standards cannot be achieved for the final length of sanitary sewer prior to connecting to Arkell Road. This is due to the existing sanitary stub provided, which has approximately 1.6m of cover. However, this is not considered an issue from a servicing perspective since there are no service connections on this pipe lead. The preliminary Sanitary Sewer Design Sheet for the proposed development is included in **Appendix C**.

The proposed sanitary sewers within the right-of-way exceed the minimum frost penetration depth per OPSD 3090.101.

5.2 Water Distribution

The City has noted that the Subject Lands are located within Pressure Zone 1. This zone is serviced by two elevated towers; Verney and Clair, which are at a hydraulic gradeline (HGL) of 377.2m. The City has confirmed that there is adequate capacity in its existing water supply and distribution system to accommodate the proposed development. However, there is potential for low water supply pressures under certain conditions, such as: the peak hour demand scenario at locations with an elevation greater than 346.0m and the average day demand scenario at locations with an elevation greater than 339.0m. Based on preliminary grades being below 339.0m and the proposed looping of the new watermain through Dawes Avenue, these low pressures are not expected for the proposed development.

The existing 200mm diameter watermain along Dawes Avenue will be extended through the Subject Lands, along Street A, and connect to the existing 400mm diameter watermain along Arkell Road. This connection will eliminate the existing dead end watermain at the Dawes Avenue cul-de-sac and provide a locally looped system. The proposed townhouse units will have individual 25mm diameter service connections from the 200mm diameter watermain through the Subject Lands. Additionally, 200mm diameter watermain stubs will be provided to the property limits of the Site Plan blocks (Blocks 1 and 3).

Furthermore, any existing water supply wells onsite are to be decommissioned in accordance with O. Reg 903 prior to construction. Refer to **Figure 5.2** for more details regarding the proposed water distribution network.

5.3 Storm Servicing and Drainage

Storm drainage for the proposed development will be provided through a combination of minor (piped) and major (overland) drainage systems.

The majority of the onsite conveyance will be collected via a storm sewer network, ranging in size from 300mm to 525mm in diameter. 450mm and 300mm diameter storm sewer pipe stubs will be provided for Blocks 1 and 3 at the property lines, respectively.

The primary major overland flow route directs flows along Street A towards the SWM Facility inlet. Major overland flow routes for Blocks 1 and 3 have been provided to direct their major flows towards the SWM facility and prevent overflow into Arkell Road. The SWM facility will outlet into an infiltration cell.,

Blocks 1 and 3 roof areas will be directed towards a proposed infiltration gallery within their respective blocks to have minor events attenuated. Overflow from the galleries will be directed into the proposed storm sewer system that is directed to the SWM Facility. Block 2 roof areas will drain directly into the proposed storm sewer system, to be attenuated within the proposed SWM facility.

Due to the grading constraints within the subject lands, existing road connections, as well as providing an outlet to the SWM Facility above the 25mm ponding event, the typical 2.7m of storm sewer cover per the City's Design Standards is not possible within the subject lands. Cover of 1.4m to the pipe obverts is provided within the proposed Street A right-of-way where possible in order to provide positive drainage towards the primary stormwater outlet. The only sewers with depth less than 1.4m within the proposed right-of-way are the sewers from MH6 to OGS9, where the sewers were set shallower to take the most minor flows possible to divert away from Arkell Road. These pipes will be installed with insulation above to ensure frost mitigation is present where required. A detail of the proposed insulation layouts is provided in **Appendix B**. Insulation will not interfere with the Street A road substructure. The proposed depth in which insulation is required is per typical frost penetration depths for Southern Ontario, depicted in OPSD 3090.101**.**

As a result of the required shallow storm sewer system, the foundation drains will not be collected via gravity to the storm sewer system. The drains shall discharge to a watertight sump, and shall be pumped to the surface rear yard, per the City of Guelph standard as an alternative to typical foundation drainage. This alternative storm sewer strategy will adequately service the site.

A portion of Block 1 and the adjacent existing SWM facility embankments drain overland towards the future trail block. To provide a legal outlet to Torrance Creek and prevent ponding, a series of drainage swales, catchbasins, and catchbasin manholes are proposed to be located adjacent to the future trail block. These sewers will be directed across Street A, and outlet via a flow dispersion structure towards the wetland complex.

Refer to **Figure 5.3** and **Appendix D** for more details of the proposed storm sewer system. It should be noted that the storm sewers and drainage areas shown within the multi-residential blocks are preliminary to approximate flows directed towards Street A. Detailed grading and servicing within the multi-residential blocks will be determined and finalized at the time of the Site Plan Applications.

LEGEND

- SITE BOUNDARY
- LIMIT OF WETLAND
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- 334.5 — EXISTING CONTOUR
- Ex. MH — Ex. 300mmø SAN. — EXISTING SANITARY SEWER
- Ex. MH — Ex. 375mmø STM. — EXISTING STORM SEWER
- Ex. HYD. — Ex. 200mmø WTM. — EXISTING WATERMAIN
- PROPOSED SANITARY SEWER
- 104 / 0.454 / 32 u — CATCHMENT ID No. / AREA (ha) / # OF UNITS
- PROPOSED SANITARY DRAINAGE AREA
- FUTURE SANITARY SEWER
- (TOP) 3:1 (BOTTOM) — PROPOSED EMBANKMENT

DAWES AVENUE

BLOCK 20 OPEN SPACE

EX. SWM FACILITY

PROPOSED 3.0m TRAIL

Ex. Asphalt Laneway

ARKELL ROAD

STREET A

SUMMERFIELD DRIVE

T/G=337.42
SAN OBV.=334.60±
DEPTH=2.82m±

T/G=336.85
SAN OBV.=333.92±
DEPTH=2.93m±

T/G=336.73
SAN OBV.=333.78±
DEPTH=2.95m±

T/G=336.57
SAN OBV.=333.57±
DEPTH=3.0m±

SURVEYED SAN.MH
NW.INV.=333.10m

EX. SAN STUB INV.=333.13±
(PER 0.35% AS RECORDED DRAWING)

MH1A, MH2A, MH3A, MH4A, MH5A, MH101A, MH102A, MH103A, MH104A, MH201A

101 / 0.396 / 11 u — 200mmø SAN

102 / 0.032 / – — 200mmø SAN

103 / 0.083 / – — 200mmø SAN

104 / 0.706 / 16 u — FUT 200mmø SAN

105 / 0.136 / 4 u — FUT 200mmø SAN

106 / 0.056 / – — 200mmø SAN

Blk. 1 Multiple Residential 0.706ha

Blk. 2 Multiple Residential 0.220ha

Blk. 3 Multiple Residential 0.136ha

Blk. 4 Stormwater Management 0.242ha

Blk. 5 Open Space 0.862ha

30m WETLAND SETBACK

LIMIT OF WETLAND (APPROX.)

SURVEYED DRIPLINE

10m DRIPLINE SETBACK

FUTURE SWM INFILTRATION GALLERY

PROPOSED SIDEWALK

BROADENED SIDEWALK

FIGURE 5.1

Date: JUN.18/24
Scale: 1:750

PRELIMINARY SANITARY SERVICING PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104

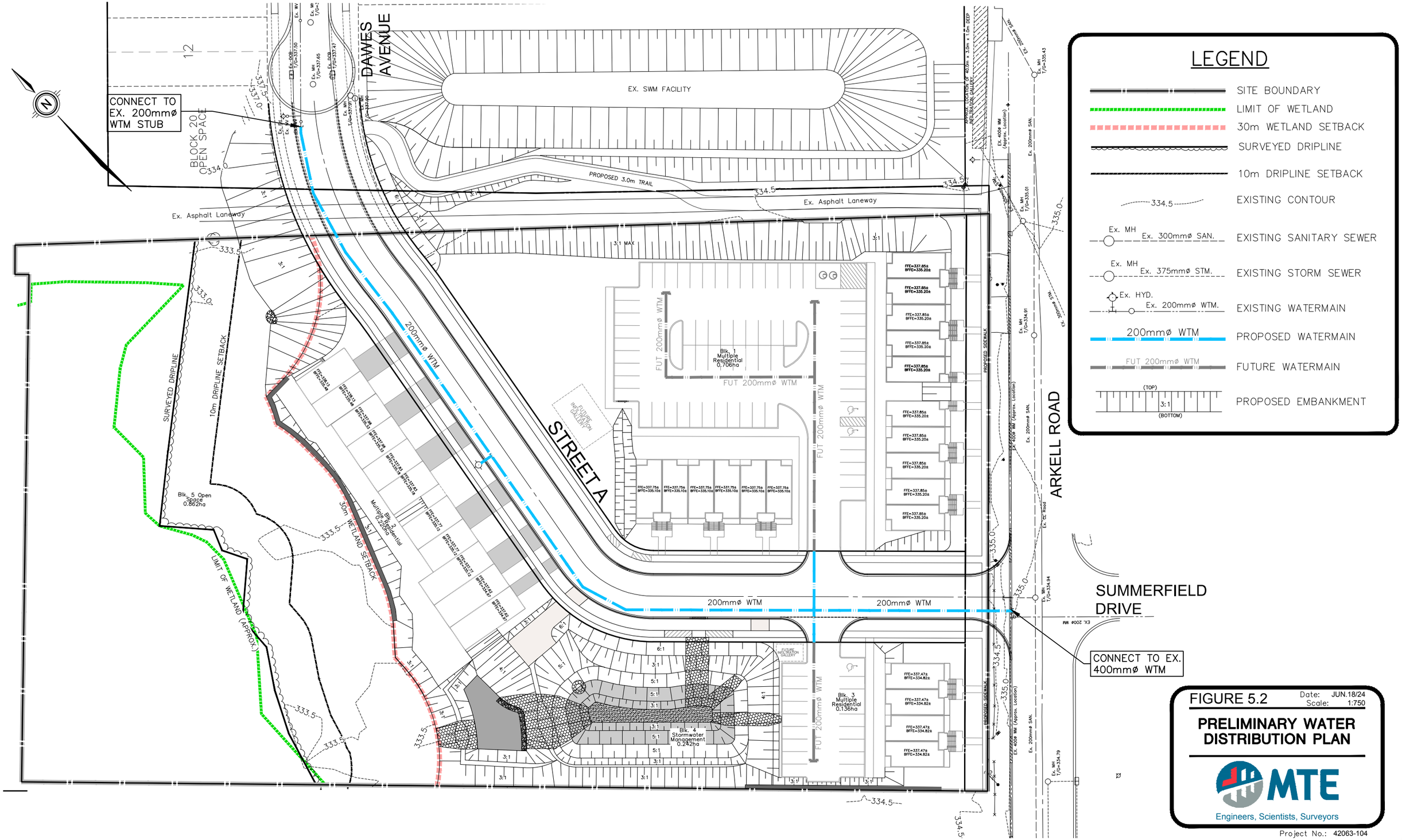


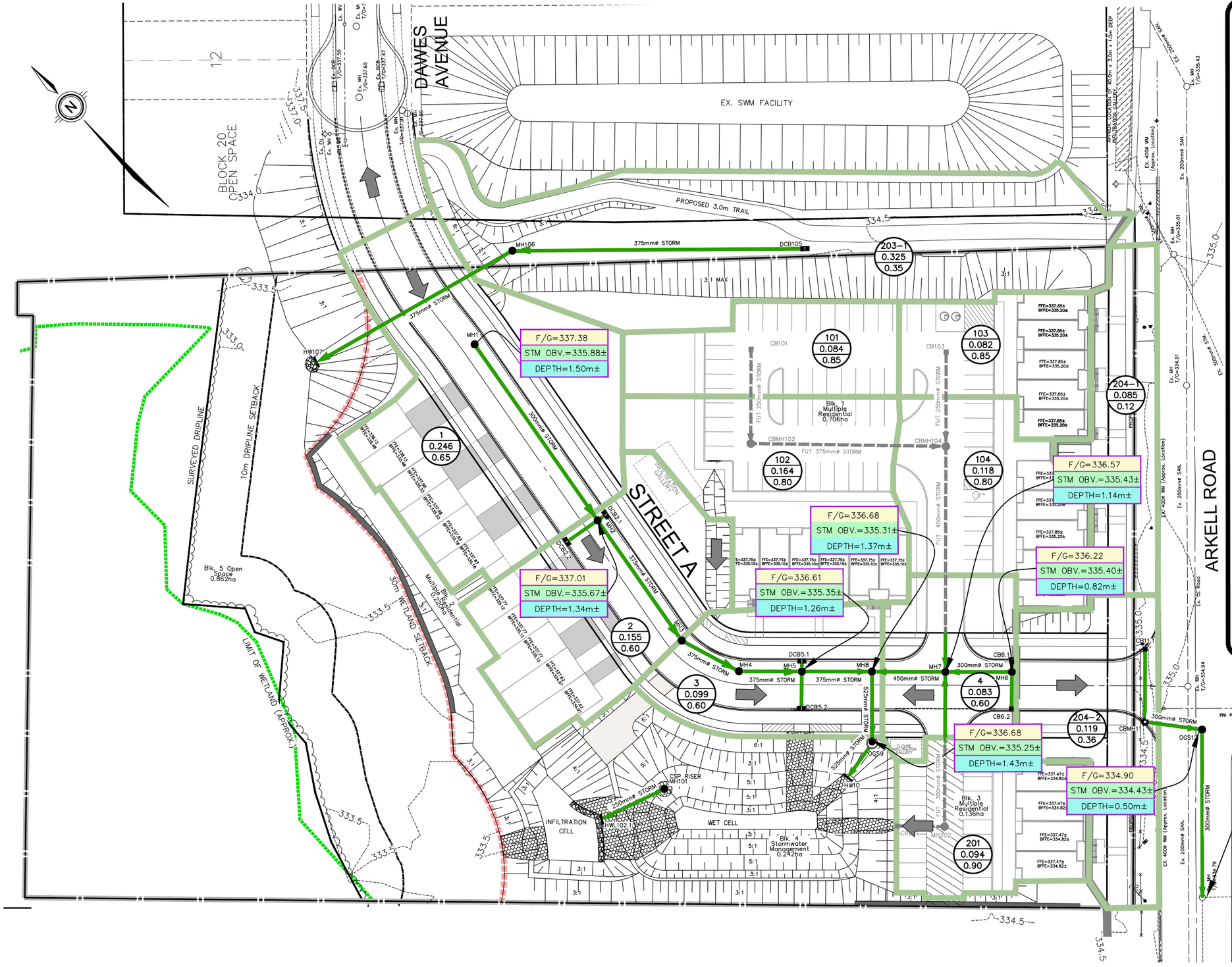
FIGURE 5.2

Date: JUN.18/24
Scale: 1:750

PRELIMINARY WATER DISTRIBUTION PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104



LEGEND

- SITE BOUNDARY
- LIMIT OF WETLAND
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
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- Ex. MH — Ex. 375mmø STM. — EXISTING STORM SEWER
- Ex. HYD. — Ex. 200mmø WTM. — EXISTING WATERMAIN
- PROPOSED STORM SEWER
- RIP RAP
- OVERLAND FLOW
- STORM DRAINAGE AREA
- DIRECTION OF DRAINAGE/SWALE
- 205.2 / 0.060 / 0.65% — CATCHMENT ID no. / AREA (ha) / RUNOFF C VALUE
- FUTURE STORM SEWER
- (TOP) 3:1 (BOTTOM) — PROPOSED EMBANKMENT

FIGURE 5.3

Date: JUN.18/24
Scale: 1:750

PRELIMINARY STORM SERVICING PLAN

MTE
Engineers, Scientists, Surveyors

Project No.: 42063-104

5.4 Storm Drainage to Arkell Road

As described within the SWM Report, there are portions of the subject lands directed towards Arkell Road that are unable to be attenuated within the proposed SWM Facility. Drainage Areas 204-1 and 204-2 consists of portions of the subject lands directed towards existing storm infrastructure within Arkell Road.

5.4.1 Drainage Area 204-1

Drainage Area 204-1 is approximately 0.09ha, consisting of grassed area within Block 1 and Arkell Road boulevard. These flows are directed overland towards existing storm sewers connected to an existing OGS, and ultimately to an existing 40.0m long x 3.0m wide x 1.0m deep infiltration gallery located in the boulevard adjacent to the Arkell Meadows subdivision SWM facility.

As-recorded plan and profile drawing G-66 for Arkell Road (dated November 3, 2008) was provided by the City of Guelph. Using typical storm sewer design, the capacity of the existing storm sewer system was confirmed. The storm sewer spreadsheet is provided in **Appendix D**.

5.4.2 Drainage Area 204-2

Drainage Area 204-2 is approximately 0.12ha, consisting of a portion of Street A, grassed area within Block 3, and a portion of Arkell Road Boulevard. These flows will be directed to an existing storm sewer system, and ultimately through a stone energy dissipater into the Torrance Creek wetland complex. As such, flow generated from uncontrolled portions of the Subject Lands will ultimately contribute to recharging surface water inputs to the wetland feature and subsurface water inputs to the local groundwater table.

Prior to directing storm flows from the proposed right-of-way to the existing storm sewer system, flows are to be directed to an oil-grit separator (OGS). Flows from the OGS are directed to the existing storm sewer system via a 300mm pipe. The OGS is further described within the SWM Report.

As previously stated, as-recorded plan and profile drawings were provided by the City of Guelph, and capacity within the system was confirmed, provided in **Appendix D**. It should be noted that the proposed pipes within Arkell Road are shallow (~0.5m deep to obvert) due to the nature of the shallow existing pipes in which they are connecting. Insulation will be provided where possible.

6.0 STORMWATER MANAGEMENT

The proposed stormwater management strategy includes water quality, quantity, and erosion and sedimentation control within a proposed stormwater management facility located near the centre of the Subject Lands. The SWM strategy for the proposed development is presented in the *190-216 Arkell Road – Preliminary Stormwater Management Report* (revised June 21, 2024) prepared by MTE. The following summarizes the key points of the report:

- Water quality and quantity control will be provided within one (wet cell and infiltration cell) SWMF facility. The proposed facility will provide peak flow control of runoff from the contributing drainage area for storm events up to and including the Regional storm event;
- Enhanced (previously Level 1) water quality control will be provided in the proposed SWM facility wet cell and upstream OGS unit treatment train;

- Post-development erosion targets will be met;
- Maintain existing surface water volume inputs into significant environmental features; and
- Post-development groundwater inputs will be maintained/exceed the minimum requirements set forth by the Torrance Creek Subwatershed Study Management Strategy (GRCA, 1999).

Storm drainage for the proposed development will be provided through a combination of minor (piped) and major (overland) drainage systems. The storm sewers will be designed for the 5-year storm event, with major overland flow routes generally flowing through the proposed road allowance and drainage channels.

End-of-pipe infiltration measures are proposed wherever possible to promote infiltration, provide temperature mitigation, and match/maintain pre-development water balance rates.

7.0 UTILITY SERVICING

It is anticipated that Guelph Hydro (electrical), Bell Canada (telephone), Union Gas (natural gas), and Rogers Cable (cable TV) can all adequately service the proposed development through the connection to and extension of existing services from Arkell Road and Dawes Avenue, where required.

8.0 SUMMARY

The main findings of the Functional Servicing Report for the proposed subdivision at 190-216 Arkell Road are:

1. The roadworks and lot grading within the proposed development can generally be completed in compliance with the City of Guelph's Design Standards. Due to grading and servicing constraints, typical minimum cover over proposed storm sewers and the final reach of sanitary sewer cannot be provided. As such, pipe insulation is proposed where the minimum cover requirement cannot be achieved.
2. The proposed Street A will be constructed to the City's standard 20.0m urban right-of-way.
3. The proposed development can be adequately serviced for sanitary sewage through the extension of the existing gravity sewer connection along Arkell Road. Furthermore, the City has confirmed there are no anticipated capacity issues downstream because of the proposed development.
4. Water supply for the proposed development will be provided by extending the existing watermain on Dawes Avenue through the Subject Lands and connecting to the existing watermain on Arkell Road. The required pressure and flow demands can be satisfactorily met by these connections.
5. Stormwater management for the development can be accommodated by directing the maximum allowable drainage areas to the proposed wet cell/infiltration cell SWM facility, as outlined in the *Preliminary Stormwater Management Report*.
6. 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.

Valentina Lazic, P. Eng
Design Engineer
519-743-6500 ext. 1450
vlazic@mte85.com

AJC:VAL:jng

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Appendix A

Draft Plan of Subdivision (Reduced)

DRAFT PLAN OF SUBDIVISON

Legal Description
PART OF LOT 6, CONCESSION 8, GEOGRAPHICAL TOWNSHIP OF PUSLINCH.
CITY OF GUELPH

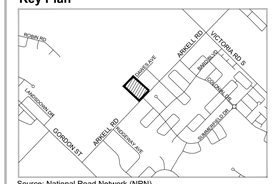
Owner's Certificate
I HEREBY AUTHORIZE MACNAUGHTON HERMSEN BRITTON CLARKSON PLANNING LIMITED TO SUBMIT THIS PLAN FOR APPROVAL.

DATE:_____

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:_____

Key Plan



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. MULTIPLE RESIDENTIAL, OPEN SPACE		
E. AS SHOWN	F. AS SHOWN	G. AS SHOWN
H. MUNICIPAL WATER SUPPLY	I. LOAM	J. AS SHOWN
K. ALL SERVICES AS REQUIRED	L. AS SHOWN	

Area Schedule **61T_____**

Description	Lots/Blocks	Units	Area (ha)
Multiple Residential	1-3	80 (Stacked TH) 11 (Townhouse)	1.055
Stormwater Management	4		0.242
Open Space	5		0.865
Servicing Corridor	6		0.004
Road Widening	7		0.063
Roads			0.348
Total	**7**	**91**	**2.577**

Notes
1. All dimensions are in metres unless otherwise shown
2. Dripline Limits - Natural Resource Solutions Inc. (NRSI) June, 2016
3. Wetland Limits - Natural Resource Solutions Inc. (NRSI) August, 2016
4. Property boundary is approximate, based on MTE Existing Conditions Plan and Wellington County Survey plans 61R-773, 61R-2819
5. Surrounding parcel boundaries are approximate/ taken from Vumap (First Base Solutions) aerial imagery
6. Unit yield based on Conceptual Site Plan prepared by MHBC Planning
7. Building footprints outside of subject lands gathered from City of Guelph open data

Revision No.	Date	Issued / Revision	By
14.	May 13, 2024	Revised Draf Plan;	G.C.
13.	April 27, 2022	Revisions to multiple blocks;	G.C.
12.	April 28, 2021	Adjust Stormwater, Residential Blocks;	G.C.
11.	January 28, 2021	Stacked Townhouse Orientation;	G.C.
10.	March 18, 2020	SWM revision;	G.C.
9.	January 6, 2020	Update/ Issued for Review;	G.C.
8.	December 11, 2019	Update/ Issued for Review;	G.C.
7.	October 9, 2019	Update/ Issued for Review;	G.C.
6.	July 8, 2019	Update/ Issued for Review;	G.C.
5.	December 6, 2018	Update/ Issued for Review;	G.C.
3.	September 12, 2018	Update/ Issued for Review;	G.C.
2.	July 4, 2017	Update/ Issued for Review;	G.C.
1.	March 13, 2017	Issued for Review;	G.C.

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	May 13, 2024
File No.	15246A
Plan Scale	1:400 (36x24)
Drawn By	G.C.
Checked By	D.A.
Other	

Project Arkell Road - Guelph

Applicant
Crescent Homes
151 Curzon Crescent
Guelph, ON. N1K OB3
P: 647.523.6487

File Name **Draft Plan of Subdivision**

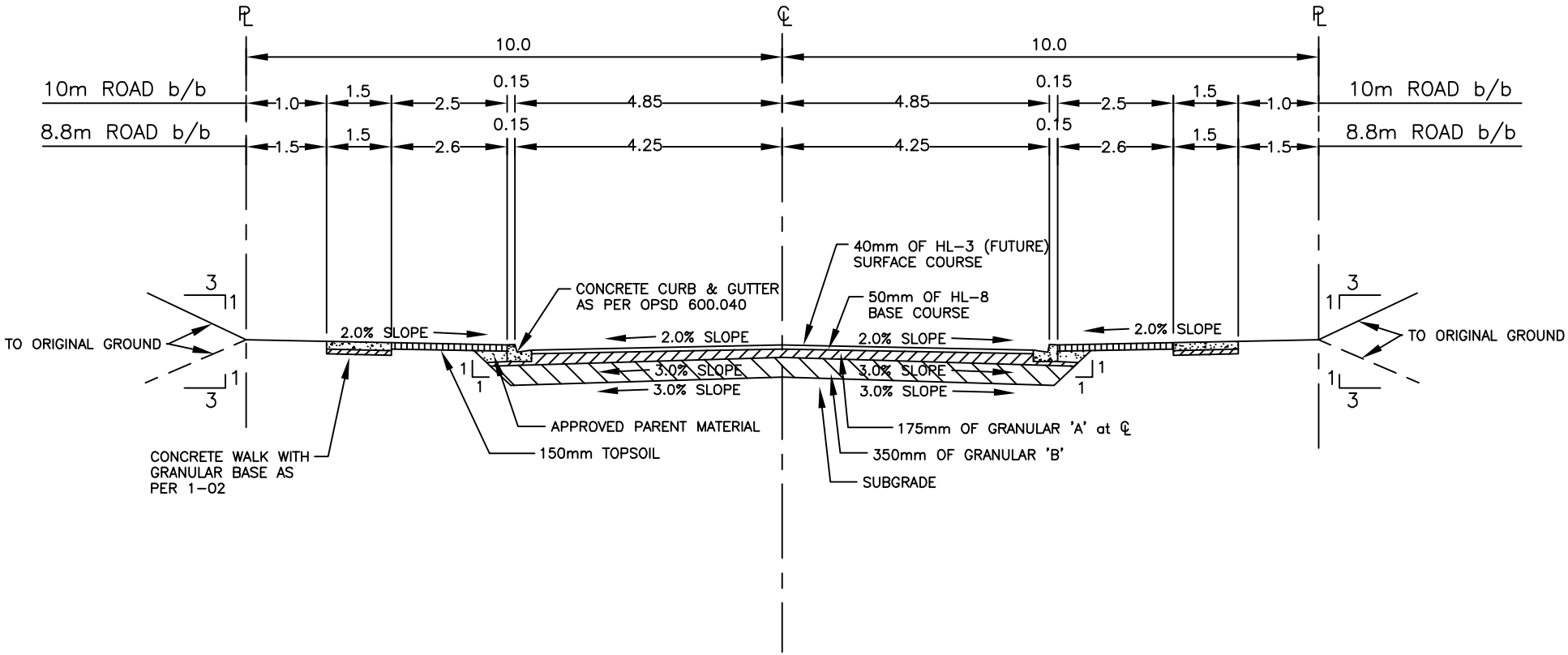
Dwg No. **1 of 1**

Scale Bar 2.5 0 5 10 25m

K:\15246A-Crescent Homes-Arkell Road-Guelph\DP\Draft Plan May13_2024.dwg

Appendix B

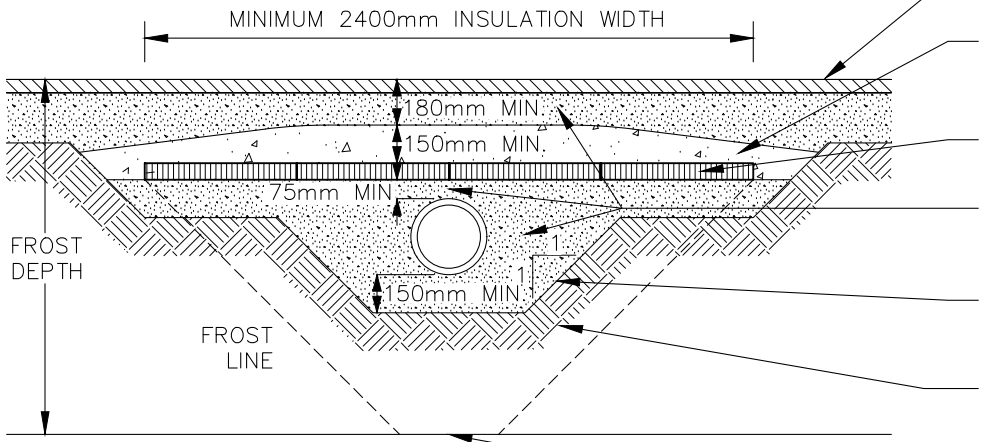
20.0m Urban Right-of-Way + Insulation Detail



CITY OF GUELPH STANDARD DRAWING

TYPICAL CROSS SECTION FOR 10m & 8.8m ROADS - 20m R.O.W.

DATE DRAWN: AUG/88	REV. No.: R-11	Guelph
DESCRIPTION: REVIEWED DEC/2011		
REV. DATE: DEC/11	REV. BY.: G.F./C.M.C.	ENGINEERING
APPROVED BY: CITY ENGINEER		5 - 48



PAVEMENT STRUCTURE (ASPHALT AND/OR GRANULAR), OR SELECT NATIVE MATERIAL AND TOPSOIL, AS SPECIFIED ON DRAWINGS

20 MPa CONCRETE c/w 6% AIR ENTRAINMENT, MINIMUM 150mm CENTRAL AREA THICKNESS, TAPERED TO MINIMUM 75mm EDGE THICKNESS AS SHOWN

RIGID EPS–INSULATION BOARD PER SPECIFICATION NOTES (MINIMUM R10–THICKNESS, TYPICALLY 50–65mm)

GRANULAR–A BEDDING & BACK FILL AROUND PIPE, UNDER INSULATION, AND ABOVE CONCRETE AS SHOWN, COMPACTED TO MINIMUM 95% SPMDD

NOTE: TRENCH SIDE–SLOPES IN AREAS OF PIPE INSULATION TO BE MAXIMUM 1:1 SLOPE, NO VERTICAL SECTIONS ALLOWED UNLESS INDICATED IN DETAIL

NATIVE SOILS – WHERE NATIVE SOIL IS SOFT AND/OR OF ORGANIC CONTENT, REMOVE TO DEPTH OF SUITABLE SOILS AND REPLACE WITH GRANULAR–B2 MATERIAL COMPACTED TO 95% SPMDD, OR CONSTRUCT IN ACCORDANCE WITH WRITTEN DIRECTION FROM GEOTECHNICAL CONSULTANT

FROST DEPTH – PROTECT SOIL ZONE UNDER PIPE FROM FREEZING REFER TO OPSD 3400.011 FOR SPECIFIC LOCAL FROST DEPTH

SEWER PIPE INSULATION DETAIL

FOR SEWER PIPES HAVING LESS THAN
615mm COVER AND MINIMUM 470mm
N.T.S.

Appendix C

Sanitary Sewer Analysis

190-216 ARKELL ROAD
CITY OF GUELPH

SANITARY SEWER DESIGN SHEET

ENGINEERING SERVICES

Project Number: 42063-104
Date: June 18, 2024
Design By: CVP
Checked By: VAL
File: Q:\42063\104\SAN\42063-104 Sanitary Sewer Design Sheet_march 2024.xls

Drainage Area Plan No: Figure 5.1
Revision: March 2023

Design Parameters

Average Daily Flow

Residential	1.00 L/s/ha	Manning's "n"	0.013	
Commercial	1.70 L/s/ha			
Industrial	1.70 L/s/ha	**Velocity**	**(m/s)**	
School/Multl-Res	2.50 L/s/ha	Minimum	0.6	
Apt (150upha)	6.00 L/s/ha	Maximum	3.0	
Apt (295upha)	7.00 L/s/ha			

LOCATION				SANITARY FLOW					DESIGN							
STREET	AREA NUMBER	MANHOLE LOCATION FROM MH	MANHOLE LOCATION TO MH	AREA (A)	CONTRIBUTING UNIT TYPE	SANITARY COEFF.	SANITARY FLOW	CUMULATIVE FLOW	PIPE SIZE	PIPE TYPE	LENGTH	SLOPE	CAPACITY	FULL FLOW VELOCITY	ACTUAL FLOW VELOCITY	% PIPE FULL
				ha		*L/s/ha*	*L/s*	*L/s*	*mm*		*m*	*%*	*L/s*	*m/s*	*m/s*	*%*
Street A	101	MH1A	MH2A	0.396	MULTI-RESIDENTIAL	2.50	0.9900	0.9900	200	PVC	68.6	1.00	32.7818	1.0440	0.4662	3.0%
Street A	102	MH2A	MH3A	0.032	MULTI-RESIDENTIAL	2.50	0.0800	1.0700	200	PVC	15.0	0.50	23.1802	0.7382	0.3750	4.6%
Street A	103	MH3A	MH4A	0.083	MULTI-RESIDENTIAL	2.50	0.2075	1.2775	200	PVC	41.9	0.50	23.1802	0.7382	0.3950	5.5%
Block 1	104	Block 1	MH4A	0.706	MULTI-RESIDENTIAL	2.50	1.7650	1.7650	200	PVC	13.0	0.50	23.1802	0.7382	0.4349	7.6%
Block 3	105	Block 3	MH4A	0.136	MULTI-RESIDENTIAL	2.50	0.3400	0.3400	200	PVC	13.0	0.50	23.1802	0.7382	0.2637	1.5%
Street A	106	MH4A	MH5A	0.056	MULTI-RESIDENTIAL	2.50	0.1400	3.5225	200	PVC	36.7	0.50	23.1802	0.7382	0.5324	15.2%
		MH5A	Ex. MH	0.000	MULTI-RESIDENTIAL	2.50	0.0000	3.5225	200	PVC	7.1	0.35	19.3940	0.6176	0.4689	18.2%

* All sanitary design flows include an allowance for peaking and 10.0 cm/ha/day for infiltration.

Appendix D

Storm Sewer Analysis

190-216 ARKELL ROAD
CITY OF GUELPH, Ontario

STORM SEWER DESIGN SHEET

ENGINEERING AND PUBLIC WORKS

Project Number: 42063-104
Date: 18/06/2024
Design By: CVP
Checked By: VAL
File: Q:\42063\104\STM\42063-104 Storm Sewer Design Sheet_2024.xlsx

Drainage Area Plan No: FIGURE 5.3
Revision: March 2024

Design Parameters

5 YEAR STORM

Q=kAIR, k=0.00278
Intensity (I) = a/(tc+b)^c
a = 1593
b = 11.0
c = 0.8789

Manning's "n" 0.013
Min. Velocity 0.600 m/s
Max. Velocity 6.000 m/s

LOCATION				STORMWATER FLOW 5 YEAR STORM								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 A	1	MH1	MH2	0.246	0.65	0.1599	0.1599	5.0000	0.6238	139.28833	61.91673	300	41.0	0.50	68.37776	0.9673	90.55
Street A	2	MH2	MH3	0.155	0.65	0.1008	0.2607	5.6238	0.3753	134.68402	97.59298	375	28.0	0.50	123.97713	1.1225	78.72
Street A		MH3	MH4	0.000	0.65	0.0000	0.2607	5.9991	0.1668	132.06674	95.69648	375	12.4	0.50	123.97713	1.1225	77.19
Street A	3	MH4	MH5	0.099	0.60	0.0594	0.3201	6.1660	0.1567	130.93788	116.50054	375	12.0	0.50	123.97713	1.1225	93.97
Street A		MH5	MH8	0.000	0.60	0.0000	0.3201	6.3227	0.1752	129.89610	115.57363	375	13.4	0.50	123.97713	1.1225	93.22
								6.4979									
	4	MH6	MH7	0.083	0.60	0.0498	0.0498	5.0000	0.2547	139.28833	19.28363	300	12.7	0.50	68.37776	0.9673	28.20
								5.2547									
BLOCK 1																	
	101	*Fut. CB101*	*Fut. CBMH102*	*0.084*	*0.85*	*0.0714*	*0.0714*	5.0000	*0.3282*	*139.28833*	*27.64762*	*250*	*18.0*	*0.50*	*42.04989*	*0.8566*	*65.75*
	102	*Fut. CBMH102*	*Fut. CBMH104*	*0.164*	*0.80*	*0.1312*	*0.2026*	*5.3282*	*0.5242*	*136.82486*	*77.06359*	*375*	*37.2*	*0.50*	*123.97713*	*1.1225*	*62.16*
								5.8523									
	103	*Fut. CB103*	*Fut. CBMH104*	*0.082*	*0.85*	*0.0697*	*0.0697*	5.0000	*0.3299*	*139.28833*	*26.98934*	*250*	*18.0*	*0.50*	*42.04989*	*0.8566*	*64.18*
								5.3299									
	104	*Fut. CBMH104*	MH7	*0.118*	*0.80*	*0.0944*	*0.3667*	*5.8523*	*0.4179*	*133.07733*	*135.66249*	*450*	*34.1*	*0.50*	*201.60049*	*1.2676*	*67.29*
								6.2703									
BLOCK 2																	
	201	*Fut. CB201*	*Fut. MH202*	*0.094*	*0.90*	*0.0846*	*0.0846*	5.0000	*0.1584*	*139.28833*	*32.75894*	*250*	*9.0*	*0.50*	*42.04989*	*0.8566*	*77.90*
		Fut. MH202	MH7	*0.000*	*0.00*	*0.0000*	*0.0846*	*5.1584*	*0.2706*	*138.08747*	*32.47652*	*300*	*15.5*	*0.50*	*68.37776*	*0.9673*	*47.50*
								5.4290									
Steet A		MH7	MH8	0.000	0.00	0.0000	0.5011	6.2703	0.1627	130.24268	181.43560	450	14.0	0.50	201.60049	1.2676	90.00
								6.4330									
		MH8	OGS9	0.000	0.00	0.0000	0.8212	6.4330	0.1427	129.17385	294.87768	525	13.7	0.50	304.09995	1.4048	96.97
		OGS9	HW10	0.000	0.00	0.0000	0.8212	6.5756	0.0834	128.25175	292.77272	525	8.0	0.50	304.09995	1.4048	96.28
								6.6590									
EXTERNAL DRAINAGE AREAS																	
203-1		DCB105	MH107	0.325	0.35	0.1138	0.1138	5.0000	1.0344	139.28833	44.04645	375	55.9	0.35	103.72671	0.9392	42.46
		MH107	HW108	0.000	0.35	0.0000	0.1138	6.0344	0.8073	131.82624	41.68675	375	43.0	0.35	103.72671	0.9392	40.19
								6.8418									
204-1		204-1	*Ex. CB*	0.092	0.12	0.0110	0.0110	5.0000	0.5631	139.28833	4.27493	*250*	*27.2*	*1.48*	*72.34537*	*1.4738*	*5.91*
		EX. CB	*EX. 68 (OGS)*	0.082	0.65	0.0533	0.0643	5.5631	0.3418	135.11771	24.16786	*250*	*27.2*	*1.48*	*72.34537*	*1.4738*	*33.41*
		EX. 68 (OGS)	*EX. GALLERY*	0.054	0.65	0.0351	0.0994	5.9049	0.2750	132.71372	36.68780	*300*	*17.5*	*0.61*	*75.52571*	*1.0685*	*48.58*
								6.1799									
204-2		204-2	OGS	0.111	0.36	0.0400	0.0400	5.0000	0.2345	139.28833	15.47337	300	11.0	0.50	*68.37776*	*0.9673*	*22.63*
		OGS	*EX. 70*	0.000	0.65	0.0000	0.0400	5.2345	0.6847	137.51870	15.27679	300	32.0	0.50	*68.37776*	*0.9673*	*22.34*
		EX. 70	*EX. 18*	0.078	0.65	0.0507	0.0907	5.9191	1.1030	132.61551	33.42372	*300*	*49.6*	*0.26*	*49.30791*	*0.6976*	*67.79*
		EX. 18	*EX. 17*	0.105	0.65	0.0683	0.1589	7.0221	0.9426	125.45505	55.42225	*375*	*49.6*	*0.28*	*92.77599*	*0.8400*	*59.74*
		EX. 17	*EX. DISSIPATOR*	0.132	0.65	0.0858	0.2447	7.9648	0.1463	119.95765	81.60644	*375*	*10.6*	*0.51*	*125.21077*	*1.1337*	*65.18*
								8.1111									

Appendix E

Geotechnical Report

Peto MacCallum Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL INVESTIGATION
PROPOSED ARKELL ROAD SUBDIVISION
GUELPH, ONTARIO

for

CRESCENT HOMES INC.
c/o MTE CONSULTANTS 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: Crescent Homes Inc.
(+email - njnits@gmail.com)
2 cc: MTE Consultants Inc. (+email - jcabral@mte85.com)
1 cc: PML Kitchener

PML Ref.: 17KF002
Report: 1
September 28, 2018

Peto MacCallum Ltd.
CONSULTING ENGINEERS

September 28, 2018

PML Ref.: 17KF002
Report: 1

Mr. Nitin Jain
Crescent Homes
c/o Mr. Jason Cabral, C.E.T.
MTE Consultants Inc.
520 Bingemans Centre Drive,
Kitchener, Ontario
N2B 3X9

Dear Mr. Jain

Geotechnical Investigation
Proposed Arkell Road Subdivision
Guelph, 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 verbally from Mr. Nitin Jain of Crescent Homes Inc., with a signed Engineering Services Agreement to be returned.

The project involves the proposed development of a residential subdivision on the north side of Arkell Road (at Summerfield Drive), in Guelph, Ontario. It is understood that the proposed development site is currently comprised of several residential dwellings, which will be demolished as part of the project. The site is approximately 2.54 ha in size, however, the northern third of the site will not be developed. The development will include 74, three storey town-house units, with associated parked areas as well as one roadway.

The purpose of the geotechnical investigation was to explore the subsurface soil and ground water conditions at the site. Based on the findings, we have prepared an engineering report with geotechnical recommendations pertaining to design and construction of the proposed residential subdivision. 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, including the presence of any topsoil, organic, fill or other anomalous features below grade;
- Log of borehole sheets, a borehole location plan drawing, and geotechnical laboratory test results;

- Foundation design options, including shallow foundation recommendations, bearing resistances, settlement projections and site class for seismic design;
- Slab-on-grade floor recommendations, including compaction requirements, perimeter and underfloor drainage requirements, and geotechnical suitability of onsite soils for re-use;
- Excavation recommendations, including safe side slopes and dewatering requirements,
- Pipe bedding, cover and backfill requirements, including material and compaction requirements, suitability of excavated soils for reuse as backfill;
- Ground water infiltration; and,
- Pavement design recommendations, including component thicknesses, compaction requirements, and drainage requirements.

The comments and recommendations provided in this report are based on the site conditions at the time of the investigation, and are for preliminary design purposes 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 to ensure their applicability.

A limited chemical testing program of select soil samples was also completed. It should be noted that the scope of work did not include a Phase One or Phase Two Environmental Site Assessment (ESA), and the chemical testing program might not have identified all potential or actual occurrences of soil or ground water impairment at the site.

Investigation Procedure

The field work for the geotechnical investigation was completed on February 13 and March 21, 2017. Boreholes were drilled at six locations (BH1 to BH6) as shown on the appended Borehole Location Plan, Drawing 1. The field work included the installation of a total of four monitoring wells in BH2, BH3, BH4 and BH5.

The boreholes were advanced using a Diedrich D50 track mounted drillrig equipped with an automatic hammer and continuous flight hollow stem augers. The drilling equipment was supplied and operated by specialist contractors working under subcontract to PML.

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. 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.

The field work was supervised throughout by a member of PML's engineering staff who directed the drilling and sampling operation, prepared the stratigraphic logs, monitored ground water conditions, and processed the recovered samples.

The borehole and monitoring well locations were established in the field by Peto MacCallum Ltd. The ground surface elevations were surveyed by MTE Consultants Inc., and provided to PML on a borehole location plan.

All soil samples collected during the investigation were returned to PML's laboratory for detailed visual examination and testing. The geotechnical testing program included natural moisture content determinations on all recovered samples and two particle size distribution analyses carried out on samples of the major soil types encountered.

Summarized Site and Subsurface Conditions

The site is currently comprised of several residential dwellings, which will be demolished as part of the project. However, the northern third of the site will not be developed. The total area of the site is approximately 2.54 ha in size and relatively flat, with a gentle slope to the north, to the wetland area adjacent to the site. It is noted that the adjacent development to the east is approximately 5 m higher that the subject site.

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, 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 subsurface stratigraphy encountered at the borehole locations consists of surficial topsoil and localized fill overlying cohesionless native deposits.

Topsoil / Topsoil Fill

Between 100 and 300 mm (average thickness of 220 mm) of dark brown silt topsoil or topsoil fill was contacted from the surface in all of the boreholes. The topsoil was typically described as damp to moist, dark brown silt, trace sand with rootlets.

Fill

Below the topsoil / topsoil fill in BH1 and BH6, fill was penetrated, extending to depths of 0.46 m to 0.69 m below existing grades. The fill was variable in composition, comprising either sand and gravel or silt. Occasional rootlets were observed within the fill deposits in BH6.

Within the fill, SPT N values typically between 7 and 18 blows per 0.30 m penetration of the split spoon sampler indicate that a variable degree of compaction was used to place the fill soils. The fill soils were described as damp and moist, as demonstrated by laboratory moisture contents in the range of 5 to 20%.

Native Deposits

Native cohesionless deposits encountered below the surficial topsoil and fill were variable and generally comprised silt / sand / sand and gravel extending to the borehole termination depths. A deposit of silt till was also contacted in BH6, extending from 5.8 to 6.6 m. Generally, the encountered native cohesionless soil deposits were compact to very dense, with typical SPT N values ranging from 10 to greater than 50 blows per 0.3 m penetration of the split spoon sampler. Localized loose / very loose zones were contacted in BH1 (between 0.46 to 0.69 m), BH2

(between 0.25 to 0.69 m) and BH3 (between 0.2 to 1.4 m). Moisture contents typically ranging between 3 and 20% were indicative of variable damp to saturated conditions, with depth.

Two soil samples of the sand / sand and gravel were collected and analyzed for particle size distribution analysis, with results presented on Figure 1 and Figure 2 attached. Based on the results, the soil classification was generally consistent with those observed during the field work as included on the appended Log of Borehole sheets.

Ground Water Conditions

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

Ground water was first contacted at depths of 0.7 to 2.9 m below grade in the boreholes, corresponding to elevations of 333.4 to 331.7 (metric, geodetic), respectively.

An initial water level was also taken within the monitoring wells once installed. Ground water was measured at depths of 0.75 to 3.4 m below grade in the monitoring wells, corresponding to elevations of between 333.38 and 331.8 (metric, geodetic), respectively. Follow up ground water levels by MTE Consultants Inc., completed between March, 2017 and June, 2018 measured ground water at depths of surface level (MW4) to 3.65 m below grade (MW2), corresponding to an elevation range of between 330.38 (MW2 and MW5) to 333.99 (MW4) (metric, geodetic).

Based on the ground water observations, the ground water level appears to generally slope down from north to south, away from the wetland area.

The ground water levels at the site are subject to seasonal fluctuations and precipitation patterns.

Discussion and Recommendations

The site is an approximately 2.54 ha, rectangular shaped piece of land which is relatively flat located on the north side of Arkell Road at Summerfield Drive, Guelph, Ontario.

It is understood that the proposed development site is currently comprised of several residential dwellings, which will be demolished as part of the project. The development will include 74, three storey town-house units, with associated parked areas as well as one roadway. However, the northern third of the site will not be developed.

Once the design details for the proposed development are finalized, the recommendations in this report should be revisited to confirm that they remain applicable.

In general, the subsurface stratigraphy encountered at the borehole locations consist of surficial topsoil and localized fill overlying cohesionless native deposits.

Site Grading

As noted, the site is relatively flat with a total relief of approximately 1 m. The adjacent development to the east is approximately 5 m higher than the subject site. Consideration is being given to infilling the site.

Due to the inherent variability of the existing fill materials and the lack of consistent compactive effort utilized during fill placement, these materials are not considered suitable for support of building foundations, floor slabs, pavements, or other settlement sensitive structures. Also, the loose to very loose native materials (BH1, BH2 and BH3) are not considered suitable for the support of building foundations. In this regard, all existing fill and localized very loose / loose materials should be completely subexcavated from beneath any settlement sensitive structures (i.e., building envelopes, pavements, etc.) and replaced with well compacted, suitable engineered fill materials.

Following the stripping / removal of all surficial topsoil and any other deleterious material, and approval of the subgrade, the grades may then be raised where required. Surficial topsoil / organic thicknesses across the site were typically between 100 and 300 mm. In calculating the approximate quantity of topsoil to be stripped, we recommend that the topsoil thickness shown on the individual borehole logs be increased by 50 mm to account for variations and some stripping of the mineral soil below.

Prior to any fill placement, the subgrade surface should be proofrolled with a heavy vibratory compactor under the full time supervision of qualified geotechnical personnel. Any soft spots encountered during the proofrolling process should be subexcavated to the level of competent soils.

Fill used to raise grades should comprise either on site native inorganic cut soils or approved imported material. All engineered fill materials should be pre-approved by the geotechnical consultant prior to placement. Engineered fill material should be placed in maximum 300 mm thick lifts and compacted to at least 98% standard Proctor maximum dry density (SPMDD) below footings and 95% SPMDD below floors and pavements. Further, generic recommendations for fill subgrade preparation and engineered fill construction are provided in Appendix A.

It is noted that materials generated from grade cuts will generally consist of native cohesionless soil deposits. In general, the native on site cohesionless soils will be suitable for reuse as engineered fill, subject to geotechnical verification during construction, providing all organic, wet or saturated soils, and otherwise deleterious soils are discarded. Silty soils described as wet or saturated on the borehole logs should be dried prior to reuse.

The silty soils (i.e. silt) are frost susceptible and highly susceptible to moisture content variations, and are not well suited for engineering fill construction. Compaction to 98% SPMDD may be difficult to achieve; however, these insitu soils should be acceptable for use as engineered fill where compaction to 95% SPMDD is specified.

Foundations

For preliminary design purposes, conventional strip / spread footings founded at least 0.30 m into the competent compact to dense native deposits, or on engineered structural fill compacted to 98% SPMDD, 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). If very loose / loose soils are contacted at the proposed footing level, the loose soils should be subexcavated to the level of competent founding soils.

Accordingly, footings designed in accordance with the Ontario Building Code for residential housing will be satisfactory. The following table summarizes the minimum foundation depths based on the borehole findings:

LOCATION	MINIMUM FOUNDATION DEPTH (m)	CORRESPONDING ELEVATION (METRIC, GEODETIC)
BH1	1.0	333.50
BH2	1.0	334.10
BH3	1.7	332.70
BH4	0.6	333.50
BH5	0.6	334.30
BH6	0.7	333.30

Although in general, footings are anticipated to be placed on native insitu soils, where required the footings may be supported on engineered structural fill, placed in accordance with the generic recommendations for engineered fill construction provided in Appendix A. Prior to placement of engineered fill, all existing fill must be removed and the soils should be subexcavated to the level of competent native overburden soils noted in the table above. For engineered fill supporting footing loads, compaction to a minimum 98% of the materials SPMDD, should be specified as per recommendations outlined in the preceding 'Site Grading' section of this report and in Appendix B.

Footings supported on the structural fill may also be designed using the values for a net factored resistance at ULS and SLS of 225 and 150 kPa, respectively. 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. Prior to concrete placement, all founding surfaces should be examined by PML personnel to check the competency of the founding surfaces.

Total settlements of footings founded on the approved engineered fill or compact to dense native overburden deposits, designed as outlined above are not expected to exceed 25 mm, with differential settlements between footings being no more than 50% of this value.

All exterior footings should be provided with a minimum 1.2 m of earth cover or the thermal insulation equivalent to provide adequate insulation against potential frost damage. A 25 mm thick layer of polystyrene insulation is thermally equivalent to 600 mm of soil cover.

Prior to concrete placement, all founding surfaces should be examined by PML personnel to check the competency of the founding surfaces.

For earthquake design, a site Class D seismic response classification may be assumed, in accordance with the 2012 Ontario Building Code.

Basement / Slab-on-Grade Floor Slabs

In general, the ground water level at the site was first contacted below depths of 0.7 to 2.9 m (Elevation 333.4 to 331.7) with follow up ground water monitoring showing ground water depths of surface level to 3.65 m below grade (Elevation 330.38 to 333.99). Basements, if any, must be located at least 1.0 m above the high ground water level. Conventional slab-on-grade construction of basement floor slabs is feasible on compact to dense native soil deposits, or on engineered structural fill compacted to 95% SPMDD.

Preparation of the floor slab subgrade should include stripping of the topsoil, and other deleterious material followed by proofrolling 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.

Fill placed under the floor slab to achieve finished subgrade levels or as foundation excavation 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% of SPMDD.

A minimum 150 mm thick layer of well compacted clear stone (or equivalent) is recommended directly beneath the slab-on-grade. A polyethylene vapour barrier should be placed at the surface of the stone if a moisture sensitive finish is to be placed on the floor.

For slab-on-grade (basement less) structures, exterior grades should be maintained at least 150 mm below the finished floor slab-on-grade level and sloped to promote drainage away from the building.

Foundation Drainage and Earth Pressure Parameters

Foundation drainage measures should be taken for units with basements. Perforated drainage pipe should be laid around the outside edge of the footings, and connected to a frost free sump system. It is recommended that the drainage pipes be surrounded with a granular filter protected with filter fabric, or alternatively wrapped with filter cloth and surrounded by concrete sand.

A “free draining” granular material, or an equivalent, approved drainage board product must be provided for the basement walls, in accordance with the Ontario Building Code. The onsite native cohesionless deposits may be suitable for use as basement wall backfill. However, it should be noted that soils with high silt content (i.e. silt) are not suitable for use as basement wall backfill unless a drainage board product is provided. Backfilling should not take place until the ground floor has been constructed, in order to provide lateral support for the wall.

In conjunction with the granular material, a weeping tile system should be installed to minimize the build-up of hydrostatic pressure behind the wall. The weeping tile 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.

The following earth pressure design parameters may be assumed for calculation of backfill materials compacted to 95% SPMDD:

PARAMETER	OPS GRANULAR B	Onsite SAND / SAND AND GRAVEL
Angle of Internal Friction (degrees)	32	30
Unit Weight (kN/m^3)	21	20
Coefficient of Active Earth Pressure (K_a)	0.30	0.33
Coefficient of Earth Pressure At Rest (K_o)	0.47	0.50
Coefficient of Passive Earth Pressure (K_p)	3.23	2.77

Note: Earth pressure coefficients assume Rankin analysis (wall friction ignored, non-sloping backfill)

It is assumed that basement floors will be more than 1.0 m above the ground water table and as such, underfloor drainage systems will not be required.

Excavation and Dewatering

It is assumed that excavations for site grading, footings and service trenches will extend through the surficial topsoil and into the native cohesionless soils, which are classified as Type 3 materials as defined in the Occupational Health and Safety Act (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.

Ground water was first contacted at depths of 0.7 to 2.9 m below grade in the boreholes, corresponding to elevations of 333.4 to 331.7 (metric, geodetic), respectively.

An initial water level was also taken within the monitoring wells once installed. Ground water was measured at depths of 0.75 to 3.4 m below grade in the monitoring wells, corresponding to elevations of between 333.38 and 331.8 (metric, geodetic), respectively. Follow up ground water levels by MTE Consultants Inc., completed between March 2017 and June 2018 showed ground water depths of surface level to 3.65 m below grade (Elevation 330.38 to 333.99). The extent of ground water control will depend on the depth of excavation below the ground water level.

Shallow excavations extending less than 0.5 m below the ground water level can be dewatered using conventional sump pumping techniques. Deeper excavations, extending more than 0.5 m below the ground water level may require extensive ground water control measures such as keg wells or well point dewatering. 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 0.30 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, and in compliance with the Ministry of Environment and Climate Change's (MOECC) policy and Permit to Take Water (PTTW) Manual (April 2005), an application should be filed to the MOECC for the subject project 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). Reference is made to the hydrological report by MTE Consultants Inc. for further details.

At the time of tendering, test pits should be excavated on site to allow prospective Contractors to judge the ground water conditions and to determine the appropriate control methods required closer to the time of construction. Ground water conditions are subject to seasonal variations. In this regard, a later summer construction schedule would be preferable.

Pipe Bedding and Backfilling

No bearing problems are anticipated for pipes founded in the native cohesionless soils or structural fill. On stable subgrade, a minimum 150 mm thick bedding course of Granular A material compacted to 95% SPMDD is recommended beneath the pipes. The Granular A material should extend around the pipe to at least 300 mm above the pipe obvert or as set out by Ontario Provincial Standards (OPS), or the local authority.

Backfill below pavements, floor slabs and other settlement sensitive features should be similarly compacted to 95% SPMDD. Backfill should be placed in 300 mm maximum lifts. Material that is too wet for compaction to a minimum of 95% SPMDD should be allocated for use in landscaped / non settlement sensitive locations, and compacted to at least 90% SPMDD.

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.

Pavement Construction

Prior to the construction of the new pavements, surficial topsoil, fill and loose to very loose deposits should be removed. If some settlement is acceptable, the loose to very loose soils can remain in place. Based on the anticipated traffic patterns, frost susceptibility, and strength of the expected subgrade soils, the following pavement component thicknesses are considered suitable for local residential and parking lot traffic categories (no truck / heavy vehicle use).

PAVEMENT COMPONENT	**THICKNESS (mm)**
Asphalt	80
Granular A Base	150
Granular B Subbase	350

The flexible pavement designs provided above consider that construction will be carried out during the drier time of the year and the subgrade is stable, as determined by proofrolling inspected by PML personnel. If the subgrade is wet and unstable, additional granular subbase will be required.

The pavement materials should conform to current OPS specifications. The Granular A base and Granular B subbase courses should be placed in thin lifts and 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). Reference is made to OPS Specification 310, as revised.

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

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

If relatively impermeable silty soils are present at a shallow depth beneath the pavement structure, pavement subdrains should be provided to prevent water accumulation on the pavement subgrade surface. The subgrade should be graded so that water is directed to the catch basin structures or to the pavement edge. Subdrains should be discharged in to the catch basins. The subdrains may consist of filter wrapped, 100 mm diameter perforated plastic pipe, set within the subbase layer at the subgrade surface.

Soil Infiltration

Soil infiltration rates for storm water management (SWM) and roof water infiltration systems were determined for the major near surface soil units and are as follows:

SOIL TYPE	ESTIMATED COEFFICIENT OF PERMEABILITY (cm/sec)	INFILTRATION RATE (mm/hr)
Sand / Sand and Gravel	1×10^{-3}	30

Any SWM ponds should be inspected by PML personnel during construction to verify the presence of a suitable subgrade. In general, the slopes of the storm water management pond should be constructed at 5H:1V or shallower and be provided with vegetation cover to minimize the potential for erosion and sloughing of the side slopes.

Limited Chemical Testing Program

As noted, a limited chemical testing program was completed on samples recovered during geotechnical investigation. PML understands that excess soil may be generated during construction, the volume of which is unknown at this time. The chemical testing program was completed to check the geoenvironmental quality of the site soils at selected sampling locations in order to provide commentary regarding on site or off site re-use and / or disposal options of potentially excess soils.

The soil sampling and testing was conducted as a limited testing program. A Phase One Environmental Site Assessment (ESA) was not within the scope of work for this assignment. Accordingly, soil and ground water impairment that has not been identified by the limited chemical testing program may exist elsewhere at the site. The limited chemical testing program does not constitute an ESA as defined under the Environmental Protection Act and O. Reg. 153/04, as amended.

Chemical Testing Protocol

Representative samples collected during the geotechnical investigation were returned to our laboratory for detailed visual examination. Soil samples were submitted for chemical analysis to AGAT Laboratories Limited (AGAT), a Canadian Association for Laboratory Accreditation Inc. (CALA) accredited laboratory in Mississauga, Ontario. The chemical analyses conducted by AGAT were in accordance with the O. Reg. 153/04, as amended Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act dated March 9, 2004, amended as of July 1, 2011.

As part of the geoenvironmental procedural protocol, all recovered soil samples were examined for visual and olfactory evidence of potential contamination. In addition, soil vapour concentrations (SVCs) were measured in the headspace of the recovered samples. The measured SVCs were typically 0 to 5 parts per million, which are not considered significant.

Five soil samples were submitted for chemical analysis for metals and inorganic parameters, and two samples were submitted for analysis for organochlorine (OC) pesticides. Selection of samples was based on visual and olfactory indications of contamination, SVCs and for general coverage. Details of the samples submitted for chemical testing are as follows:

SAMPLE ID	BOREHOLE	SAMPLE NUMBER	DEPTH (m)	SOIL TYPE	PARAMETERS TESTED
BH4 SS1	1	1	0 to 0.6	Topsoil	M&I and OC pesticides
BH5 SS1	5	1	0 to 0.6	Topsoil	M&I
BH5 SS4	5	4	2.3 to 2.7	Native	M&I
BH6 SS1	6	1	0 to 0.6	Topsoil / Fill	M&I and OC pesticides
BH6 SS3	6	3	1.5 to 2.1	Native	M&I

Site Condition Standards

The Ministry of the Environment, Conservation and Parks (MECP) has developed a set of Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act (April 15, 2011) and O.Reg. 153/04, as amended. The standards consist of nine tables (Table 1 through Table 9) that provide criteria for maximum concentrations of various contaminants. In general, the applicable Table and corresponding Site Condition Standards (SCSs) depend on the site location, land use, soil texture, bedrock depth, soil pH and source of potable water at the site.

The site is currently comprised of several residential dwellings and it is to be developed into a residential subdivision. The site is bordered by the Torrance Creek Wetland Complex to the north, which is a provincially significant wetland as identified by the Ministry of Natural Resources. Based on review of the above factors, PML selected the Generic Criteria of the O.Reg. 153/04, Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act dated April 15, 2011. In particular, the Table 1 (T1) Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community (RPI/ICC) property use would likely apply to the site; however a full evaluation of applicable SCSs in accordance with Sections 41 and 43.1 of O.Reg. 153/04, as amended, was not within the scope of this assignment and further environmental work would be required to confirm this.

For off site re-use with minimal environmental restrictions, the O.Reg. 153/04, as amended, Full Depth Background Table 1 (T1) SCSs for RPI/ICC property uses were utilized. In addition, the Full Depth Generic SCSs (T2) in a Portable Ground Water Condition for ICC property use are also examined.

It is noted that a comparison to the Table 3 SCSs for full depth generic condition, Tables 4 and 5 SCSs for stratified site condition, Tables 6 and 7 SCSs for shallow bedrock condition and Table 8 and Table 9 for use within 30 m of a water body for a non-potable ground water condition were not conducted as part of this assignment. If the potential receiving site for excess soil falls within one of these categories, additional evaluation by PML will be required to confirm conformance.

Analytical Findings and Conclusions

Laboratory certificates of analysis compared to the Table 1 and 2 SCSs are included in Appendix C. The measured values and corresponding Standards (labelled as G/S for Guideline / Standard) are shown on the certificates of analysis. In the event of an exceedance of the SCSs, the level is shown in **bold** text, where applicable.

On Site Re-use

Based on the results of chemical testing, the measured concentrations of the tested parameters met the T1 RPI/ICC SCSs, with the exception of zinc in two samples (BH5 SS1 and BH6 SS3).

It is noted that there is no legal imperative to remove or treat the soil that exceeds the applicable SCSs, provided it is demonstrated that there is no off site impact or adverse effect. However, if contaminated soil is left on site, the landowner assumes liability associated with the contamination. The liability concerns could include potential scrutiny from the MECP, neighbouring property owners and the public; potential for decreased value of the land and issues during potential divesting of the property due to environmental liability concerns on the part of future owners or their financiers/insurers.

Off Site Re-use

As noted, the measured concentrations of the tested parameters met the T1 RPI/ICC SCSs, with the exception of zinc in two samples (BH5 SS1 and BH6 SS3). When compared to the T2 ICC Standards, one sample (BH6 SS3) exceeded the SCS for zinc.

If the soil is to be removed from the site for off site re-use, the following conditions must be met:

- The extent of the material that exceeds the applicable SCSs is delineated;
- All analytical results and environmental assessment reports must be fully disclosed to the receiving site owners / authorities and they have agreed to receive the material;
- The work must be completed in accordance with local by-laws governing soil movement and/or placement at other sites;
- The applicable SCSs for the receiving site have been determined, as confirmed by the environmental consultant and the SCSs are consistent with the chemical quality of the soil originating at the source site;
- Transportation and placement of the excess soil is monitored by the environmental consultant to check the material is appropriately placed at the pre-approved site;
- The excess soil cannot be taken to a property for which a RSC is being filed as outlined in O.Reg. 153/04, as amended, unless the chemical testing program is completed in accordance with the regulation;
- The excess soil cannot be taken to a property for which a RSC has been previously filed unless the soil quality meets the SCSs contained in the RSC;
- The receiving site must be arranged and/or approved well in advance of excavation in order to avoid delays during construction. As well, it is noted the chemical testing requirements for various receiving sites is site-specific and additional testing may be required, beyond that provided in this report; and

- The excavation work should be conducted in accordance with a Soil Management Plan prepared by a qualified professional to ensure that all surplus excavated material is tested and managed appropriately, and that imported fill material is of suitable quality and meets the SCSs applicable to the site. Re-use of excess excavated soil on site is also subject to acceptance for re-use by the geotechnical consultant at the time of construction based on geotechnical considerations.

If landfill disposal of excess soils is considered, PML recommends toxicity characteristic leaching procedure (TCLP) testing be completed in accordance with O. Reg. 347/558, Schedule 4, as amended.

It is recommended that transportation of fill material from the Source Site(s) to the Receiving Site(s) be carried out in accordance with the MECP document Management of Excess Soil – A guideline for Best Management Practices dated January, 2014.

Additional sampling and chemical testing should be carried out during construction to verify the chemical quality of the excess soil to assess the appropriate management/disposal options for the soil leaving the site.

It should be noted that the soil conditions may differ from those encountered during this assignment. PML should be contacted if impacted soil conditions become apparent to further assess and appropriately handle the materials, if any, and to evaluate whether modifications to the conclusions documented in this report are necessary.

Geotechnical Review and Construction Inspection and Testing

It is recommended that the design drawings be submitted to PML for general geotechnical review for compatibility with the 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 preliminary recommendations provided in this report are based on the information revealed in the boreholes. Conditions away from and between boreholes may vary. 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.

Closure

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

We trust 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.

Hassen Shinwary, BASc
Project Supervisor
Geotechnical and Geoenvironmental Services

Ken Hanes, P.Eng.
Project Engineer
Geotechnical and Geoenvironmental Services

Gerry Mitchell, MEng, P.Eng.
Vice President

HS/KH:sh

Enclosures:
Figures 1 to 2 – Particle Size Distribution Charts
List of Abbreviations
Log of Boreholes 1 to 6
Drawing 1 – Borehole Location Plan
Appendix A – Engineered Fill
Appendix B – Statement of Limitations
Appendix C – AGAT Certificates of Analysis

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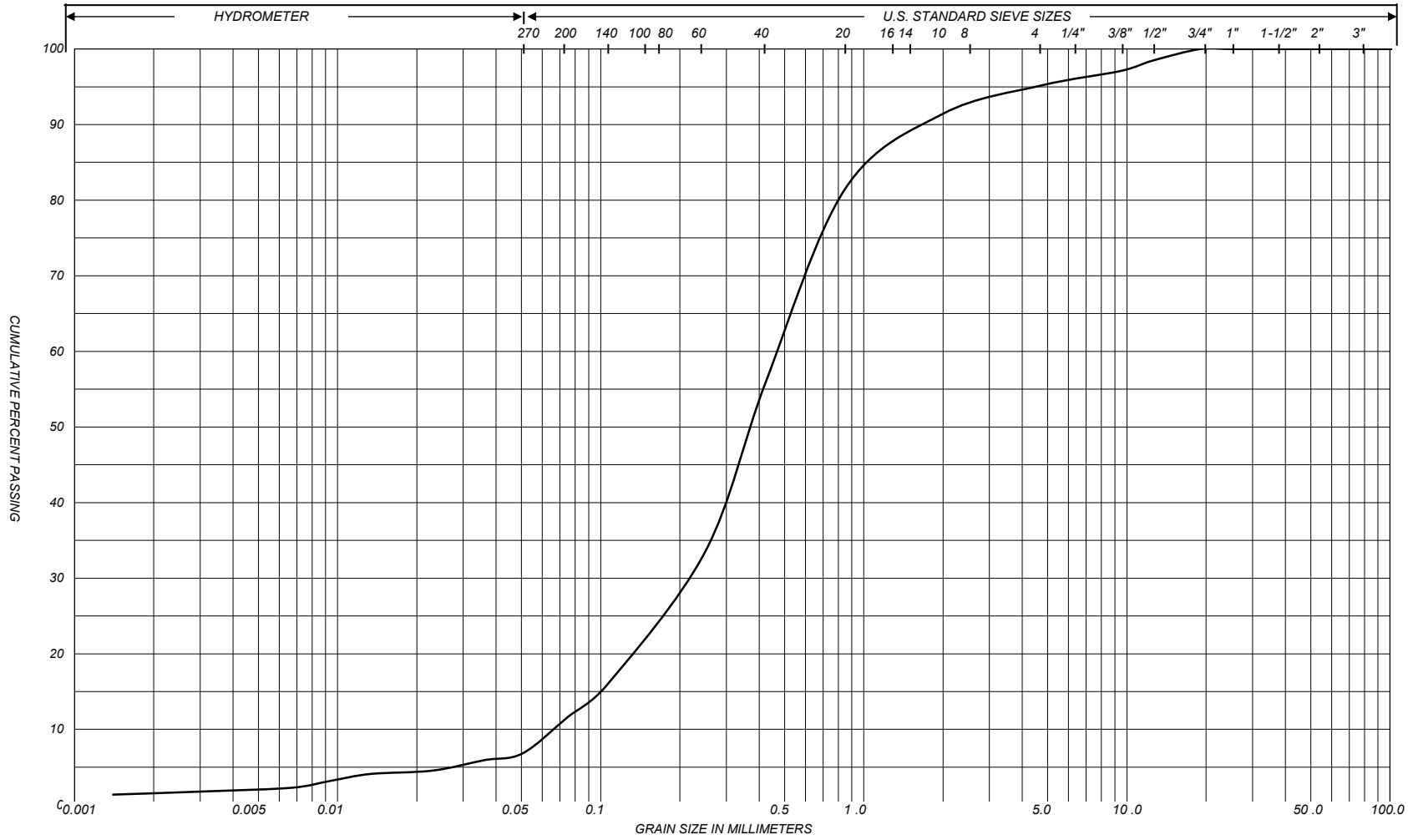
PARTICLE SIZE DISTRIBUTION CHART

PML REF. 17KF002
REPORT NO. 1
FIGURE. 1



SILT & CLAY				FINE	MEDIUM	COARSE	GRAVEL				COBBLES	UNIFIED
				SAND								
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL				COBBLES	M.I.T.
	SILT			SAND								
CLAY	SILT			VERY FINE	FINE	MEDIUM	COARSE	GRAVEL				U.S. BUREAU
				SAND								

REMARKS Borehole 1, Sample SS6, Depth 4.5 to 5.0 m

SAND, SOME SILT, TRACE GRAVEL

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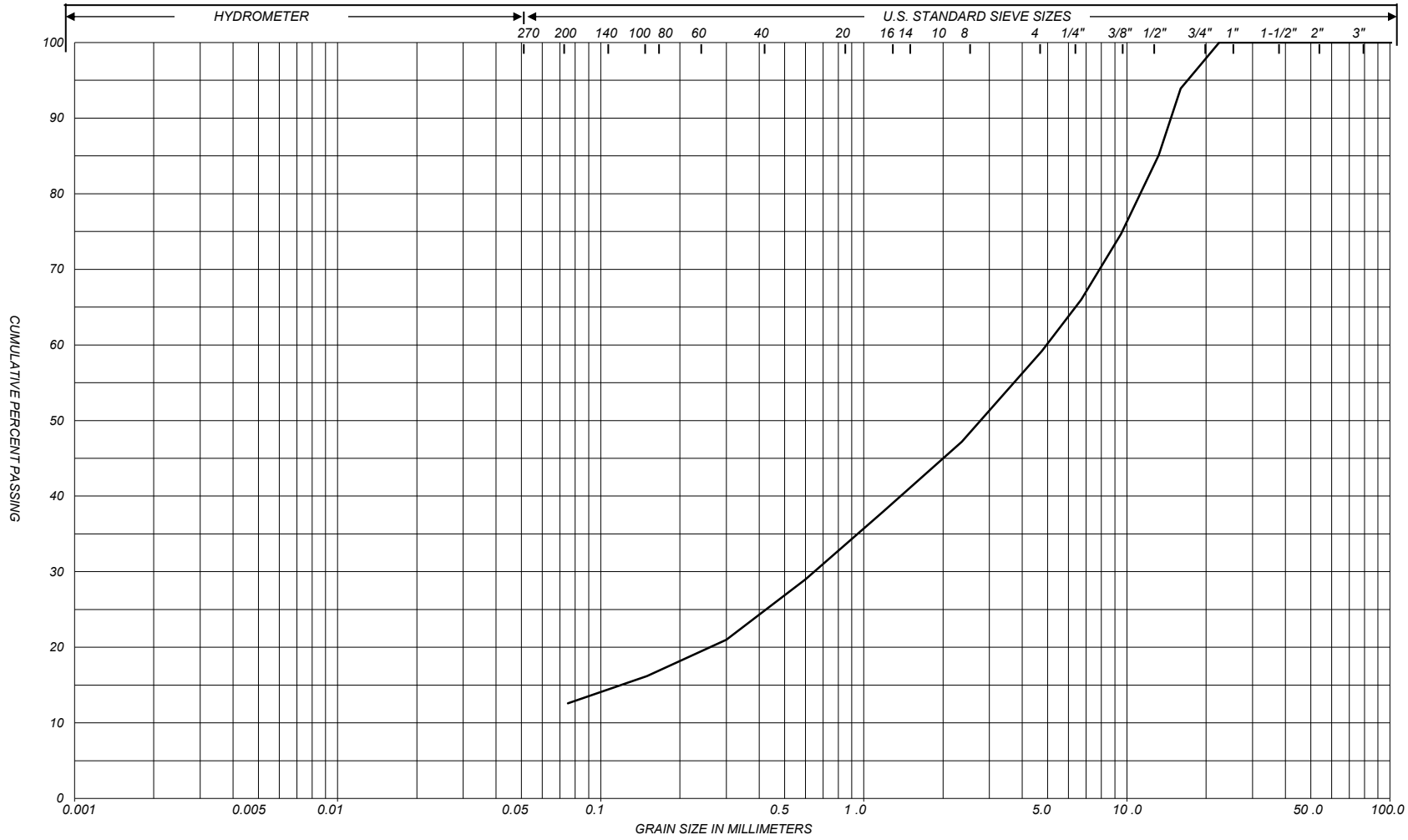
CONSULTING ENGINEERS

PARTICLE SIZE DISTRIBUTION CHART

PML REF. 17KF002
REPORT NO. 1
FIGURE. 2



SILT & CLAY			FINE	MEDIUM	COARSE	GRAVEL		COBBLES	UNIFIED		
			SAND								
CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	GRAVEL		COBBLES	M.I.T.	
	SILT			SAND							
CLAY	SILT		VERY FINE	FINE	MEDIUM	COARSE	GRAVEL			U.S. BUREAU	
			SAND								

REMARKS Borehole 2, Sample SS2, Depth 0.7 to 1.2 m

SAND AND GRAVEL, SOME SILT

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

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 02 13
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.56					
0.10	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp		1	SS	7	
0.46						
0.69	FILL: Brown sand and gravel, trace silt, moist					
333.87			2	SS	42	
	SILT: Loose brown silt, trace sand, occasional rootlets, damp					
	SAND AND GRAVEL: Dense to very dense brown sand and gravel, trace to some silt, numerous cobbles, damp		3	SS	50/150mm	
2.1						
332.5	becoming moist		4	SS	39	
2.9						
331.7	becoming compact, no cobbles, saturated, contains saturated silt layers		5	SS	23	
4.0						
330.6	SAND: Compact brown sand, trace to some silt, trace gravel, saturated		6	SS	12	
6.6			7	SS	16	
328.0	BOREHOLE TERMINATED AT 6.6 m					

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT _____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GR SA SI&CL

Sampler wet from SS5

Upon completion of augering
Wet cave to 3.1 m

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 0ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 2

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 02 13
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

GROUND ELEVATION 335.16

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES
0.25 / 334.91	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp	1	SS	3
0.69 / 334.47	SILT: Loose dark brown silt, some sand, trace gravel, occasional rootlets, damp	2	SS	57
	SAND AND GRAVEL: Very dense sand and gravel, trace to some silt, numerous cobbles, damp	3	SS	64
2.1 / 333.1	SAND: Compact to dense brown sand, trace to some silt, trace gravel, occasional cobbles, saturated	4	SS	34
		5	SS	31
		6	SS	30
		7	SS	26
7.7 / 8.1 / 327.1	SILT: Dense brown silt, trace sand, trace gravel, wet BOREHOLE TERMINATED AT 8.1 m	8	SS	39

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
GR SA SI&CL
Concrete
Sampler wet from SS4
Bentonite Seal
50 mm Plastic Riser
FIlter Sand
Screen

Water Level Readings:
Initial: 3.40 m
Elevation: 331.76

2017-04: 2.51 m
Elevation: 332.45

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 0ppm, SS5 5ppm, SS6 0ppm, SS7 0ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 3

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 02 13
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.42					
0.20	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, moist		1	SS	5	334
0.51 / 333.91	SILT: Loose dark brown silt, some sand, occasional rootlets		2	SS	3	
1.4 / 333.1	SAND AND GRAVEL: Very loose brown sand and gravel, trace to some silt, occasional cobbles, damp becoming compact, saturated		3	SS	35	333
			4	SS	31	332
2.9 / 331.5	SAND: Compact to dense brown sand, trace to some silt, trace gravel, occasional cobbles, saturated		5	SS	24	331
			6	SS	42	330
			7	SS	27	329
7.8			8	SS	21	328
8.0 / 326.4	SILT: Compact brown silt, trace sand, trace gravel, wet BOREHOLE TERMINATED AT 8.0 m					327

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT _____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m^3

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
Concrete
Sampler wet from SS3
Bentonite Seal
50 mm Plastic Riser
FIlter Sand
Screen

Water Level Readings:
Initial: 1.95 m
Elevation: 332.47

2017-04: 1.86 m
Elevation: 332.56

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 0ppm, SS5 5ppm, SS6 0ppm, SS7 5ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

+ UNDISTURBED FIELD VANE
⊕ REMOLDED FIELD VANE
⊛ LAB SHEAR TEST
▲ POCKET PENETROMETER
◆ POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 4

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 03 21
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.13				
0.30	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, moist	1	SS	6	334
0.69 / 333.44	SAND AND GRAVEL: Compact brown sand and gravel, trace to some silt, occasional cobbles, moist	2	SS	13	333
1.5	becoming saturated				
332.7	SAND: Compact brown sand, trace to some silt, trace gravel, saturated	3	SS	14	332
		4	SS	11	
		5	SS	12	331
		6	SS	18	330
		7	SS	10	329
		8	SS	25	328
8.1 / 326.0	BOREHOLE TERMINATED AT 8.1 m				327

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT _____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
GR SA SI&CL
Concrete
Sampler wet from SS2
Bentonite Seal
FIlter Sand
Screen

Water Level Readings:
Initial: 0.75 m
Elevation: 333.38

2017-04: 0.44 m
Elevation: 333.55

NOTES: Headspace: SS1 0ppm, SS2 5ppm, SS3 0ppm, SS4 5ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 5

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 03 21
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.97				
0.25 / 334.72	TOPSOIL: Dark brown silt, trace sand, trace gravel, numerous rootlets, damp	1	SS	13	
	SAND AND GRAVEL: Dense brown sand and gravel, trace to some silt, numerous cobbles, damp	2	SS	49	334
		3	SS	31	
2.2 / 332.8	SAND: Compact brown sand, some gravel, trace to some silt, occasional cobbles, saturated	4	SS	24	333
		5	SS	27	332
		6	SS	14	331
5.6 / 329.4	becoming very dense	7	SS	51	330
7.1 / 327.9	SAND AND GRAVEL: Very dense brown sand and gravel, trace silt, numerous cobbles, saturated	8	SS	52	329
8.1 / 326.9	BOREHOLE TERMINATED AT 8.1 m				328
					327

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

Stick up
GR SA SI&CL
Concrete
Sampler wet from SS4
Bentonite Seal
FIlter Sand
Screen

Water Level Readings:
Initial: 2.3 m
Elevation: 332.67

2017-04: 2.18 m
Elevation: 332.65

NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 5ppm, SS4 5ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm, SS8 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH

Peto MacCallum Ltd.
CONSULTING ENGINEERS

LOG OF BOREHOLE NO. 6

PROJECT Proposed Arkell Road Subdivision
LOCATION Arkell Road, Guelph, Ontario
BORING METHOD Continuous Flight Hollow Stem Augers
BORING DATE: 2017 03 21
PML REF.: 17KF002
ENGINEER K. Hanes
TECHNICIAN H. Shinwary

DEPTH in METRES	DESCRIPTION	LEGEND	NUMBER	TYPE	BLOWS/0.3m N - VALUES	ELEVATION SCALE
	GROUND ELEVATION 334.0					
0.20	TOPSOIL: Dark brown silt, trace sand, numerous rootlets, damp		1	SS	18	
0.41						
0.69	FILL: Dark brown silt, some sand, trace gravel, occasional rootlets, damp					
333.31			2	SS	45	333
1.5	SAND AND GRAVEL: Dense brown sand and gravel, trace to some silt, numerous cobbles, damp					
332.6	becoming moist		3	SS	36	
2.2	becoming saturated					332
331.8	SILT: Compact brown silt, trace sand, trace gravel, trace clay, wet to saturated		4	SS	12	
			5	SS	10	331
						330
			6	SS	16	
5.8						329
328.2	SILT TILL: Very dense brown silt, some sand, some gravel, occasional cobbles, damp		7	SS	50/75mm	328
6.6						
327.4	BOREHOLE TERMINATED AT 6.6 m					

SHEAR STRENGTH C_u (kPa) 50 100 150 200
DYNAMIC CONE PENETRATION ×
STANDARD PENETRATION TEST ●
BLOWS/0.3M 20 40 60 80

LIQUID LIMIT ____ W_L
PLASTIC LIMIT ____ W_P
WATER CONTENT ___ W
W_P W W_L
WATER CONTENT % 10 20 30

UNIT WEIGHT γ kN/m³

GROUND WATER OBSERVATIONS AND REMARKS

GR SA SI&CL

Sampler wet from SS3

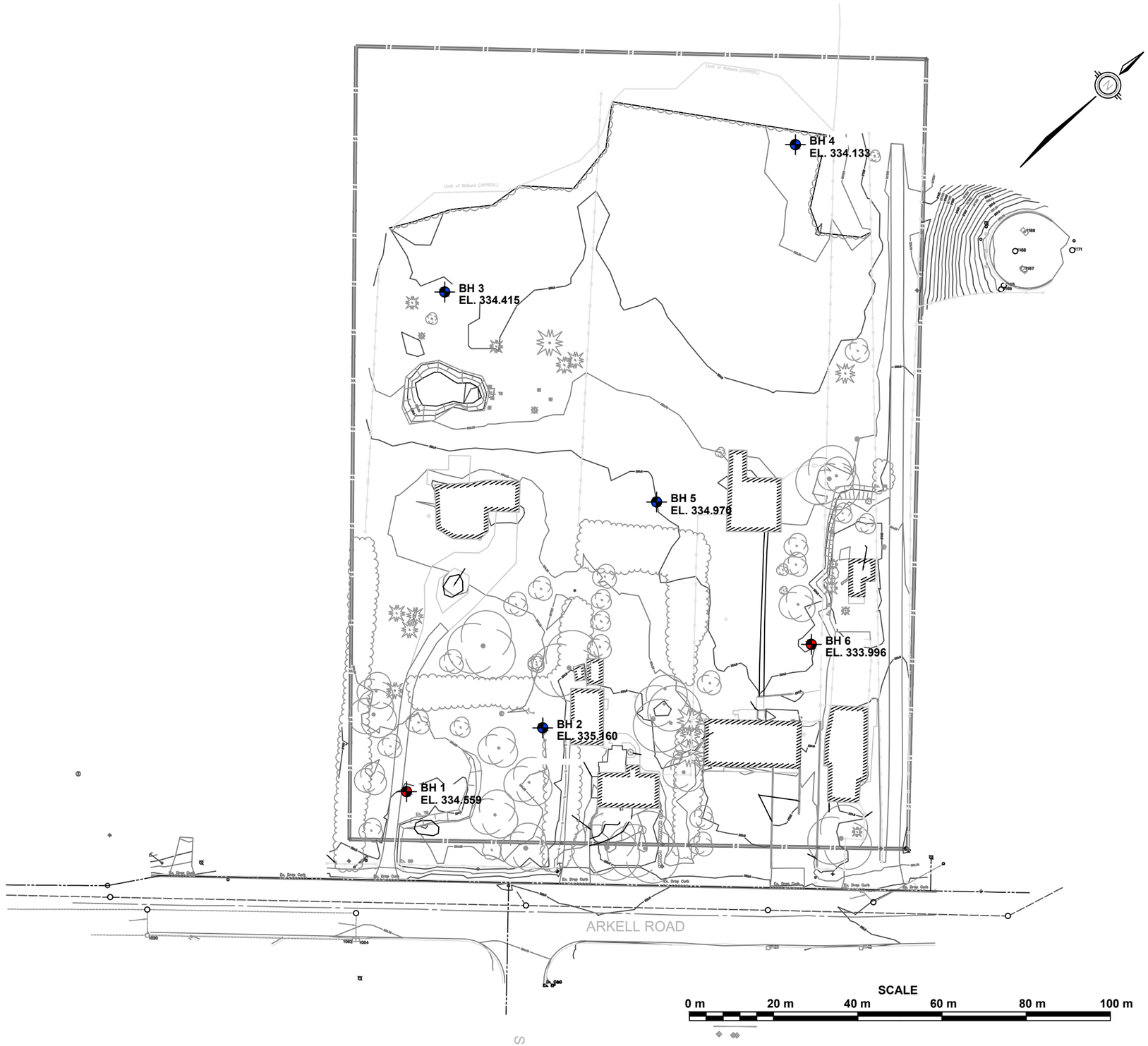
Upon completion of augering
Cave to 2.0 m
Free water at 1.83 m

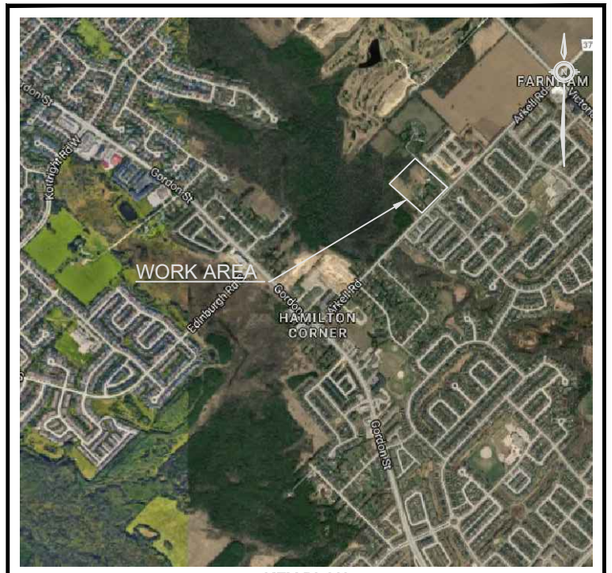
NOTES: Headspace: SS1 0ppm, SS2 0ppm, SS3 0ppm, SS4 5ppm, SS5 0ppm, SS6 0ppm, SS7 0ppm

WATER LEVEL OBSERVED DURING / UPON COMPLETION OF DRILLING
WATER LEVEL MEASURED IN MONITORING WELL

UNDISTURBED FIELD VANE
REMOLDED FIELD VANE
LAB SHEAR TEST
POCKET PENETROMETER
POCKET TORVANE

CHECKED BY KH





KEY PLAN

LEGEND:

- BOREHOLE
- BOREHOLE WITH MONITORING WELL

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.

CRESCENT HOMES

PROPOSED ARKELL ROAD SUBDIVISION

ARKELL ROAD

GUELPH, ONTARIO

BOREHOLE LOCATION PLAN

PML Peto MacCallum Ltd.
CONSULTING ENGINEERS

DRAWN	D. BRICE	DATE	SCALE	PML REF.	DWG. NO.
CHECKED	H. SHINWARY	SEPTEMBER 2018	AS SHOWN	17KF002	1
APPROVED	W. LOGHRIN				

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.

APPENDIX C

AGAT CERTIFICATES OF ANALYSIS

O.Reg. 153/04, As Amended, Table 1 Standards (Soil)

(Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use)

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: PETO MACCALLUM LIMITED
16 FRANKLIN STREET SOUTH
KITCHENER, ON N2C1R4
(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17T199091

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Apr 18, 2017

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH5-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276150	8276151
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	5	6
Barium	µg/g	220	2	15	45	48
Beryllium	µg/g	2.5	0.5	<0.5	<0.5	<0.5
Boron	µg/g	36	5	6	6	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.17	0.23	0.27
Cadmium	µg/g	1.2	0.5	<0.5	0.7	0.6
Chromium	µg/g	70	2	8	13	13
Cobalt	µg/g	21	0.5	1.9	4.4	4.9
Copper	µg/g	92	1	8	11	11
Lead	µg/g	120	1	40	62	53
Molybdenum	µg/g	2	0.5	0.6	0.9	0.5
Nickel	µg/g	82	1	5	10	10
Selenium	µg/g	1.5	0.4	<0.4	0.4	0.5
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.5	0.5	0.5
Vanadium	µg/g	86	1	11	22	24
Zinc	µg/g	290	5	182	313	254
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.177	0.233	0.173
Sodium Adsorption Ratio	NA	2.4	NA	0.125	0.142	0.053
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.74	6.90	7.07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

8276142-8276151 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

AGAT Laboratories

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Certificate of Analysis

AGAT WORK ORDER: 17T199091
PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED
SAMPLING SITE:

ATTENTION TO: Ken Hanes
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276151
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	<0.007	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01
Moisture Content	%		0.1	33.0	6.7
Surrogate	Unit	Acceptable Limits			
TCMX	%	50-140		70	66
Decachlorobiphenyl	%	60-130		72	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

8276142-8276151 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By: NPopowich

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Guideline Violation

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8276150	BH5-SS1	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	290	313

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8272855		3.6	3.6	NA	< 0.8	126%	70%	130%	105%	80%	120%	96%	70%	130%
Arsenic	8272855		9	7	25.0%	< 1	108%	70%	130%	105%	80%	120%	103%	70%	130%
Barium	8272855		76	75	1.3%	< 2	101%	70%	130%	98%	80%	120%	101%	70%	130%
Beryllium	8272855		<0.5	<0.5	NA	< 0.5	83%	70%	130%	105%	80%	120%	89%	70%	130%
Boron	8272855		6	6	NA	< 5	82%	70%	130%	107%	80%	120%	93%	70%	130%
Boron (Hot Water Soluble)	8272855		0.41	0.42	NA	< 0.10	112%	60%	140%	103%	70%	130%	99%	60%	140%
Cadmium	8272855		0.8	0.8	NA	< 0.5	110%	70%	130%	106%	80%	120%	105%	70%	130%
Chromium	8272855		18	18	0.0%	< 2	96%	70%	130%	114%	80%	120%	112%	70%	130%
Cobalt	8272855		5.5	5.5	0.0%	< 0.5	102%	70%	130%	110%	80%	120%	99%	70%	130%
Copper	8272855		63	62	1.6%	< 1	101%	70%	130%	117%	80%	120%	85%	70%	130%
Lead	8272855		190	197	3.6%	< 1	105%	70%	130%	101%	80%	120%	70%	70%	130%
Molybdenum	8272855		1.3	1.3	NA	< 0.5	107%	70%	130%	103%	80%	120%	105%	70%	130%
Nickel	8272855		24	25	4.1%	< 1	103%	70%	130%	112%	80%	120%	100%	70%	130%
Selenium	8272855		0.9	1.0	NA	< 0.4	128%	70%	130%	99%	80%	120%	106%	70%	130%
Silver	8272855		<0.2	<0.2	NA	< 0.2	98%	70%	130%	115%	80%	120%	110%	70%	130%
Thallium	8272855		<0.4	<0.4	NA	< 0.4	103%	70%	130%	104%	80%	120%	98%	70%	130%
Uranium	8272855		<0.5	<0.5	NA	< 0.5	98%	70%	130%	93%	80%	120%	95%	70%	130%
Vanadium	8272855		20	20	0.0%	< 1	99%	70%	130%	109%	80%	120%	109%	70%	130%
Zinc	8272855		205	199	3.0%	< 5	102%	70%	130%	117%	80%	120%	84%	70%	130%
Chromium VI	8277762		<0.2	<0.2	NA	< 0.2	93%	70%	130%	98%	80%	120%	100%	70%	130%
Cyanide	8278916		<0.040	<0.040	NA	< 0.040	102%	70%	130%	108%	80%	120%	94%	70%	130%
Mercury	8272855		0.15	0.17	NA	< 0.10	100%	70%	130%	88%	80%	120%	93%	70%	130%
Electrical Conductivity	8277893		0.376	0.369	1.9%	< 0.005	93%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8276363		0.057	0.053	7.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8277854		7.37	7.42	0.7%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8267227		< 0.01	< 0.01	NA	< 0.01	82%	50%	140%	96%	50%	140%	64%	50%	140%
Gamma-Hexachlorocyclohexane	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	78%	50%	140%	66%	50%	140%
Heptachlor	8267227		< 0.005	< 0.005	NA	< 0.005	80%	50%	140%	90%	50%	140%	80%	50%	140%
Aldrin	8267227		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	94%	50%	140%	68%	50%	140%
Heptachlor Epoxide	8267227		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	96%	50%	140%	82%	50%	140%
Endosulfan	8267227		< 0.005	< 0.005	NA	< 0.005	89%	50%	140%	88%	50%	140%	69%	50%	140%
Chlordane	8267227		< 0.007	< 0.007	NA	< 0.007	87%	50%	140%	91%	50%	140%	78%	50%	140%
DDE	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	98%	50%	140%	78%	50%	140%
DDD	8267227		< 0.007	< 0.007	NA	< 0.007	94%	50%	140%	94%	50%	140%	84%	50%	140%
DDT	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	87%	50%	140%	78%	50%	140%
Dieldrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	90%	50%	140%	80%	50%	140%
Endrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	76%	50%	140%	82%	50%	140%
Methoxychlor	8267227		< 0.005	< 0.005	NA	< 0.005	76%	50%	140%	82%	50%	140%	96%	50%	140%
Hexachlorobenzene	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	100%	50%	140%	92%	50%	140%
Hexachlorobutadiene	8267227		< 0.01	< 0.01	NA	< 0.01	93%	50%	140%	100%	50%	140%	68%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

AGAT Laboratories

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CLIENT NAME: PETO MACCALLUM LIMITED
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(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17W201248

SOIL ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Apr 10, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-30

DATE REPORTED: 2017-04-10

		SAMPLE DESCRIPTION:		BH5-SS4	BH6-SS3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8288805	8288806
Antimony	µg/g	1.3	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	4
Barium	µg/g	220	2	9	13
Beryllium	µg/g	2.5	0.5	<0.5	<0.5
Boron	µg/g	36	5	<5	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	<0.10	<0.10
Cadmium	µg/g	1.2	0.5	<0.5	0.6
Chromium	µg/g	70	2	5	8
Cobalt	µg/g	21	0.5	1.8	4.0
Copper	µg/g	92	1	8	15
Lead	µg/g	120	1	18	43
Molybdenum	µg/g	2	0.5	<0.5	0.8
Nickel	µg/g	82	1	4	8
Selenium	µg/g	1.5	0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	<0.5	<0.5
Vanadium	µg/g	86	1	11	19
Zinc	µg/g	290	5	180	370
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.098	0.174
Sodium Adsorption Ratio	NA	2.4	NA	0.303	0.509
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.94	8.16

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

8288805-8288806 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Sofiya Pehlyova

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8288806	BH6-SS3	ON T1 S RPI/ICC	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	290	370

AGAT Laboratories

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

Soil Analysis

RPT Date: Apr 10, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8287941		<0.8	<0.8	NA	< 0.8	116%	70%	130%	100%	80%	120%	92%	70%	130%
Arsenic	8287941		4	4	NA	< 1	107%	70%	130%	98%	80%	120%	104%	70%	130%
Barium	8287941		48	47	2.6%	< 2	98%	70%	130%	96%	80%	120%	101%	70%	130%
Beryllium	8287941		<0.5	<0.5	NA	< 0.5	78%	70%	130%	108%	80%	120%	89%	70%	130%
Boron	8287941		<5	<5	NA	< 5	89%	70%	130%	108%	80%	120%	91%	70%	130%
Boron (Hot Water Soluble)	8287941		0.34	0.36	NA	< 0.10	112%	60%	140%	100%	70%	130%	101%	60%	140%
Cadmium	8287941		<0.5	<0.5	NA	< 0.5	89%	70%	130%	100%	80%	120%	103%	70%	130%
Chromium	8287941		13	13	0.0%	< 2	95%	70%	130%	106%	80%	120%	120%	70%	130%
Cobalt	8287941		6.0	6.2	3.3%	< 0.5	102%	70%	130%	108%	80%	120%	108%	70%	130%
Copper	8287941		32	33	3.1%	< 1	94%	70%	130%	110%	80%	120%	115%	70%	130%
Lead	8287941		10	10	0.0%	< 1	101%	70%	130%	101%	80%	120%	99%	70%	130%
Molybdenum	8287941		<0.5	<0.5	NA	< 0.5	101%	70%	130%	103%	80%	120%	103%	70%	130%
Nickel	8287941		13	13	0.0%	< 1	105%	70%	130%	107%	80%	120%	108%	70%	130%
Selenium	8287941		<0.4	<0.4	NA	< 0.4	107%	70%	130%	103%	80%	120%	102%	70%	130%
Silver	8287941		<0.2	<0.2	NA	< 0.2	93%	70%	130%	106%	80%	120%	105%	70%	130%
Thallium	8287941		<0.4	<0.4	NA	< 0.4	86%	70%	130%	102%	80%	120%	103%	70%	130%
Uranium	8287941		<0.5	<0.5	NA	< 0.5	90%	70%	130%	92%	80%	120%	95%	70%	130%
Vanadium	8287941		22	22	0.0%	< 1	100%	70%	130%	106%	80%	120%	124%	70%	130%
Zinc	8287941		53	49	7.8%	< 5	103%	70%	130%	118%	80%	120%	116%	70%	130%
Chromium VI	8284952		<0.2	<0.2	NA	< 0.2	92%	70%	130%	96%	80%	120%	98%	70%	130%
Cyanide	8288805	8288805	<0.040	<0.040	NA	< 0.040	102%	70%	130%	103%	80%	120%	104%	70%	130%
Mercury	8287941		<0.10	<0.10	NA	< 0.10	102%	70%	130%	95%	80%	120%	102%	70%	130%
Electrical Conductivity	8291645		0.428	0.431	0.7%	< 0.005	94%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8287941		0.751	0.761	1.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8285504		7.26	7.23	0.4%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Sofiya Pehlyova

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

O.Reg. 153/04, As Amended, Table 2 Standards (Soil)

(Industrial / Commercial / Community Property Use)

AGAT Laboratories

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CLIENT NAME: PETO MACCALLUM LIMITED
16 FRANKLIN STREET SOUTH
KITCHENER, ON N2C1R4
(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17T199091

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Apr 18, 2017

PAGES (INCLUDING COVER): 6

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

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Certificate of Analysis

AGAT WORK ORDER: 17T199091
PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED
SAMPLING SITE:

ATTENTION TO: Ken Hanes
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH5-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276150	8276151
Antimony	µg/g	40	0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	5	6
Barium	µg/g	670	2	15	45	48
Beryllium	µg/g	8	0.5	<0.5	<0.5	<0.5
Boron	µg/g	120	5	6	6	<5
Boron (Hot Water Soluble)	µg/g	2	0.10	0.17	0.23	0.27
Cadmium	µg/g	1.9	0.5	<0.5	0.7	0.6
Chromium	µg/g	160	2	8	13	13
Cobalt	µg/g	80	0.5	1.9	4.4	4.9
Copper	µg/g	230	1	8	11	11
Lead	µg/g	120	1	40	62	53
Molybdenum	µg/g	40	0.5	0.6	0.9	0.5
Nickel	µg/g	270	1	5	10	10
Selenium	µg/g	5.5	0.4	<0.4	0.4	0.5
Silver	µg/g	40	0.2	<0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	<0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	0.5	0.5	0.5
Vanadium	µg/g	86	1	11	22	24
Zinc	µg/g	340	5	182	313	254
Chromium VI	µg/g	8	0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	0.177	0.233	0.173
Sodium Adsorption Ratio	NA	12	NA	0.125	0.142	0.053
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.74	6.90	7.07

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON T2 S ICC CT

8276142-8276151 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Amanjot Bhela

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Certificate of Analysis

AGAT WORK ORDER: 17T199091
PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED
SAMPLING SITE:

ATTENTION TO: Ken Hanes
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-03-23

DATE REPORTED: 2017-04-18

		SAMPLE DESCRIPTION:		BH4-SS1	BH6-SS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8276142	8276151
Hexachloroethane	µg/g	0.21	0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.056	0.005	<0.005	<0.005
Heptachlor	µg/g	0.19	0.005	<0.005	<0.005
Aldrin	µg/g	0.088	0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005
Endosulfan	µg/g	0.3	0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007
DDE	µg/g	0.52	0.007	<0.007	<0.007
DDD	µg/g	4.6	0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007
Dieldrin	µg/g	0.088	0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005
Methoxychlor	µg/g	1.6	0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.66	0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.031	0.01	<0.01	<0.01
Moisture Content	%		0.1	33.0	6.7
Surrogate	Unit	Acceptable Limits			
TCMX	%	50-140		70	66
Decachlorobiphenyl	%	60-130		72	88

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON T2 S ICC CT

8276142-8276151 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By: N Popnikolof

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Soil Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8272855		3.6	3.6	NA	< 0.8	126%	70%	130%	105%	80%	120%	96%	70%	130%
Arsenic	8272855		9	7	25.0%	< 1	108%	70%	130%	105%	80%	120%	103%	70%	130%
Barium	8272855		76	75	1.3%	< 2	101%	70%	130%	98%	80%	120%	101%	70%	130%
Beryllium	8272855		<0.5	<0.5	NA	< 0.5	83%	70%	130%	105%	80%	120%	89%	70%	130%
Boron	8272855		6	6	NA	< 5	82%	70%	130%	107%	80%	120%	93%	70%	130%
Boron (Hot Water Soluble)	8272855		0.41	0.42	NA	< 0.10	112%	60%	140%	103%	70%	130%	99%	60%	140%
Cadmium	8272855		0.8	0.8	NA	< 0.5	110%	70%	130%	106%	80%	120%	105%	70%	130%
Chromium	8272855		18	18	0.0%	< 2	96%	70%	130%	114%	80%	120%	112%	70%	130%
Cobalt	8272855		5.5	5.5	0.0%	< 0.5	102%	70%	130%	110%	80%	120%	99%	70%	130%
Copper	8272855		63	62	1.6%	< 1	101%	70%	130%	117%	80%	120%	85%	70%	130%
Lead	8272855		190	197	3.6%	< 1	105%	70%	130%	101%	80%	120%	70%	70%	130%
Molybdenum	8272855		1.3	1.3	NA	< 0.5	107%	70%	130%	103%	80%	120%	105%	70%	130%
Nickel	8272855		24	25	4.1%	< 1	103%	70%	130%	112%	80%	120%	100%	70%	130%
Selenium	8272855		0.9	1.0	NA	< 0.4	128%	70%	130%	99%	80%	120%	106%	70%	130%
Silver	8272855		<0.2	<0.2	NA	< 0.2	98%	70%	130%	115%	80%	120%	110%	70%	130%
Thallium	8272855		<0.4	<0.4	NA	< 0.4	103%	70%	130%	104%	80%	120%	98%	70%	130%
Uranium	8272855		<0.5	<0.5	NA	< 0.5	98%	70%	130%	93%	80%	120%	95%	70%	130%
Vanadium	8272855		20	20	0.0%	< 1	99%	70%	130%	109%	80%	120%	109%	70%	130%
Zinc	8272855		205	199	3.0%	< 5	102%	70%	130%	117%	80%	120%	84%	70%	130%
Chromium VI	8277762		<0.2	<0.2	NA	< 0.2	93%	70%	130%	98%	80%	120%	100%	70%	130%
Cyanide	8278916		<0.040	<0.040	NA	< 0.040	102%	70%	130%	108%	80%	120%	94%	70%	130%
Mercury	8272855		0.15	0.17	NA	< 0.10	100%	70%	130%	88%	80%	120%	93%	70%	130%
Electrical Conductivity	8277893		0.376	0.369	1.9%	< 0.005	93%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8276363		0.057	0.053	7.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8277854		7.37	7.42	0.7%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Amanjot Bhela

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Apr 18, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8267227		< 0.01	< 0.01	NA	< 0.01	82%	50%	140%	96%	50%	140%	64%	50%	140%
Gamma-Hexachlorocyclohexane	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	78%	50%	140%	66%	50%	140%
Heptachlor	8267227		< 0.005	< 0.005	NA	< 0.005	80%	50%	140%	90%	50%	140%	80%	50%	140%
Aldrin	8267227		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	94%	50%	140%	68%	50%	140%
Heptachlor Epoxide	8267227		< 0.005	< 0.005	NA	< 0.005	90%	50%	140%	96%	50%	140%	82%	50%	140%
Endosulfan	8267227		< 0.005	< 0.005	NA	< 0.005	89%	50%	140%	88%	50%	140%	69%	50%	140%
Chlordane	8267227		< 0.007	< 0.007	NA	< 0.007	87%	50%	140%	91%	50%	140%	78%	50%	140%
DDE	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	98%	50%	140%	78%	50%	140%
DDD	8267227		< 0.007	< 0.007	NA	< 0.007	94%	50%	140%	94%	50%	140%	84%	50%	140%
DDT	8267227		< 0.007	< 0.007	NA	< 0.007	88%	50%	140%	87%	50%	140%	78%	50%	140%
Dieldrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	90%	50%	140%	80%	50%	140%
Endrin	8267227		< 0.005	< 0.005	NA	< 0.005	84%	50%	140%	76%	50%	140%	82%	50%	140%
Methoxychlor	8267227		< 0.005	< 0.005	NA	< 0.005	76%	50%	140%	82%	50%	140%	96%	50%	140%
Hexachlorobenzene	8267227		< 0.005	< 0.005	NA	< 0.005	92%	50%	140%	100%	50%	140%	92%	50%	140%
Hexachlorobutadiene	8267227		< 0.01	< 0.01	NA	< 0.01	93%	50%	140%	100%	50%	140%	68%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: N Popnikolof

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17T199091

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

AGAT Laboratories

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MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
http://www.agatlabs.com

CLIENT NAME: PETO MACCALLUM LIMITED
16 FRANKLIN STREET SOUTH
KITCHENER, ON N2C1R4
(519) 893-7500

ATTENTION TO: Ken Hanes

PROJECT: 17KF002

AGAT WORK ORDER: 17W201248

SOIL ANALYSIS REVIEWED BY: Sofka Pehlyova, Senior Analyst

DATE REPORTED: Apr 10, 2017

PAGES (INCLUDING COVER): 5

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
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http://www.agatlabs.com

Certificate of Analysis

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-03-30

DATE REPORTED: 2017-04-10

		SAMPLE DESCRIPTION:		BH5-SS4	BH6-SS3
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		2017-03-21	2017-03-21
Parameter	Unit	G / S	RDL	8288805	8288806
Antimony	µg/g	40	0.8	<0.8	<0.8
Arsenic	µg/g	18	1	3	4
Barium	µg/g	670	2	9	13
Beryllium	µg/g	8	0.5	<0.5	<0.5
Boron	µg/g	120	5	<5	<5
Boron (Hot Water Soluble)	µg/g	2	0.10	<0.10	<0.10
Cadmium	µg/g	1.9	0.5	<0.5	0.6
Chromium	µg/g	160	2	5	8
Cobalt	µg/g	80	0.5	1.8	4.0
Copper	µg/g	230	1	8	15
Lead	µg/g	120	1	18	43
Molybdenum	µg/g	40	0.5	<0.5	0.8
Nickel	µg/g	270	1	4	8
Selenium	µg/g	5.5	0.4	<0.4	<0.4
Silver	µg/g	40	0.2	<0.2	<0.2
Thallium	µg/g	3.3	0.4	<0.4	<0.4
Uranium	µg/g	33	0.5	<0.5	<0.5
Vanadium	µg/g	86	1	11	19
Zinc	µg/g	340	5	180	370
Chromium VI	µg/g	8	0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040
Mercury	µg/g	3.9	0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	1.4	0.005	0.098	0.174
Sodium Adsorption Ratio	NA	12	NA	0.303	0.509
pH, 2:1 CaCl2 Extraction	pH Units		NA	7.94	8.16

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to ON T2 S ICC CT

8288805-8288806 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By: Sofiya Pehlyova

AGAT Laboratories

Guideline Violation

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

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CLIENT NAME: PETO MACCALLUM LIMITED

ATTENTION TO: Ken Hanes

SAMPLEID	SAMPLE TITLE	GUIDELINE	ANALYSIS PACKAGE	PARAMETER	UNIT	GUIDEVALUE	RESULT
8288806	BH6-SS3	ON T2 S ICC CT	O. Reg. 153(511) - Metals & Inorganics (Soil)	Zinc	µg/g	340	370

AGAT Laboratories

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Quality Assurance

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

SAMPLING SITE:

SAMPLED BY:H. Shinwary

Soil Analysis

RPT Date: Apr 10, 2017			DUPLICATE				REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Method Blank	Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - Metals & Inorganics (Soil)															
Antimony	8287941		<0.8	<0.8	NA	< 0.8	116%	70%	130%	100%	80%	120%	92%	70%	130%
Arsenic	8287941		4	4	NA	< 1	107%	70%	130%	98%	80%	120%	104%	70%	130%
Barium	8287941		48	47	2.6%	< 2	98%	70%	130%	96%	80%	120%	101%	70%	130%
Beryllium	8287941		<0.5	<0.5	NA	< 0.5	78%	70%	130%	108%	80%	120%	89%	70%	130%
Boron	8287941		<5	<5	NA	< 5	89%	70%	130%	108%	80%	120%	91%	70%	130%
Boron (Hot Water Soluble)	8287941		0.34	0.36	NA	< 0.10	112%	60%	140%	100%	70%	130%	101%	60%	140%
Cadmium	8287941		<0.5	<0.5	NA	< 0.5	89%	70%	130%	100%	80%	120%	103%	70%	130%
Chromium	8287941		13	13	0.0%	< 2	95%	70%	130%	106%	80%	120%	120%	70%	130%
Cobalt	8287941		6.0	6.2	3.3%	< 0.5	102%	70%	130%	108%	80%	120%	108%	70%	130%
Copper	8287941		32	33	3.1%	< 1	94%	70%	130%	110%	80%	120%	115%	70%	130%
Lead	8287941		10	10	0.0%	< 1	101%	70%	130%	101%	80%	120%	99%	70%	130%
Molybdenum	8287941		<0.5	<0.5	NA	< 0.5	101%	70%	130%	103%	80%	120%	103%	70%	130%
Nickel	8287941		13	13	0.0%	< 1	105%	70%	130%	107%	80%	120%	108%	70%	130%
Selenium	8287941		<0.4	<0.4	NA	< 0.4	107%	70%	130%	103%	80%	120%	102%	70%	130%
Silver	8287941		<0.2	<0.2	NA	< 0.2	93%	70%	130%	106%	80%	120%	105%	70%	130%
Thallium	8287941		<0.4	<0.4	NA	< 0.4	86%	70%	130%	102%	80%	120%	103%	70%	130%
Uranium	8287941		<0.5	<0.5	NA	< 0.5	90%	70%	130%	92%	80%	120%	95%	70%	130%
Vanadium	8287941		22	22	0.0%	< 1	100%	70%	130%	106%	80%	120%	124%	70%	130%
Zinc	8287941		53	49	7.8%	< 5	103%	70%	130%	118%	80%	120%	116%	70%	130%
Chromium VI	8284952		<0.2	<0.2	NA	< 0.2	92%	70%	130%	96%	80%	120%	98%	70%	130%
Cyanide	8288805	8288805	<0.040	<0.040	NA	< 0.040	102%	70%	130%	103%	80%	120%	104%	70%	130%
Mercury	8287941		<0.10	<0.10	NA	< 0.10	102%	70%	130%	95%	80%	120%	102%	70%	130%
Electrical Conductivity	8291645		0.428	0.431	0.7%	< 0.005	94%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8287941		0.751	0.761	1.3%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8285504		7.26	7.23	0.4%	NA	100%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.
Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: Sofiya Pehlyova

AGAT Laboratories

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Method Summary

CLIENT NAME: PETO MACCALLUM LIMITED

AGAT WORK ORDER: 17W201248

PROJECT: 17KF002

ATTENTION TO: Ken Hanes

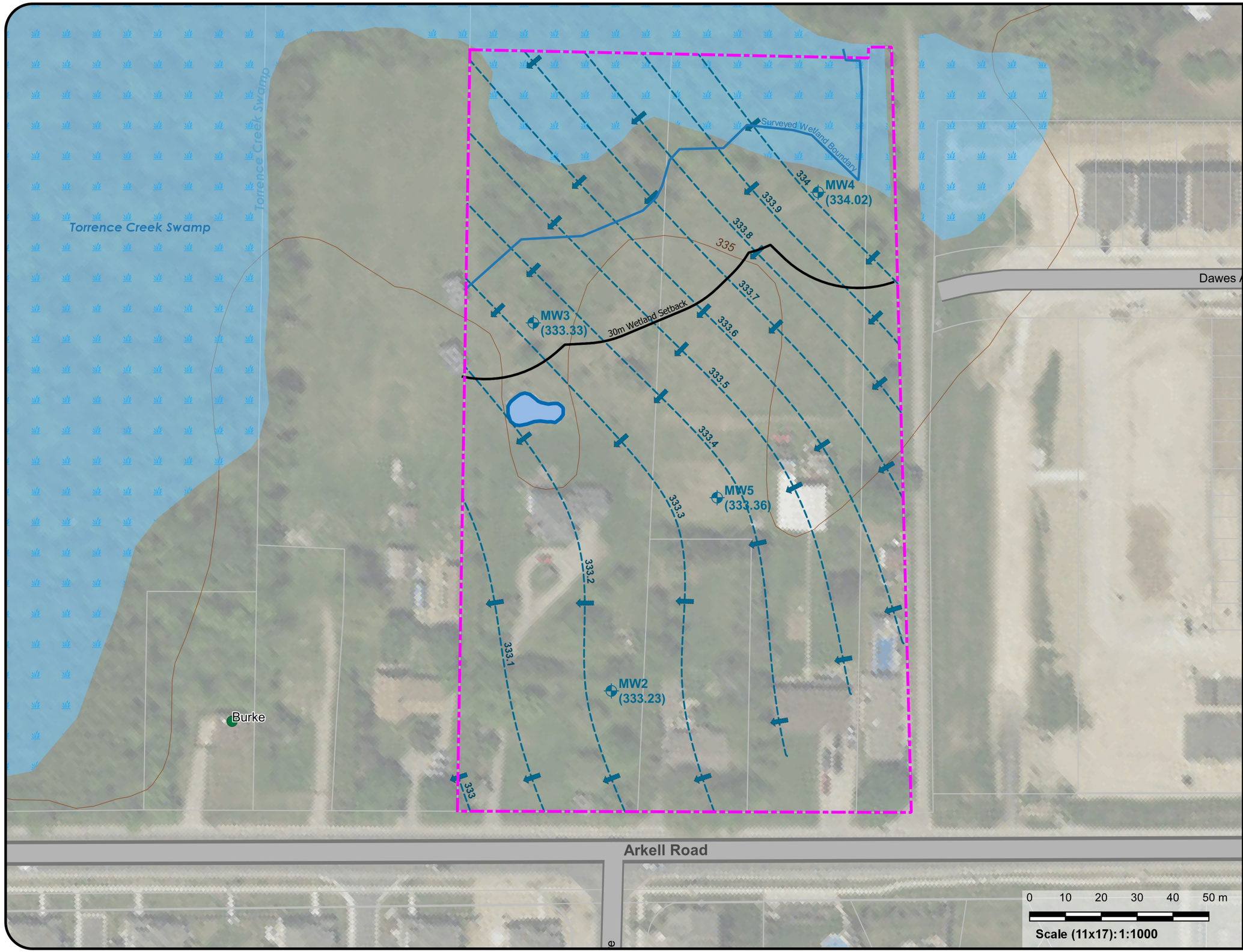
SAMPLING SITE:

SAMPLED BY:H. Shinwary

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A;SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER

Appendix F

Seasonal High GW



NORTH

PROJECT NORTH

Legend

- Subject Lands
- Study Area (500m)
- Municipal Well (GRCA)
- Monitoring Well (Groundwater Elevation (mamsl))
- Seasonal High Groundwater Elevation Contour (mamsl) & Flow Direction (May 6, 2017)

Surface Water

- Surface Water Body
- Watercourse
- Provincally Significant Wetland (GRCA)

Ground Surface Elevation Contour (mamsl)

- Major Contour (10m)
- Minor Contour (5m)

Data Sources:

Contains information licensed under the Open Government License Ontario.

Contains Information made available under Grand River Conservation Authority's Open Data Licence v2.0

South Central Ontario Orthophotography Project (2018). Source: Data provided by Ontario Ministry of Natural Resources and Forestry. ©

Project CRS: NAD83 / UTM zone 17N

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

Client: Crescent Homes Ltd.

Project: Hydrogeological Assessment

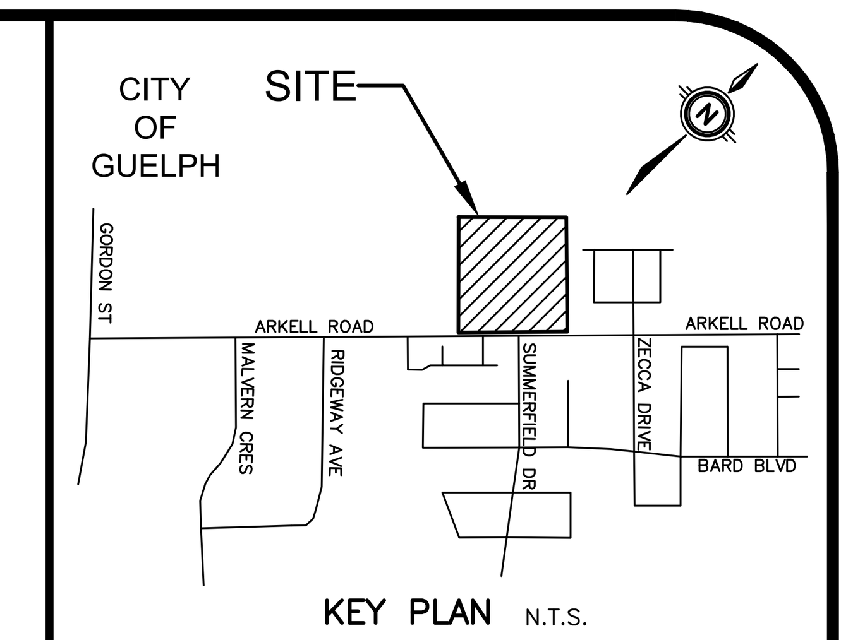
Site: 190-216 Arkell Road, Guelph

Title: Seasonal High Groundwater Flow Interpretation (May 6, 2017)

Reviewed By	PAG		
Prepared By	KLW	Project No	42063-200
Drawn By	KLW	Figure No	9B
Date	November 2021		

Project No: 42063-200 Q:\42063\1041Hydrogeology\42063-104 QGIS.qgs
GWR2.9B
November 08, 2021 - 09:27 - Plotted By: KWallace

Drawings



GEODETIC BM ELEV. =335.455m
CITY OF GUELPH
#255 BURKE WELL PUMP HOUSE

SITE BENCHMARK ELEV. =335.455m
SEE ABOVE

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.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	JUN.28/24
3.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	MAY 4/23
2.	REISSUED FOR DRAFT PLAN APPROVAL	DFH	DEC.03/21
1.	ISSUED FOR DRAFT PLAN APPROVAL	IKC	APR.3/20

MTE
Engineers, Scientists, Surveyors
519-743-6500

OWNER
CRESCENT HAVEN HOMES INC.
180 FROBISHER DRIVE UNIT 3 WATERLOO

PROJECT
ARKELL ROAD PROPERTIES
216 ARKELL ROAD GUELPH

DRAWING
EXISTING CONDITIONS PLAN

Project Manager K.HANES	Project No. 42063-104
Design By CJC/AJC	Checked By VAL
Drawn By SXP/KAT	Checked By CVP
Surveyed By MTE	Drawing No. EC1.1
Date Dec.04/19	
Scale 1:400	Sheet 1 of 3

LEGEND

- SITE BOUNDARY
- EXISTING CONTOURS (326)
- EXISTING CURB (Ex. Drop Curb)
- EXISTING DRIPLINE
- 10m DRIPLINE SETBACK
- WETLAND BOUNDARY
- 30m WETLAND SETBACK
- PROPOSED SPOT ELEVATIONS (326.00) EX =MAINTAIN EXISTING HP =HIGH POINT LP =LOW POINT
- DIRECTION OF DRAINAGE/SWALE (1.0% 1.0%)
- PROPOSED EMBANKMENT (TOP) 3:1 (BOTTOM)
- MAJOR OVERLAND FLOW ROUTE
- DEPRESSED CURB
- PROPOSED 300mmø GABION MAT
- PROPOSED RETAINING WALL

DAWES AVENUE

BLOCK 20 OPEN SPACE

EX. SWM FACILITY

FUTURE ROAD CONNECTION TO DAWES AVENUE

MATCH INTO TOP OF EX. BERM OF EX. SWM FACILITY

TOP OF BERM = 336.15m

MATCH INTO EX. GRADE

PROPOSED 3.0m TRAIL

EXTEND PROPOSED SIDEWALK TO EX. BUS PAD

EX. CSW

EX BUS PAD (APPROX)

PROPOSED SIDEWALK

APPROX. LOCATION OF 40.0m x 3.0m x 1.0m DEEP INFILTRATION GALLERY

N 47°29'00" W

N 44°32'00" E 6.40

N45°05'28"W 3.048

N 45°05'00" W 115.158

Blk. 6 Servicing Corridor 0.004ha

Blk. 1 Multiple Residential 0.706ha

Amenity Area

Blk. 5 Open Space 0.862ha

Multiple Blk. 2 Residential 0.220ha

Blk. 4 Stormwater Management 0.232ha

Blk. 3 Multiple Residential 0.136ha

Blk. 7 Road Widening 0.063ha

STREET A

ARKELL ROAD

SUMMERFIELD DRIVE

BLOCK 1 LAYOUT AND PROPOSED GRADING TO BE CONFIRMED AND FINALIZED DURING SITE PLAN APPLICATION PROCESS

BLOCK 2 LAYOUT AND PROPOSED GRADING TO BE CONFIRMED AND FINALIZED DURING SITE PLAN APPLICATION PROCESS

GRADES TO BE RAISED TO ENSURE POSITIVE DRAINAGE WITHIN FUTURE ROW

MAJOR OVERLAND FLOW ROUTE FOR BLOCK 1

MAJOR OVERLAND FLOW ROUTE FOR BLOCK 2

DEPRESSED CURB

PROPOSED APPROX. 62m RETAINING WALL, MAX. 1.7m HIGH.

PROPOSED APPROX. 43m RETAINING WALL, MAX. 2.1m HIGH.

INFILTRATION CELL

WET CELL

FUTURE INFILTRATION GALLERY

MH106 MH1 MH1A MH2 MH2A MH3 MH3A MH4 MH4A MH5 MH6 MH7 MH8 MH9 MH10 MH10A MH10B MH101A MH102A MH103A MH104A MH201A MH202A

CB101 CB102 CB103 CB104 CB201 CB6.1 CB6.2 CB11.1 CBMH11 CBMH102 CBMH104

DCB105 DCB1 DCB2 DCB2.1 DCB5.1 DCB5.2

OGS9 OGS12

HW07 HW10 HW10.1 HW10.2

10m DRIPLINE SETBACK

LIMIT OF WETLAND (APPROX.)

Ex. 200mmø SAN. Ex. 250mmø SAN. Ex. 300mmø SAN. Ex. 400mmø SAN. Ex. 200mmø WM Ex. 250mmø STM Ex. 300mmø STM Ex. 400mmø STM

SECTION A–A
NTS

BLOCK 5 Open Space – 30m WETLAND SETBACK | BLOCK 2 Multiple Residential | PROP BUILDING

PROP P/L — VARIES — 5.00m MIN.

3.0% — 3:1 — TOP OF EMBANKMENT

EX. GRADE

PROPOSED RETAINING WALL, MAX 1.7m HIGH. WALLSTONE GRANDE OR APPROVED EQUIVALENT.

0.75m

SECTION B–B
NTS

P/L WALL FACE — VARIES 0.15m – 1.5m MIN. — PROPOSED PARKING LOT 0.6% — 3:1

EX. GRADE

PROPOSED RETAINING WALL, MAX 2.1m HIGH. WALLSTONE GRANDE OR APPROVED EQUIVALENT.

0.75m

CITY OF GUELPH — SITE

ARKELL ROAD — ARKELL ROAD — GORDON ST — VILLAGE GREEN DR — SUMMERFIELD DR — TESCA DRIVE — BARD BLVD

KEY PLAN N.T.S.

GEODETIC BM ELEV. = 335.455m
CITY OF GUELPH
#255 BURKE WELL PUMP HOUSE

SITE BENCHMARK ELEV. = 335.455m
SEE ABOVE

NOTE TO CONTRACTOR :

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8.			
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3.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	MAY 4/23
2.	REISSUED FOR DRAFT PLAN APPROVAL	DFH	DEC.3/21
1.	ISSUED FOR DRAFT PLAN APPROVAL	IXC	JAN.10/20

MTE
Engineers, Scientists, Surveyors
519-743-6500

OWNER
CRESCENT HAVEN HOMES INC.
180 FROBISHER DRIVE UNIT 3 WATERLOO

PROJECT
ARKELL ROAD PROPERTIES
216 ARKELL ROAD GUELPH

DRAWING
AREA GRADING PLAN

Project Manager K.HANES	Project No. 42063-104
Design By AJC/BDS	Checked By VAL
Drawn By SXP/KAT	Checked By AJC
Surveyed By MTE	Drawing No. AG1.1
Date Mar.30/20	
Scale 1:400	Sheet 2 of 3

P:\P\42063\104\42063-104-AG1

MTE FILE PATH:

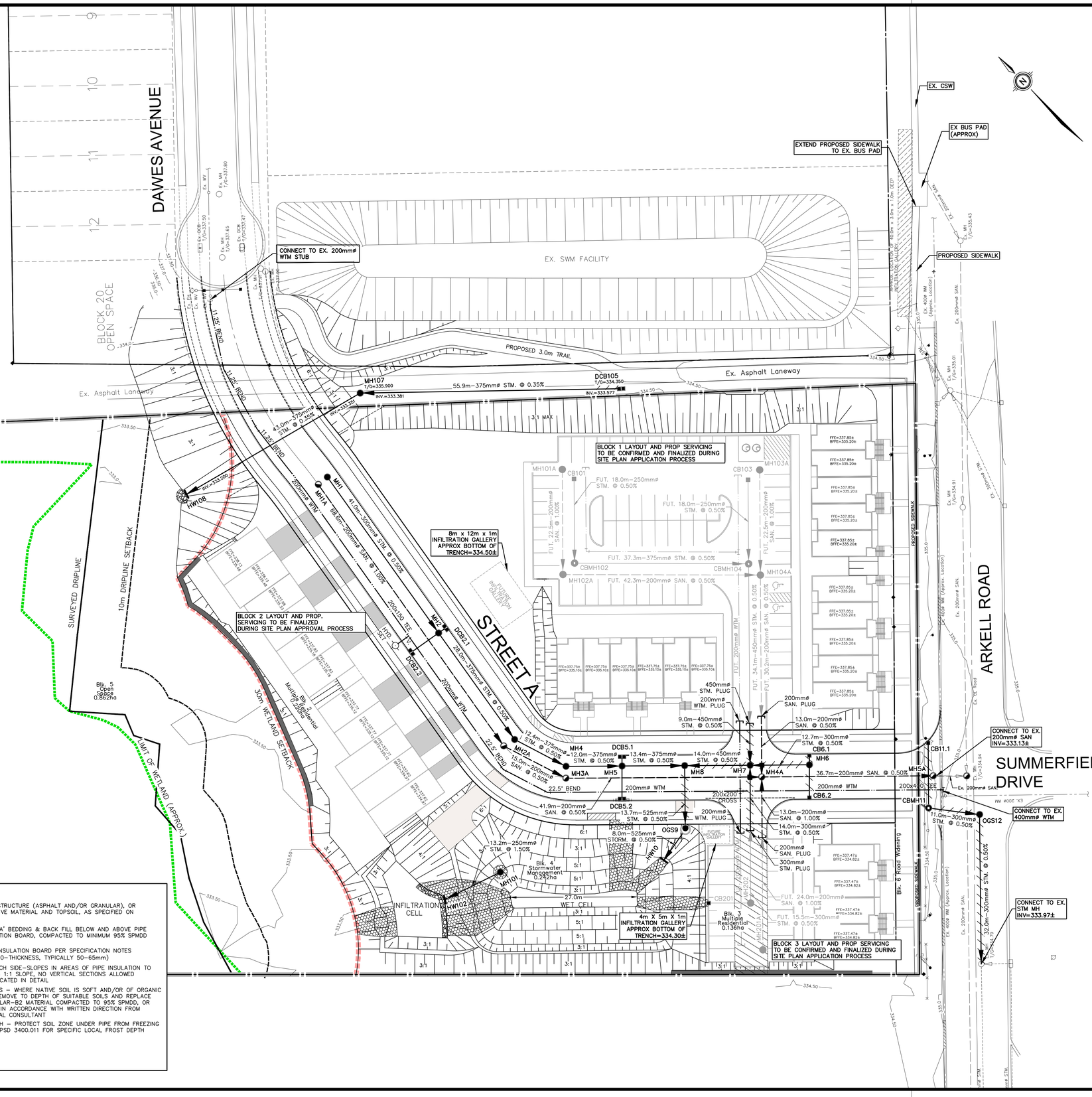
June 18, 2024 – 11:33:24 AM – Plotted By: Gemma Cabral-Gushue

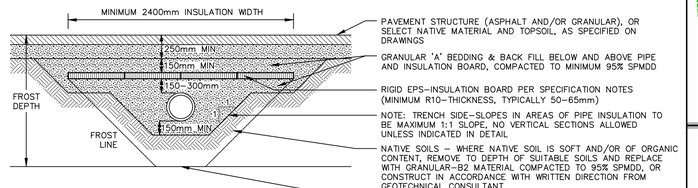
P:\P\42063\104\42063-104-GP1

MTE FILE PATH:

LEGEND

- SITE BOUNDARY
- WETLAND BOUNDARY
- 30m WETLAND SETBACK
- SURVEYED DRIPLINE
- 10m DRIPLINE SETBACK
- EXISTING CONTOURS
- EXISTING CURB
- EXISTING DRIPLINE
- EXISTING SANITARY SEWER
- EXISTING WATERMAIN
- EXISTING STORM SEWER
- PROPOSED SANITARY SEWER
- PROPOSED STORM SEWER
- PROPOSED WATERMAIN
- FUTURE SANITARY SEWER
- FUTURE STORM SEWER
- FUTURE WATERMAIN
- PROPOSED EMBANKMENT (SLOPE AS NOTED)
- PROPOSED SHALLOW PIPE INSULATION (SEE DETAIL)
- PROPOSED 300mmø GABION MAT
- PROPOSED RETAINING WALL





PAVEMENT STRUCTURE (ASPHALT AND/OR GRANULAR), OR SELECT NATIVE MATERIAL AND TOPSOIL, AS SPECIFIED ON DRAWINGS

GRANULAR 'A' BEDDING & BACK FILL BELOW AND ABOVE PIPE AND INSULATION BOARD, COMPACTED TO MINIMUM 95% SPMDD

RIGID EPS–INSULATION BOARD PER SPECIFICATION NOTES (MINIMUM R10–THICKNESS, TYPICALLY 50–65mm)

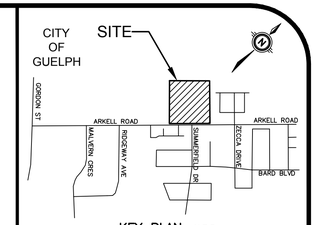
NOTE: TRENCH SIDE–SLOPES IN AREAS OF PIPE INSULATION TO BE MAXIMUM 1:1 SLOPE, NO VERTICAL SECTIONS ALLOWED UNLESS INDICATED IN DETAIL

NATIVE SOILS – WHERE NATIVE SOIL IS SOFT AND/OR OF ORGANIC CONTENT, REMOVE TO DEPTH OF SUITABLE SOILS AND REPLACE WITH GRANULAR–B2 MATERIAL COMPACTED TO 95% SPMDD, OR CONSTRUCT IN ACCORDANCE WITH WRITTEN DIRECTION FROM GEOTECHNICAL CONSULTANT

FROST DEPTH – PROTECT SOIL ZONE UNDER PIPE FROM FREEZING REFER TO OPSD 3400.011 FOR SPECIFIC LOCAL FROST DEPTH

SHALLOW SEWER PIPE INSULATION DETAIL

FOR SEWER PIPES HAVING LESS THAN 1400mm COVER AND MINIMUM 615mm COVER
N.T.S.



KEY PLAN N.T.S.

GEODETIC BM ELEV. = 335.455m
CITY OF GUELPH
#255 BURKE WELL PUMP HOUSE

SITE BENCHMARK ELEV. = 335.455m
SEE ABOVE

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.

THE OWNER/ARCHITECT/CONTRACTOR IS ADVISED THAT M.T.E. CONSULTANTS INC. CANNOT CERTIFY ANY COMPONENT OF THE SITE WORKS NOT INSPECTED DURING CONSTRUCTION. IT IS THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO NOTIFY M.T.E. CONSULTANTS INC. PRIOR TO COMMENCEMENT OF CONSTRUCTION TO ARRANGE FOR INSPECTION.

No.	REVISION	BY	DATE
8.			
7.			
6.			
5.			
4.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	JUN.28/24
3.	REISSUED FOR DRAFT PLAN APPROVAL	KDH	MAY 4/23
2.	REISSUED FOR DRAFT PLAN APPROVAL	DFH	DEC.3/21
1.	ISSUED FOR DRAFT PLAN APPROVAL	IKC	APR.03/20

MTE
Engineers, Scientists, Surveyors
519-743-6500

OWNER
CRESCENT HAVEN HOMES INC.
180 FROBISHER DRIVE UNIT 3 WATERLOO

PROJECT
ARKELL ROAD PROPERTIES
216 ARKELL ROAD GUELPH

DRAWING
GENERAL PLAN OF SERVICES

Project Manager K.HANES	Project No. 42063-104
Design By AJC/BDS	Checked By VAL
Drawn By SXP/KAT	Checked By AJC
Surveyed By MTE	Drawing No. GP1.1
Date Mar.25/20	
Scale 1:400	Sheet 3 of 3

June 18, 2024 – 11:34:54 AM – Plotted By: Gemma Cabral-Gushue