7370 Centre Road, Uxbridge

Functional Servicing and Stormwater Management Report

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SUBMISSION HISTORY

Submission	Date	In Support Of	Distributed To
1st	March 2021	Draft Plan Approval	Township of Uxbridge, LSRCA, Region of Durham
2nd	February 2023	Draft Plan Approval	Township of Uxbridge, LSRCA, Region of Durham

1.0 INTRODUCTION

SCS Consulting Group Ltd. has been retained by Bridgebrook Corp. to prepare a Functional Servicing and Stormwater Report (FSSR) for a proposed residential development located at 7370 Centre Road North, north of Bolton Drive within the Township of Uxbridge.

1.1 Purpose of the Functional Servicing Report

The FSSR has been prepared in support of the Draft Plan of Subdivision application for the proposed development. The Draft Plan of Subdivision is provided in **Appendix A**. The proposed development consists of the following land uses:

- low density residential (464 units),
- medium density residential (60 units),
- parks,
- natural heritage system (NHS),
- Stormwater Management (SWM) blocks, and
- Proposed roads and laneways.

The purpose of this report is to demonstrate that the development can be graded and serviced in accordance with the Township of Uxbridge, Lake Simcoe Region Conservation Authority (LSRCA), Region of Durham, and the Ministry of Environment, Conservation and Parks (MECP) design criteria.

1.2 Study Area

The study area is approximately 39.9 ha in size and is bound by 6th Concession Road to the west, Centre Road North to the east, existing residential development to the south (Quaker Village) and existing agricultural lands to the north (see **Figure 1.1**).

The existing lands are comprised of agricultural land and NHS areas. The proposed development is located within the Uxbridge Brook Subwatershed in the Township of Uxbridge.

1.3 Background Servicing Information

In preparation of the servicing and SWM strategies, the following design guidelines and standards were used:

- Design Criteria and Standard Detail Drawings for Subdivision Developments and Site Plans, Town of Uxbridge (2016);
- Design Specifications for Engineering Submissions, Regional Municipality of Durham (April 2020);
- LSRCA Technical Guidelines for Stormwater Management Submissions, LSRCA (June 2016);
- Low Impact Development Stormwater Management Planning and Design Guide, Credit Valley Conservation & Toronto and Region Conservation (2010);
- Phosphorus Offsetting Policy, Lake Simcoe Region Conservation Authority (May 2019);
- Design Guidelines for Sewage Works, MOE (2008);

- Ministry of Environment, Conservation and Parks (MECP) Stormwater Management Planning and Design Manual (March 2003); and
- Ministry of Transportation (MTO) Drainage Management Manual (1997).

The site servicing and SWM strategies in this report are based on the following reports for this Draft Plan of Subdivision:

- Geotechnical Investigation, Proposed Residential Development, 7370 Centre Road, prepared by Soil Engineers Ltd., dated February 16, 2018;
- Hydrogeological Investigation, Water Balance and Catchment Based Water Balance, 7370 Centre Road, prepared by Beacon Environmental, dated March 2021; and
- Environmental Impact Study, 7370 Centre Road, prepared by Beacon Environmental, dated March 2021; and
- Geomorphic Assessment, 7370 Centre Road, prepared by Beacon, dated March 2020.

The servicing and SWM strategies are also based on the following approved Engineering Drawings:

- Drawing P01 – Oakside Drive Sta. -0+10 to 2+50, Mason Homes, October 2004, prepared by Roberts Bell Engineering Ltd.;
- Drawing SAN –Sanitary Drainage Area Plan, Mason Homes, September 2004, prepared by Roberts Bell Engineering Ltd.;
- Drawing G-102 – General Plan Quaker Village Phase 2, September 1987, prepared by G.M. Sernas & Associates Ltd.;
- Drawing P-101 – Bolton Drive Sta. 0+000 to 0+200.0, Quaker Village Phase 2, September 1987, prepared by G.M. Sernas & Associates Ltd.;
- Drawing P-102 – Bolton Drive Sta. 0+200.0 to 0+396.080, Quaker Village Phase 2, September 1987, prepared by G.M. Sernas & Associates Ltd.;
- Drawing G-202 – General Plan Quaker Village Phase 5, September 1997, prepared by G.M. Sernas & Associates Ltd.;
- Drawing G-102B – Storm Drainage Area Plan, Quaker Village Phase 5, September 1997, prepared by G.M. Sernas & Associates Ltd.; and
- Township of Uxbridge Water Supply System Map, March 22, 2019.

Excerpts from the above listed documents are included in **Appendix B**.

A Rainscaping charrette with the Township of Uxbridge and the LSRCA was held on August 25, 2020, which confirmed the following low impact development (LID) measures would be acceptable to be considered for use in this proposed development:

Public LIDs:

- Surface infiltration facilities (bioswales/rain gardens) within the boulevards of municipal roads with no driveways, and within parks;
- Rear-yard at-surface infiltration trenches;
- Catchbasin infiltration/filtration trenches;
- Surface infiltration facilities may be used within the buffer area along the back of lots;
- Underground active storage facility; and

- Downstream Infiltration/filtration facilities.

Preliminary design input and operations and maintenance concerns were provided as part of the Rainscaping charrette process and were incorporated into the LID design outlined in the relevant report sections below. Excerpts from the Rainscaping meeting minutes are included in **Appendix B**.

1.4 Site Phasing

The proposed development may proceed as two separate phases with the first phase comprised of the lots east of the NHS and the second phase west of the NHS. The servicing of the subdivision phases will be discussed in greater detail below.

2.0 STORMWATER MANAGEMENT

2.1 Stormwater Runoff Control Criteria

The following stormwater runoff control criteria have been established based on the greatest requirements of each of the design guidelines and standards listed in **Section 1.3**. The stormwater runoff criteria are summarized below in **Table 2.1**:

Table 2.1 – Stormwater Runoff Control Criteria

Criteria	Control Measure
Quantity Control	Control proposed peak flows to existing peak flows for the 2 through 100 year storm events (MECP).
Quality Control	Provide MECP Enhanced (Level 1) Protection for 80% TSS Removal (MECP).
Erosion Control	Detention of the 40 mm storm event for a minimum of 24 hours (Uxbridge).
Volume Control	On-site retention of the 25 mm rainfall runoff (treatment alternatives to be used as necessary as outlined in LSRCA Guidelines).
Water Budget	Where feasible, measures to minimize development impacts on the water balance to be incorporated into the development design (i.e. infiltration measures) (LSRCA).
Phosphorus Budget	The target is “zero” export from development. Minimum 90% Phosphorus to be removed through mitigation (Mitigated vs Unmitigated) (Uxbridge). Any remaining phosphorus exported from the site will be compensated as outlined in the LSRCA Phosphorus Offsetting Policy (LSRCA).

For the purposes of this FSSR, the portion of the proposed development west of the NHS and the portion of the development east of the NHS will meet quantity control, quality control and erosion control individually for their respective development areas. The volume control, water budget, and phosphorus budget will be calculated based on the entire proposed development.

At detailed design, if the proposed development is phased, each phase will meet quantity control, quality control, erosion control, and water budget individually for their respective development areas. The volume control and phosphorus budget will continue to be calculated based on the entire proposed development.

2.2 Existing Drainage

As shown on **Figure 2.1**, the majority of runoff from Catchment 101 is conveyed southeast to a tributary of the Uxbridge Brook running through it. Flows in the tributary are controlled by an upstream existing SWM Pond located in the subdivision immediately south of the proposed development (Quaker Village SWM Pond) which outlets north through a storm sewer under

Bolton Drive. Drainage from the tributary is then conveyed east through a concrete box culvert underneath Centre Road North.

Runoff from a portion of Catchment 101 is directed south towards an existing crushed CSP culvert which conveys flows underneath the existing access road to the south portion of the NHS and the Uxbridge Brook tributary. An existing RLCB in the Quaker Village Subdivision has been sized to capture minor system (5 year) flows from 7.9 ha of the existing site (runoff coefficient 0.25) and convey them to the Quaker Village Subdivision SWM Pond (refer to Drawing G-102B in **Appendix B**).

Runoff from Catchment 102 is conveyed northeast to an existing CSP culvert under Centre Road which outlets to a swale draining east through the adjacent property and ultimately to a tributary of the Uxbridge Brook. The extents of the existing storm drainage boundaries were established based on the limit of development to determine relevant target release rates.

2.2.1 Existing Site Characterization

The soil classifications were identified in geotechnical and hydrogeological investigations undertaken by Soil Engineers Ltd. and Beacon Environmental Ltd. respectively. The geotechnical investigation identified that the soils within the study limits generally consist of silty clay/silty clay tills with deposits of sand and silt at various locations. Hydraulic conductivity testing was conducted at several of the sand locations across the site, the lowest measured hydraulic conductivity was 9.5 x 10^{-5} cm/s which corresponds to an infiltration rate of approximately 49 mm/hr (per LID SWM Planning and Design Guide Table C1). For design purposes, a conservative infiltration rate of 12 mm/hr, based on the presence of silty clay soils, has been used. The design infiltration rate will be confirmed with in-situ testing at the detailed design stage. Relevant excerpts from the geotechnical and hydrogeological investigations are provided in **Appendix B**.

Groundwater measurements have been conducted from December 2017 to August 2020 at all accessible monitoring locations. Groundwater depths ranged from approximately 0.2 meters below ground surface (mbgs) to 8.92 mbgs. Groundwater elevations were found to range from approximately 332.0 masl to 285.2 masl. The groundwater appears to reside unconfined within layers of silty clay and silty sand. Relevant excerpts from the hydrogeological investigation are provided in **Appendix B**.

2.2.2 Existing Hydrologic Modelling

Hydrologic modelling was undertaken using the Visual Otthymo Version 6.0 software (VO6) based on the 4-hour Chicago and 12-hour SCS Type II design storm distributions (per Uxbridge design standards). The proposed development is located within the Township of Uxbridge, therefore, the IDF rainfall information was obtained from the Township of Uxbridge design standards to determine the existing peak flows to outlet locations. The Uxbridge design standards do not include IDF information for the 50 year storm event so it has been excluded from the hydrologic analysis.

The existing flows from the study area to the outlet locations are summarized in **Table 2.2**.

Table 2.2: Summary of Existing Peak Flows

Return Period Storm	To Uxbridge Brook Tributary – VO Node 101		To Centre Road CSP Culvert – VO Node 102	
	4-Hour Chicago	12-Hour SCS	4-Hour Chicago	12-Hour SCS
2 Year	0.702	1.138	0.051	0.085
5 Year	1.431	2.091	0.109	0.148
10 Year	1.964	2.752	0.151	0.190
25 Year	2.636	3.508	0.212	0.238
100 Year	4.087	4.871	0.329	0.323

A summary of modelling parameters and an existing VO6 schematic are provided in **Appendix C**. A CD containing the VO6 hydrology model is also provided in **Appendix C**.

2.3 Best Management Practices

In accordance with the MECP Stormwater Management Planning and Design Manual (2003), a review of stormwater management best practices was completed using a treatment train approach, which evaluated lot level, conveyance system and end-of-pipe alternatives. The potential best management practices were evaluated based on the stormwater management criteria listed in **Table 2.1**.

The following are examples of lot level, conveyance and end-of-pipe controls that were evaluated for use in the proposed development.

<u>Lot Level Controls</u>

Lot-level controls are at-source measures that reduce runoff prior to stormwater entering the conveyance system, such as:

- Increased topsoil depth;
- Roof leaders to grassed areas;
- At-source storage (i.e. rooftop or parking lot storage);
- Permeable pavements; and
- Infiltration trenches/soak-away pits.

<u>Conveyance Controls</u>

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility. Examples of conveyance controls include:

- Grassed Swales;
- Bioretention systems;
- Catchbasin infiltration/filtration systems;
- Permeable pavement;
- Grassed filter strips, and

- Pervious pipe systems.

End-of-Pipe Controls

End-of-pipe stormwater management facilities receive stormwater flows from a conveyance system (i.e., storm sewers or ditches) and provide treatment of stormwater prior to discharging flows to the receiving watercourse. Typical end-of-pipe controls include:

- Wet ponds;
- Wetlands;
- Dry ponds;
- Infiltration/filtration basins;
- Manhole insert treatment systems (i.e. oil-grit-separators and filters); and
- Underground storage.

2.3.1 Proposed Lot Level Controls

Lot level controls present an opportunity to reduce runoff at the source. These controls are proposed on private properties. Incorporating controls that require minimal maintenance can be an effective method in the treatment train approach to SWM. The following lot level controls have been proposed for use in the proposed development:

Increased Topsoil Depth

An increase in the proposed topsoil depth on lots is recommended to promote lot level infiltration (up to 0.3 m depth). Increased topsoil depth will passively contribute to lot level quality and quantity control and to groundwater recharge. This contribution is not quantified to address the stormwater runoff control criteria in **Table 2.1**. A topsoil depth of 0.3 m is proposed for all landscaped areas.

Roof Leaders to Grassed Areas

Roof leaders will be discharged to grassed areas where feasible to promote lot level infiltration, thereby passively contributing to water quality and quantity control. This contribution is not quantified to address the stormwater runoff control criteria in **Table 2.1**.

Rear Yard At-Surface Infiltration Trenches

At-surface infiltration trenches will be provided in the single detached rear yards as able, thereby passively contributing to water quality and quantity control. This contribution is not quantified as part of the quality and quantity control requirement in **Table 2.1**. At-surface trenches will however be utilized to meet water balance, phosphorus budget, and volume control requirements.

2.3.2 Proposed Conveyance Controls

Conveyance controls provide treatment of stormwater during the transport of runoff from individual lots to the receiving watercourse or end-of-pipe facility. The following conveyance controls have been proposed for use in the proposed development:

Catchbasin Infiltration/Filtration Systems

Catchbasin infiltration/filtration systems will provide quality control throughout the subdivision by capturing drainage from the right-of-way. Pre-treatment will be provided in the deep sump catchbasins and other means (e.g. goss trap, CB Shield, Litta Trap, etc.) to increase the operating lifespan of the trenches. An overflow connection will be provided from the catchbasins to the storm sewer to convey runoff in excess of the trench capacities. Infiltration trenches will be provided where there is adequate separation to the seasonally high groundwater level. The stone filled trenches will be lined with an impermeable liner and provided with a subdrain where there is not adequate separation to the seasonally high groundwater level (i.e. filtration trenches).

Grassed Filter Strip

Grassed filter strips provide passive treatment of runoff in a sheet flow condition contributing to water quality and quantity control. This contribution is not quantified as part of the quality and quantity control requirement in **Table 2.1**. A grassed filter strip will be utilized at the outlet of the dry SWM Pond to meet phosphorus budget requirements.

2.3.3 Proposed End-of-Pipe Controls

While lot level and conveyance system controls are valuable components of the overall SWM plan, on their own they are not sufficient to meet the quantity and quality control objectives for the subject development. End-of-pipe stormwater management facilities receive stormwater flows from a conveyance system (i.e., storm sewers or ditches) and provide treatment of stormwater prior to discharging flows to the receiving watercourse. Accordingly, the following end-of-pipe controls have been proposed for use in the proposed development:

Wet Pond

To meet quantity, quality and erosion control targets, flow restrictors are used to control stormwater release rates. To accommodate the reduced release rate, stormwater detention facilities are required to store stormwater runoff. Stormwater storage for the proposed development west of the NHS will be provided by a wet pond system.

Dry Pond

To meet quantity and erosion control targets, flow restrictors are used to control stormwater release rates. To accommodate the reduced release rate, stormwater detention facilities are required to store stormwater runoff. Stormwater storage for the proposed development east of the NHS will be provided by a dry pond system.

Manufactured Treatment Device

A manufactured treatment device can contribute to the treatment train approach for water quality control. Per Township of Uxbridge criteria, a Vortech oil-grit-separator (OGS) Unit (or approved equivalent) will be provided to treat runoff before it enters the wet pond and the dry pond.

Table 2.3 below summarizes the recommended stormwater management Best Management Practices (BMPs) for the subject development.

Table 2.3: Summary of the Recommended Stormwater Best Management Practices (BMPs)

Stormwater Management Control	Recommended BMP
Lot Level Controls	Increased Topsoil Depth
	Roof Leader to Grassed Areas
	Rear Yard At-Surface Infiltration Trenches
Conveyance System Controls	Catchbasin Infiltration/Filtration Systems
	Grassed Filter Strip
End Of Pipe Controls	Wet Pond
	Dry Pond
	Manufactured Treatment Device (OGS)

2.4 Proposed Storm Drainage

The proposed storm drainage plan is shown on **Figure 2.2**.

Runoff from Catchment 201 will be initially conveyed to local rear yard at-surface infiltration trenches and catchbasin infiltration/filtration facilities, where feasible, or otherwise captured in the minor system (refer to **Figure 2.3** for LID location plan). A wet SWM pond (Wet SWM Pond 1) will provide quantity, quality and erosion control for runoff up to and including the 100 year storm event before outletting to the Uxbridge Brook tributary. As per Uxbridge design criteria, an OGS will provide pre-treatment upstream of the wet SWM Pond. Major system flows will be conveyed by the proposed road rights-of-way to an overland flow route in the wet SWM pond block. In an emergency spill scenario, runoff will be conveyed via an emergency spillway in the wet SWM pond to the Uxbridge Brook Tributary. A plan view of Wet SWM Pond 1 and associated infrastructure has been provided on **Figure 2.4**.

Runoff from Catchment 202 will be conveyed overland to a proposed 600 mm diameter bypass storm sewer and will outlet directly to the Uxbridge Brook tributary.

Runoff from Catchment 203 will be conveyed overland directly into the proposed wet SWM pond.

Runoff from Catchment 204 will initially be conveyed to local rear yard at-surface infiltration trenches and catchbasin filtration facilities (refer to **Figure 2.3**), followed by conveyance via storm sewers and overland flow along road rights-of-way to an end of pipe stormwater attenuation facility. The catchbasin filtration facilities will provide the quality control requirements for Catchment 204. A dry SWM pond (Dry SWM Pond 1) will provide quantity and erosion control for runoff up to and including the 100 year storm event before outletting to the Uxbridge Brook tributary. An OGS will provide pre-treatment upstream of the dry SWM pond. Outflow from the control manhole will be directed to a grassed filter strip before outletting to the Uxbridge Brook Tributary via a trapezoidal outlet swale. Major system flows will be conveyed by the proposed road right-of-ways to an overland flow route on Street 'C' (west overland flow route) and Street 'A' (north overland flow route). In an emergency spill scenario, runoff will be conveyed via an emergency spillway in the dry SWM pond to the Centre Road ditch which conveys flows to the Uxbridge Brook Tributary. A plan view of the Dry SWM Pond 1 has been provided on **Figure 2.5**.

Runoff from Catchment 205 will be conveyed overland directly into the proposed dry SWM pond.

Runoff from Catchment 206 and 208 will be conveyed to local rear yard at-surface infiltration trenches, where able, or otherwise drain uncontrolled to the Centre Road ditch and Uxbridge Brook tributary, respectively.

Runoff from Catchment 207 will be conveyed to local at-surface rear yard at-surface infiltration trenches, where able, or otherwise drain uncontrolled to the Centre Road CSP culvert.

2.5 Proposed Stormwater Management Plan

2.5.1 Quantity Control and Erosion Control

The allowable release rates to the Uxbridge Brook tributary and the north Centre Road CSP culvert for each design storm are presented in **Table 2.2** above.

Wet SWM Pond 1 will control proposed peak flows to the Uxbridge Brook tributary from the proposed development west of the NHS. Dry SWM Pond 1 will control proposed peak flows to the Uxbridge Brook tributary from the proposed development east of the NHS. Each quantity control facility is discussed in greater detail below. The active storage facilities above will control peak flows from the proposed development to existing peak flows for the 2 through 100 year storm events.

Proposed hydrology modelling was completed using the VO6 model to determine the required wet SWM pond and dry SWM Pond active storage volumes. A summary of modelling parameters and a proposed VO6 schematic are provided in **Appendix C**. A digital download link containing the VO6 hydrology model is also provided in **Appendix C**.

<u>Wet SWM Pond 1</u>

The attenuation of the extended detention volume in the wet SWM pond will provide erosion protection for the downstream watercourse as well as promote sediment removal for water quality. The extended detention volume for the proposed wet SWM pond has been sized based on the detention of the 40 mm - 4 hour Chicago rainfall event for a minimum of 24 hours. The required extended detention volume for the wet SWM pond is 5,926 m^3. This volume is greater than the 2003 MECP guidelines minimum extended detention volume of 40 m^3/ha or 1,076 m^3 based on the 26.90 ha drainage area with a 59% imperviousness. The peak release rate for the extended detention volume is approximately 0.283 m^3/s. Calculations are provided in **Appendix D**.

A 400 mm diameter extended detention orifice plate and a 2.4 m long broad crested weir are required to meet the design peak flow rates in **Table 2.2**. The weir will be provided as a cut-out from the proposed control manhole. A bottom draw outlet will be provided to convey low flows from the wet SWM pond to the control manhole. Multiple outlet design configuration and calculations are provided in **Appendix D**. The storage discharge characteristics of the wet SWM pond are provided below in **Table 2.4**.

Table 2.4: Wet SWM Pond 1 Operating Characteristics

Return Period Storm	4-Hour Chicago (VO Node 5)			12-Hour SCS Type II (VO Node 5)		
	Stage (m)	Discharge (m^3/s)	Storage (m^3)	Stage (m)	Discharge (m^3/s)	Storage (m^3)
40 mm	294.38	0.283	5,926	-	-	-
2 Year	294.01	0.188	3,232	294.10	0.218	3,901
5 Year	294.28	0.261	5,201	294.41	0.290	6,246
10 Year	294.46	0.300	6,610	294.59	0.435	7,697
25 Year	294.62	0.483	7,891	294.74	0.833	8,937
100 Year	294.85	1.222	9,822	294.96	1.708	10,771

Dry SWM Pond 1

The attenuation of the extended detention volume in the dry SWM pond will provide erosion protection for the downstream Uxbridge Brook tributary. The extended detention volume for the proposed dry SWM pond has been sized based on the detention of the 40 mm - 4 hour Chicago rainfall event for a minimum of 24 hours. The required extended detention volume for the dry SWM pond is 1,278 m^3. This volume is greater than the 2003 MECP guidelines minimum extended detention volume of 40 m^3/ha or 251.2 m^3 based on the 6.28 ha drainage area with a 56% imperviousness. The peak release rate for the extended detention volume is approximately 0.018 m^3/s. Calculations are provided in **Appendix D**.

A 95 mm diameter extended detention orifice plate and a 1.85 m long broad crested weir are required to meet the design peak flow rates in **Table 2.2**. The weir will be provided as a cut-out from a concrete wall internal to the control manhole. Multiple outlet design configuration and calculations are provided in **Appendix D**. The storage discharge characteristics of the dry SWM Pond are provided in **Table 2.5**.

Table 2.5: Dry SWM Pond 1 Operating Characteristics

Return Period Storm	4-Hour Chicago (VO Node 15)			12-Hour SCS Type II (VO Node 15)		
	Stage (m)	Discharge (m^3/s)	Storage (m^3)	Stage (m)	Discharge (m^3/s)	Storage (m^3)
40 mm	285.09	0.018	1,278	-	-	-
2 Year	284.88	0.016	847	284.98	0.017	1,033
5 Year	285.15	0.026	1,380	285.20	0.064	1,483
10 Year	285.21	0.084	1,511	285.27	0.176	1,648
25 Year	285.27	0.172	1,641	285.36	0.309	1,844
100 Year	285.41	0.451	1,966	285.50	0.724	2,182

Peak Flow Comparison

The proposed development was designed to control proposed peak flows to the existing peak flows. **Table 2.6** and **Table 2.7** provide a comparison of existing and proposed peak flows to the Uxbridge Brook tributary and to the Centre Road CSP culvert.

Table 2.6: Comparison of Existing and Proposed Peak Flows – 4-hour Chicago

Return Period Storm	To Uxbridge Brook Tributary (m^3/s) – VO Node 17		To Centre Road CSP Culvert (m^3/s) – VO Node 207	
	Ex.	Prop.	Ex.	Prop.
2 Year	0.702	0.335	0.051	0.004
5 Year	1.431	0.555	0.109	0.010
10 Year	1.964	0.707	0.151	0.015
25 Year	2.636	1.074	0.212	0.022
100 Year	4.087	2.462	0.329	0.038

Table 2.7: Comparison of Existing and Proposed Peak Flows – 12-hour SCS Type II

Return Period Storm	To Uxbridge Brook Tributary (m^3/s) – Node 17		To Centre Road CSP Culvert (m^3/s) – Node 207	
	Ex.	Prop.	Ex.	Prop.
2 Year	1.138	0.526	0.085	0.007
5 Year	2.091	0.798	0.148	0.015
10 Year	2.752	1.120	0.190	0.021
25 Year	3.508	1.804	0.238	0.029
100 Year	4.871	3.383	0.323	0.044

As shown above, the proposed peak flows are less than or equal to the existing peak flows for the 2 through 100 year storm events. A summary of modelling parameters and an existing VO6 schematic are provided in **Appendix C**. A digital download link containing the VO6 hydrology model is also provided in **Appendix C**.

2.5.2 Quality Control

Quality control will be provided for the proposed development to meet MECP Enhanced Level Protection (80% TSS Removal) requirements. The solutions for each development area are discussed below.

West of the NHS

Quality control for Catchment 201 and 203 will be provided by the proposed wet SWM pond located adjacent to the Uxbridge Brook Tributary. The wet SWM pond has been sized for a minimum of 80% TSS removal (MECP Enhanced Level), this corresponds to a required permanent pool volume of 4,312 m^3. The preliminary grading of the wet SWM pond will provide a permanent pool volume of 6,160 m^3, calculations are provided in **Appendix D**.

Additional removal of sediment from the runoff will be provided by upstream BMPs such as catchbasin infiltration/filtration trenches, rear yard at-surface infiltration trenches, and an OGS (Vortech Unit) located upstream of the wet SWM pond. The design of these additional facilities is discussed further in the following sections.

Quality control for Catchment 202 is not required. It is noted that the drainage associated with Catchment 202 is from roofs and rear yards which is generally considered clean. The runoff will have an opportunity to infiltrate in rear yard at-surface infiltration trenches and as it crosses grassed surfaces before sheet flowing to the NHS.

<u>East of the NHS</u>

Quality control for Catchment 204 will be provided by proposed catchbasin filtration trenches sized for a minimum of 80% TSS removal (MECP Enhanced Level), this corresponds to a required filtration volume of 178.3 m^3. The preliminary catchbasin filtration trench layout and design for Catchment 204 will provide a filtration volume of 185.2 m^3, calculations are provided in **Appendix E**. The design of the catchbasin filtration trenches is discussed further in the followings sections. Additional removal of sediment from the runoff will be provided by upstream BMPs such as rear yard at-surface infiltration trenches, an OGS (Vortech Unit) upstream of the dry SWM Pond, and a grassed filter strip downstream of the dry SWM Pond.

Quality control for Catchments 205, 206, and 207 is not required. It is noted that the drainage associated with these catchments is from roofs and rear yards and the SWM block which is generally considered clean. The runoff from Catchments 206 and 207 will have an opportunity to infiltrate in rear yard at-surface infiltration trenches and as it crosses grassed surfaces before sheet flowing to the NHS or to grass roadside ditches.

<u>Other Pollutants</u>

In accordance with the LSRCA Technical Guidelines for Stormwater Management Submissions, road grades have been minimized to the extent feasible to reduce the necessity of winter salting. To assist in temperature mitigation, shading will be included via plantings around the wet SWM Pond.

As the land use of the proposed development is residential, the proposed development is considered to be a low risk for contamination by other pollutants such as bacteria and pesticides. The proposed quality control measures have been designed in series to constitute a treatment train that is capable of treating the anticipated contaminants such as oil, grease, gas, and heavy metals. Regular inspection of the manufactured treatment devices, catchbasin infiltration/filtration trenches, and SWM pond facilities will assist in maintaining their effectiveness.

2.5.3 Volume Control

The proposed development will include more than 0.5 ha of new impervious surface, therefore, per LSRCA criteria, the post-development runoff volume from a 25 mm rainfall event from impervious surfaces must be retained on-site unless the site is considered a “site with restrictions”. Volume control was calculated for each development area as outlined below.

Volume control for the proposed development will be provided through rear yard at-surface infiltration trenches, and catchbasin infiltration/filtration trenches. Rear yard at-surface infiltration trenches will be provided on all split draining lots where feasible. Catchbasin infiltration trenches will be provided wherever there is adequate clearance to the seasonally high groundwater level. Catchbasin filtration trenches will be provided where infiltration trenches are not feasible. Catchbasin infiltration/filtration trenches cannot be provided where they would have to cross an intersection or where it would interfere with lot servicing connections. The design of the infiltration and filtration facilities is discussed further in the following sections.

A total impervious area of approximately 20.1 will be created as part of the proposed development resulting in a required infiltration and/or filtration runoff volume for the 25 mm storm event of 5033.8 m^3 (922.4 m^3 for Phase 1 and 4,111.4 m^3 for Phase 2).

The combined volume provided based on the preliminary BMPs above is 1,421 m^3 (290.3 m^3 for Phase 1 and 1130.7 m^3 for Phase 2) which corresponds to an equivalent depth of rainfall over the total impervious area of 7.1 mm. This achieves Alternative #2 criteria for volume control. Additional volume control cannot be provided due to the high seasonal groundwater conditions, and the generally low infiltration rate of the soils across the site (to be confirmed through detailed design). The number and size of rear yard infiltration trenches has been maximized. The size of the catchbasin infiltration/filtration trenches have been maximized to still achieve relevant sizing criteria and not interfere with required service connections and utilities in the right-of-way. Calculations are provided in **Appendix E**.

2.5.4 Water Budget

Where feasible, measures to minimize impacts on the water budget will be incorporated into the development design. As noted in the Hydrogeological Study, the estimated existing infiltration volume on the proposed development is approximately 60,883 m^3. Without mitigation the proposed development infiltration volume is approximately 31,668 m^3. It is anticipated that a proposed infiltration volume of approximately 160,246 m^3 can be achieved through the proposed mitigation measures outlined above, relevant excerpts are provided in **Appendix B**.

2.5.5 Phosphorus Budget

Under the Lake Simcoe Protection Plan, a stormwater management plan must demonstrate how phosphorus loadings are minimized between existing and proposed. The MECP database application *Lake Simcoe Phosphorus Loading Development Tool* (v2, 01-April-2012 update) was used to complete the phosphorus budget for the proposed development. Due to the complex treatment train provided by the SWM measures outlined above, a spreadsheet based on the MECP database application was developed to determine the existing and proposed phosphorus budget.

Existing Phosphorus Loadings

The existing land uses and areas are shown on **Figure 2.6**. Based on the Phosphorus Loading Development Tool, the existing annual phosphorus loadings were calculated to be 3.75 kg/year. Refer to **Appendix E** for the phosphorus loading tool output.

Proposed Phosphorus Loadings

The proposed land uses for the site are shown on **Figure 2.7**. The proposed phosphorus loading with no BMPs was calculated to be 39.48 kg/yr (refer to **Appendix E**).

The proposed phosphorus loading with the treatment train of BMPs was calculated to be 3.57 kg/yr (see **Appendix E**). In addition to the BMPs, runoff from the site has the opportunity for additional treatment as it is conveyed to the Uxbridge Brook Tributary such as through the NHS (Stream Buffer) and through grassed ditches along Centre Road North and through the adjacent property to the east (enhanced grass swales). **Table 2.8** provides a summary of the phosphorus budget calculations.

Table 2.8: Phosphorus Budget Summary

Phosphorus Loading (kg/yr)		
Existing	**Proposed without BMPs**	**Proposed with BMPs**
3.75	39.48	3.57

Based on the site conditions, the proposed phosphorus export will be approximately 4.8% less than existing conditions and 91.0% of the unmitigated phosphorus export will be removed by the proposed BMPs and outlet conveyance treatments. All remaining phosphorus exported from the proposed development will be compensated as outlined in the LSRCA Phosphorus Offsetting Policy.

A preliminary phosphorus export calculation was prepared based on the anticipated Phase 1 development limit. Based on the site conditions, the proposed Phase 1 phosphorus export will be approximately 0.64 kg/yr greater than existing conditions and 82.9% of the unmitigated phosphorus export will be removed by the proposed BMPs and outlet conveyance treatments.

2.6 Wet Stormwater Management Pond 1 Design Criteria

Preliminary wet pond grading is provided on **Figure 2.4**. The preliminary wet pond design was established based on the following general criteria:

- A maintenance access road in accordance with Uxbridge standard US-807 will be provided from a proposed road with a maximum longitudinal slope of 10% and a crossfall of 2% (max). A maximum longitudinal slope of 5% will be used where pedestrian access is anticipated. The maintenance access road will be used to facilitate machinery to access the forebay during scheduled maintenance as well as to access the outlet structure for maintenance purposes;
- A Vortech OGS Unit (or approved equivalent) will be provided upstream of the wet SWM pond per Uxbridge design criteria, preliminary sizing calculations are provided in **Appendix F**;
- A safety shelf with a maximum slope of 6:1 for 3.0 m to either side of the normal water level will be provided;
- A maximum slope of 4:1 will be provided above and below the safety shelf; and

- A maximum slope of 3:1 will be provided as required to match into existing and proposed grades at the edges of the pond block.

2.7 Dry Stormwater Management Pond 1 Design Criteria

Preliminary dry pond grading is provided on **Figure 2.5**. The preliminary dry pond design was established based on the following general criteria:

- A 4 m wide maintenance access road will be provided from a proposed road with a maximum longitudinal slope of 10% and a crossfall of 5% (max). The maintenance access road will be used to facilitate machinery to access the facility during scheduled maintenance as well as to access the outlet structure for maintenance purposes. A 6m radius turning circle will be provided at the downstream end of the facility;
- The pond bottom will have a minimum slope of 0.5% towards the outlet headwall;
- A Vortech OGS Unit (or approved equivalent) will be provided upstream of the dry SWM pond per Uxbridge design criteria, preliminary sizing calculations are provided in **Appendix F**;
- A maximum slope of 4:1 will be provided below the top of pond;
- A maximum slope of 3:1 will be provided as required to match into existing and proposed grades at the edges of the pond block; and
- A grassed filter strip/outfall swale will be provided downstream of the facility to provide additional treatment for low flows.

2.8 Rear Yard At-Surface Infiltration Trenches

Rear yard at-surface infiltration trenches are proposed throughout the site for all split drainage lots where feasible. Overflow from the proposed trenches will drain uncontrolled into the Uxbridge Brook tributary or to the proposed wet SWM Pond or dry SWM Pond.

The trenches will be located beneath the rear yard swales, covered by approximately 0.15 m of topsoil. Based on the design infiltration rate of 12 mm/hr, a maximum trench depth of 0.6 m can be infiltrated with 48 hours. The rear yard infiltration trenches will provide sufficient storage volume to infiltrate the 25 mm storm event over the rear roof area of the lot. This corresponds to a total infiltration volume of approximately 543.4 m^3 provided by the rear yard at-surface infiltration trenches. Preliminary maximum infiltration trench dimensions based on lot frontage are provided in **Table 2.9** below. Refer to **Figure 2.8** for rear yard at-surface infiltration trench details, calculations are provided in **Appendix E**.

Table 2.9: Rear Yard At-Surface Infiltration Trench Dimensions

Maximum Trench Dimensions				
Minimum Typical Lot Frontage (m)	**Length (m)**	**Width (W)**	**Depth (m)**	**Maximum Infiltration Volume Provided (m^3)**
11.0	10.0	1.0	0.6	3.6
12.2	11.2	1.0	0.6	4.0
13.4	12.4	1.0	0.6	4.5

2.9 Catchbasin Infiltration and Filtration Trenches

Catchbasin infiltration and filtration trenches are proposed to provide treatment of runoff from the road rights-of-ways and lots within the proposed development. Runoff entering deep sump catchbasins will be directed through a catchbasin pretreatment device (e.g. goss trap, CB Shield, Litta Trap, etc.) before entering a lead directed to the trenches. Runoff in excess of the capacity of the lead, or if an infiltration trench has reached capacity, will be directed through an overflow lead into the minor system. The trenches will be located beneath the right-of-way boulevards. The proposed subdivision right-of-way is discussed further in **Section 6.0**.

Based on the design infiltration rate of 12 mm/hr, a maximum trench depth of 0.6 m can be infiltrated with 48 hours. The catchbasin infiltration trenches will be composed of washed clear stone with approximate dimensions of 0.6 m deep and 1.0 m wide. Approximately 113 m of infiltration trench is proposed, the length of individual infiltration trenches will vary based on catchbasin spacing and tributary area. This corresponds to a total provided infiltration volume of 27.1 m^3. Refer to **Figure 2.9** for catchbasin infiltration trench details, calculations are provided in **Appendix E**.

The catchbasin filtration trenches will be composed of 0.6 m of washed clear stone on top of 0.4 m of brick sand and will be approximately 1.0 m wide. A perforated drain within the brick sand layer connected to the minor system will be provided at the downstream end of the filtration facility. Within Catchment 201, approximately 1,618 m of filtration trench is proposed, the length of individual filtration trenches will vary based on catchbasin spacing and tributary area. This corresponds to a total provided filtration volume of 647.2 m^3. Within Catchment 204, approximately 463 m of filtration trench is proposed (185.2 m^3 of filtration volume) to provide the required quality control volume (178.3 m^3). Refer to **Figure 2.9** for catchbasin filtration trench details, calculations are provided in **Appendix E**.

2.10 Storm Servicing

The storm sewer system (minor system) will be designed for the 5 year storm event as per the Township of Uxbridge standards (relevant excerpts provided in **Appendix B**).

The storm sewer system will typically be designed with grades between 0.5% and 4%. Throughout the proposed development, the storm sewer will be constructed at a minimum depth of 1.5 m to obvert to provide frost protection and at sufficient depth to accommodate foundation drains where connections are required. The preliminary layout for the proposed storm sewer within the proposed development is provided on **Figure 2.2**. The storm drainage system will be designed in accordance with the Township of Uxbridge and MECP guidelines, including the following:

- Pipes to be sized to accommodate runoff from a 5 year storm event,
- Minimum Pipe Size: 300 mm diameter,
- Maximum Flow Velocity: 4.5 m/s,
- Minimum Flow Velocity: 0.75 m/s,

The rainfall intensity will be calculated as follows, where 'i' is the rainfall intensity (mm/hour) and A, B, and C are as per **Table 2.10**:

$$i = A / (T_c + B)^c$$

Table 2.10: Rainfall Intensity Parameters

Return Period Storm	A	B	C
2 Year	645	5	0.786
5 Year	904	5	0.788
10 Year	1065	5	0.788
25 Year	1234	4	0.787
100 Year	1799	5	0.810

Preliminary sizing calculations were prepared for sizing the storm sewers entering the proposed wet SWM pond and dry SWM pond. The design sheet is provided in **Appendix D**.

2.11 Overland Flow

Major system flows (greater than the 5 year up to the 100 year storm event) will be conveyed within the road right-of-ways and laneways to suitable outlets. Right-of-way capacity calculations are provided in **Appendix D.**

An overland flow route is provided west of the NHS to convey major system flows to the wet SWM Pond. A 0.3 m deep channel will convey flows to the downstream end of the forebay. Calculations are provided in **Appendix D**.

East of the NHS, major system flows will be conveyed to low points on Street 'A' and Street 'C'. Overland flow routes will convey major system flows to the dry pond. The overland flow route from Street 'C' will be located in a 6 m wide block between two proposed lots. Calculations are provided in **Appendix D**.

A 600 mm diameter HDPE bypass storm sewer under Street 'A' is proposed to convey the external and rear yard flows from Catchment 202 to the Uxbridge Brook Tributary. The culvert will convey the peak flow from the greater of the 100 year and Regional storm events. Conveyance calculations are provided in **Appendix D**.

The conveyance of the 100 year storm event was calculated for the Uxbridge Brook Tributary that conveys flows through the southeast corner of the proposed development (including the

Centre Road Box Culvert) and for the drainage feature conveying external flows from the property to the north through the centre of the site to the by-pass storm sewer. Conveyance calculations are provided in **Appendix D**. The peak flow for the Uxbridge Brook Tributary is conservatively based on the peak flow provided by the LSRCA GIS data for the tributary immediately downstream. As shown in the hydraulic calculations, the water level associated with the 100 year storm event will not impact the proposed development limits or SWM pond infrastructure.

An existing 600 mm diameter CSP culvert under Centre Road is proposed to covey the external, wetland block and rear yard flows Catchment 207 and Catchment EXT to the Uxbridge Brook Tributary. During the 100 year storm event, the existing CSP culvert and Centre Road deck convey a peak flow of 2.387 m^3/s with an inlet headwater elevation of approximately 287.92 m without accounting for potential spill to the north or south via the existing ditch. Conveyance calculations are provided in **Appendix D**. The proposed rear yard elevation along Centre Road will be increased to 0.2 m above the centerline of road elevation to account for potential future urbanization (refer to **Figure 5.1**). Therefore the 100 year ponding elevation will not impact the proposed lots.

2.12 Stormwater Management and Servicing Phasing

The stormwater management and servicing of Phase 1 of the proposed development will be able to proceed without any Phase 2 infrastructure. The proposed stormwater management infrastructure (Dry SWM Pond 1, catchbasin filtration trenches, and rear yard infiltration trenches) and storm sewer system are independent of Phase 2. The bypass storm sewer will be constructed as part of Phase 2 as the crossing for Street A is not required until the Phase 2 subdivision has been constructed.

3.0 SANITARY SERVICING

3.1 Existing Sanitary Sewer System

Existing sanitary sewers are located on Oakside Drive and Bolton Drive to the south of the proposed development. The existing sanitary sewer system is illustrated on **Figure 3.1.** The anticipated flows from the proposed development were not included in the design of downstream infrastructure (refer to Drawing SAN for the Mason Lands Phase 1 development in **Appendix B)**. A capacity analysis based on the proposed sanitary sewer system was undertaken and is discussed further below.

3.2 Proposed Sanitary Sewer System

The preliminary layout for the proposed sanitary sewer within the proposed development is provided on **Figure 3.1**.

The sanitary sewers within the proposed development will have slopes ranging between 0.5% and 4% (typically) and will be provided at 3 m to 6.5 m deep.

The sanitary sewer system will be designed in accordance with the Region of Durham and MECP criteria, including but not limited to:

- Residential Sanitary Generation Rate: 364 L/c/d,
- Population Density:
    - Townhouse – 3.0 people/unit,
    - Single Detached – 3.5 people/unit
- Peaking Factor: Harmon (Max. 3.8, Min 1.5),
- Infiltration Rate: 0.26 L/s/ha,
- Minimum Pipe Size: 200 mm diameter,
- Minimum Actual Velocity: 0.60 m/s, and
- Maximum Velocity: 3.65 m/s.

An area of 29.20 ha comprised of 60 townhouses and 464 single detached dwellings (total population 1,804) will be serviced as part of the proposed development. As shown on **Figure 3.1**, the approximate extents of Phase 1 result in a sanitary drainage area of approximately 6.13 ha and a design population of 332 persons. Phase 2 has a sanitary drainage area of approximately 23.07 ha and a design population of 1472 persons. A preliminary sanitary sewer design sheet is provided in **Appendix G**.

External sanitary sewer options evaluated to service the proposed development include:

1) Bolton Drive System – The Bolton Drive sanitary sewer elevation is too high to feasibly connect the eastern half of the site. Additionally, a portion of the Bolton Drive sanitary sewer which crosses the Uxbridge Brook tributary was built at a shallow slope (0.3%) such that there is limited capacity available for even a portion of the proposed development (refer to Drawing P-101 in **Appendix B**). Downstream sewer sizes on this system also decrease in size, thereby further limiting capacity.
2) Oakside Drive System – The Oakside Drive system has some existing residual capacity and is described in further detail in **Section 3.3** below.

3) Future Mason Phase 2 development immediately east of the proposed development - The future Mason Phase 2 development has been accommodated with a connection to the existing sanitary sewer system on Apple Tree Crescent. A further analysis is included below in **Section 3.3**.

An analysis of the potential external sanitary servicing options for the proposed development is provided below.

3.3 External Sanitary Servicing

An excerpt of the Township of Uxbridge Sanitary Sewerage System map (dated March 22, 2019) has been provided in **Appendix G** which shows the existing sanitary sewer system downstream of the proposed development.

As identified in **Section 3.2** there are two viable potential options for connecting the proposed development to the existing sanitary sewer system: connecting to the existing 200 mm diameter sanitary sewer located at the intersection of Centre Road and Oakside Drive (MH 113), or connecting to the future Mason Lands Phase 2 sanitary sewer. The Mason Lands Phase 2 sanitary sewer will connect to the existing 250 mm diameter sanitary sewer on Apple Tree Crescent (MH 008), refer to Drawing SAN for the Mason Lands Phase 1 development in **Appendix B**. Both existing sanitary sewers convey flows to Ash Green Lane which ultimately connects to the Uxbridge Water Pollution Control Plant.

As shown on the Mason Phase 1 sanitary drainage plan referenced above, the Oakside Drive sanitary sewer was not sized in anticipation of external flows however there is some inherent residual capacity remaining in the system based on the original Apple Tree Crescent sanitary sewer design (12.90 ha and a population of 800 persons).

As shown on **Figure 3.1**, the sanitary sewer to Oakside Drive would be constructed on Centre Road. An existing box culvert conveys the flows of the Uxbridge Brook Tributary from west to east across Centre Road and is located between Oakside Drive and the Centre Road intersection of the proposed development. The existing culvert has an upstream invert of 281.31 m, a downstream invert of 280.94 m, and a road surface elevation of approximately 284.80 m. There is sufficient clearance above the box culvert for the sanitary sewer to cross and maintain minimum frost cover and separation from the obvert of the culvert. Upon crossing the culvert, the sanitary sewer will continue to drain by gravity to the existing Oakside Drive sanitary sewer.

Alternatively the proposed development can connect across the proposed intersection at Centre Road to the Phase 2 Mason development, however the timing of this development is unknown and so a connection may not be available when required by the proposed development.

A capacity analysis of the two different connection options was undertaken to confirm the capacity of the downstream sanitary sewer systems and to identify any potential infrastructure upgrades to support the construction of the proposed development. Phase 1 of the proposed development, which has an area of approximately 6.13 ha and a population of 332.5 persons, was also analysed. In total, four different capacity analyses were performed:

- Option 1 – Phase 1 proposed development to Oakside Drive

- Option 2 – Phase 1 proposed development to Mason Lands Phase 2
- Option 3 – Ultimate proposed development to Oakside Drive
- Option 4 – Ultimate proposed development to Mason Lands Phase 2

For clarity, Options 1 and 3 include only flow contribution from the proposed development. Options 2 and 4 include flow contribution from the proposed development and the Mason Phase 2 lands.

The Township of Uxbridge sanitary map has been modified to provide summary figures for each of the scenarios above which show the sections of sanitary sewer where capacity is exceeded (coloured red) or close to being exceeded (85% to 100% capacity, coloured yellow). The figures and preliminary design sheets have been provided in **Appendix G**. The sewers where the capacity is exceeded will need to be upgraded in order to convey the sanitary flows from the proposed development and/or the Mason Phase 2 development. The sanitary sewer upgrades resulting from the capacity analysis have been summarized below for the four scenarios analysed:

- Option 1 – 180m of sewer exceeding capacity
- Option 2 – 260m of sewer exceeding capacity, 182m close to exceedance
- Option 3 – 1307m of sewer exceeding capacity, 101m close to exceedance
- Option 4 – 1115m of sewer exceeding capacity

In general Option 1 and Option 2 result in minimal surcharging of the sanitary sewer system on Dallas Street where the sewer was constructed at very shallow slopes (<0.4%), otherwise the system has sufficient capacity to convey the proposed flows. Option 3 and Option 4 require modifications to a significant length of the existing sanitary sewer system from Ash Green Lane to Dallas Street.

An HGL analysis was performed for Option 1. Based on the analysis there will be no anticipated negative impacts on upstream properties due to the anticipated surcharging. The analysis has been provided in **Appendix G**.

Consideration should be given to conducting a sanitary flow monitoring program to confirm actual flow rates in the existing sanitary sewers. If the actual flow rate is lower than the Region's theoretical design criteria, the required modifications to the existing sewer could be reduced. For example, under Option 3, by reducing the average domestic flow to 275 L/cap/day the length of sewer exceeding capacity is reduced to 640 m.

Should the confirmation of existing flow rates be an acceptable approach to Durham Region, coordination with the Region will continue through the draft plan approval process to confirm the scope of the sanitary flow monitoring program.

3.4 Servicing Allocation

Durham Region operates the water supply and treatment infrastructure as well as the wastewater collection and treatment systems. As such, Durham Region provides bulk servicing allocation to the Township of Uxbridge. The Township of Uxbridge Council provides Servicing Allocation to individual development applications.

Wastewater servicing allocation is the limiting factor in the Township of Uxbridge. Servicing allocation is based on the capacity of the Uxbridge Brook Water Pollution Control Plant (WPCP). The WPCP current capacity is 15,000 people. The Region is currently undertaking a planned upgrade to the oxygenation system which could increase the current capacity to 16,480 people.

Uxbridge has been divided into two phasing areas. Phase 1 is the current Urban Area boundary and includes some potential infill and intensification areas. Phase 2 includes three proposed development properties outside of the current Urban Area as identified in the Township's Development Services – Planning staff report DS-03/19:

1) 1,905 people - Bridgebrook – 7370 Centre Rd (proposed development, current draft plan proposes a population of 1,804 per **Section 3.2**)
2) +/- 910 people - Mason – 7309 Centre Rd
3) +/- 1,245 people - Furlan – E. of Conc. 7, S. or Enzo Cres.

The following existing and proposed population statistics were identified in the Township's Development Services Planning Report DS 03/19 dated January 21, 2019:

- 11,520 - Current population estimate in Uxbridge (serviced)
- 555 - Current population estimate in Uxbridge (un-serviced)
- 600 – Allocation for Downtown Uxbridge
- 150 – Allocation for Long Term Care Facility
- 225 – Allocation for public lands
- 444 – Unbuilt Residential Development with Sanitary Capacity Allocated by the Region (Registered/Agreement)
- 680 – Unbuilt Residential Development Approved by the Township or OMB (Conditional)
- 535 – Phase 1 Potential Residential Development (Active applications or pre-consultation)
- 16,480 – Anticipated 2031 population forecast for Uxbridge and also the anticipated capacity of the WWTP upon completion of the current upgrade
- 1,761 – Remaining capacity to service the Phase 2 lands.

Based on the anticipated total Phase 2 population values noted above, there will be a Servicing Allocation shortfall of approximately 2,209 people based on the currently anticipated WPCP capacity (1,804+921+1,245-1,761). Based on the currently anticipated available servicing capacity of 16,480 people, the following options are available to service the proposed development, along with the remaining Phase 2 area:

- Durham Region to pursue a WPCP expansion through completion of a Class EA and an update of the Environmental Compliance Approval with the objective of servicing the entire Phase 2 population;
- Durham Region to investigate opportunities to re-rate the existing WPCP to maximize the servicing capacity, up to the full Phase 2 population if possible (may include stress testing the existing facility and possible incorporation of inflow/infiltration reduction measures or water use reduction measures);

- Utilize (borrow) a portion of the Phase 1 reserved servicing allocation to advance Phase 2 lands prior to implementing further WPCP improvements;
- Utilize private communal wastewater treatment facilities in portion of the Phase 2 lands (subject to a detailed site assessment to confirm this is a suitable approach), beyond the overall available WPCP capacity; or
- Combinations of the options above.

4.0 WATER SUPPLY AND DISTRIBUTION

4.1 Existing Water Distribution

The existing watermain system extends to the intersections of Bolton Drive and 6th Concession Road to the south of the site and Oakside Drive and Centre Road North to the south-east of the site. The existing watermain system is illustrated on **Figure 4.1**.

The existing Quaker Hill Zone U1 reservoir and Quaker Hill Zone U2 pumping station are immediately south of Bolton Drive fronting onto 6th Concession.

The study area is bisected by the U1 and U2 pressure zones. As shown, the Centre Road North and the eastern portion of Bolton Drive are within Zone U1 and the western portion of Bolton Road are within Zone U2. Refer to **Appendix B** for the Township of Uxbridge (West) Water Supply System map. The U1 reservoir high water level (static HGL) is 330.6 m and has approximate maximum ground level service elevation of 300 m. The U2 high water level maintained by the Quaker Hill pumping station (static HGL) is 362 m and has an approximate maximum ground level service elevation of 330.5 m.

4.2 Proposed Water System

The preliminary layout for the proposed watermain system is provided on **Figure 4.1.** The development may be serviced via the following connection locations:

- Connection to the existing 300 mm diameter watermain on Centre Road North (U1).
- Connection to the existing 300 mm diameter watermain on Bolton Drive (U1 or U2); and
- Connection to the existing 300 mm diameter watermain on 6th Concession (U2);

Based on the elevations of the subject lands, the eastern portion of the site will be serviced via Zone U1 and the western portion via Zone U2 (see **Figure 4.1**).

The existing rated capacity of the Region's Water Supply System can currently provide water servicing for the permitted service population of up to 15,000 people. An increase in the rated capacity of the water supply system will be required to provide service to the Official Plan population projection of 16,480 in 2031.

Through discussions with the Region it is understood that the following Regional infrastructure upgrades are required to accommodate a population increase beyond 15,000 people Phase 2 of the (anticipated growth area) Township of Uxbridge Official Plan:

- Additional wells for water supply. (Project is identified in 2018 DC and current Budget/Forecast)
- Additional Zone 1 water storage. (Project is identified in 2018 DC and current Budget/Forecast)

The existing Zone U2 pumping station was designed to accommodate the Quaker Hill development area. The following infrastructure improvements are anticipated by the Region to accommodate the western portion of the subject lands which are within Zone U2:

- Additional Zone U2 pumping capacity at the Quaker Hill Reservoir & Pumping Station. (Project is not yet identified in 2018 DC and current Budget/Forecast)

The Region has initiated the EA process for the additional water supply wells to service beyond the current 15,000 person capacity, however it is temporarily on hold pending confirmation of the overall growth projections for Uxbridge and the associated sanitary servicing capacity of the WPCP as noted in **Section 3.4**.

An analysis of the site water distribution network was completed by Municipal Engineering Solutions. The Phase 1 lands are within the existing Zone U1 and can be serviced via a connection to the existing U1 watermain on both Bolton Drive and Centre Road north. The analysis identified that servicing Phase 2 of the proposed development has ground elevations ranging from 330m in the east to 337m in the west, which exceeds the maximum U2 service elevation of 330.5m. Further analysis of the complete water model of the Township is recommended to account for pressure variations not captured by the hydrant tests performed in support of the analysis as well as the typical operation of the Township's water system.

An additional analysis was prepared by Municipal Engineering Solutions to determine Zone U2 servicing alternatives which resolve the pressure requirements for elevations above the current Zone U2 service limit. A copy of the analysis is provided in **Appendix H**. Four servicing options were considered as part of the Municipal Engineering Solutions analysis and were determined to be feasible options for future consideration based on pre-consultation with Region staff. The servicing options are outlined below.

Option 1 – Raise HGL of Zone U2

Option 1 involves an upgrade of the Quaker Hill (Zone U2) Pumping Station to raise the Hydraulic Grade Line (HGL) of Zone 2 from 360 m to 366 m. This would increase pressures within Zone U2 by approximately 60 kPa (9 psi) in all existing areas.

As part of this servicing strategy, three (3) pressure reducing valves (PRVs) could be installed on existing watermains within the Zone 2 serviced area to maintain current service pressures for existing areas. The PRVs would be placed to maintain pressures below 550 kPa as required by the Ontario Building Code. PRVs would be located on Bolton Drive, on the south feed from the PS, and within the new development. Alternatively, individual PRVs could be placed on the services to each existing or new unit where pressures are expected to exceed 550 kPa at fixture.

Option 2 – Additional Booster Pumping Station

Option 2 involves an upgrade of the Quaker Hill (Zone U2) Pumping Station to service an expanded population including the subject lands and incorporates a second booster pumping station for the area with elevations above the Zone U2 service limit, just east of 6th Concession. The additional booster pump station would be located within the proposed development. Alternatively, the booster pump station could be located on 6th Concession or within the existing Quaker Hill Booster Pumping station site if possible.

Option 3 – New Dedicated Pumping Station

Option 3 maintains the Quaker Hill (Zone U2) pumping station in its existing condition and incorporates a new booster pumping station to service the entirety of the higher pressure zone for the proposed development area, above Zone U1. The new Pumping Station could be built on within the subject lands, fed from Zone U1 watermains at Quaker Village Drive and Bolton Drive. Alternatively, if space permits the new pumping station could be built on the existing Quaker Hill Reservoir and Pumping Station site, and feed the development through a new watermain on Concession 6.

Option 4 – Lowering the Development

An additional option to service the development may be to regrade the development, if possible, so that serviced elevations do not exceed 330 m and can be serviced by the current Zone U2 service elevation range. Option 4 will still require an update to the existing Zone U2 booster pump and an extension of watermain along Concession 6 to the site. This option would require significant site earthworks as there is a difference of 5-7 m between existing grades and the existing Zone U2 upper service boundary along the west side of the development, along Concession 6. This alternative would limit road access/egress opportunities to Concession 6 due to the significant grade differences that would be required along the west property limit, would create significant grading buffer requirements and would result in significant fill export from the site. On this basis, while physically possible, this option is considered to be the least practical.

The above noted water servicing alternatives all provide possible solutions to service the Phase 2 lands. Option 3 is considered to be the preferred option based on its minimal impact to the existing community, ability to service the entire Phase 2 lands with a single, on-site solution, and ability for the project to be implemented through the Subdivision Approval process.

The watermain system will be designed in accordance with the Region of Durham and MECP criteria including:

- Residential water usage rate: 450 L/c/d,
- Population Single Family Dwelling: 3.5 persons/unit;
- Townhouse Dwelling: 3.0 persons/unit;
- Minimum Residential Pipe Size: 150 mm diameter;
- Minimum Pipe Depth: 1.8 m;
- Maximum of 20 houses on a dead end section; and
- Maximum Hydrant Spacing: 150 m.

A closed valve will be provided on Street ‘A’ at the break between Zone U1 and Zone U2 as noted on **Figure 4.1**.

5.0 GRADING

5.1 Existing Grading Conditions

The existing topography has slopes in the range of 0.5% to 25%. The ground surface elevations through the proposed development range from approximately 335 m in the northwest corner to approximately 282.5 m in the southeast corner.

5.2 Proposed Grading Concept

In general, the proposed development will be graded in a manner which will satisfy the following goals:

- Satisfy the Township of Uxbridge lot and road grading criteria including:
    - Minimum Road Grade: 0.5%
    - Maximum Road Grade: 5.0%
    - Minimum Lot Slope: 2%
    - Maximum Lot Slope: 5%
    - Maximum Lot Grade: 12% (calculated from difference in lot elevations between the rear wall of the house and property line – embankments included)
    - Maximum slope between terraces and embankments shall be 3:1 when vertical difference does not exceed 1 metre and 4:1 otherwise.
- Provide continuous road grades for overland flow conveyance;
- Minimize the need for retaining walls;
- Minimize the volume of earth to be moved and minimize cut/fill differential;
- Minimize the need for rear lot catchbasins; and
- Achieve the stormwater management objectives required for the proposed development.

A preliminary grading plan is provided on **Figure 5.1**.

The change in elevation across the site is substantial. For the main road which bisects the proposed development (Street ‘A’), the western intersection with 6th Concession has an elevation of approximately 334.6 m and the eastern intersection with Centre Road North has an elevation of approximately 287.8 m (46.8m difference). The difference in elevation across the site has been considered in the preliminary grading plan and results in a road slope of 5.2%.

In order to match into the existing road at the site boundaries and NHS, the required road grade across the site exceeds the maximum allowable grade of 5.0%, with all roads that have an east-west alignment at a grade of 5.2% to the extent possible. The municipal design criteria limitations of the centerline grading result in significant areas of cut and fill throughout the site with a maximum proposed cut depth of approximately 5.0 m and a maximum proposed fill depth of approximately 6.3 m. A slightly steeper road slope than the current municipal design criteria (i.e. 6.0%) would significantly minimize the proposed cut and fill volumes and would also minimize retaining walls and significant grade drops through built form (i.e. reduction in deck requirements). This will be discussed further with Township staff through the draft plan approval process and can be implemented at the detailed design stage.

Sloping is required into the NHS around the Street ‘C’ cul-de-sac. Per the Beacon Environmental Impact Study, the NHS in this area (HDF2) is described as ephemeral and will be compensated for accordingly (refer to relevant excerpts in **Appendix B**).

At the detailed design stage, the preliminary grading shown on **Figure 5.1** will be subject to a more in-depth analysis in an attempt to balance the cut and fill volumes and minimize slopes and walls.

6.0 RIGHT-OF-WAYS AND SIDEWALKS

The proposed road network of the proposed development is composed of a 20.0 m right-of-way.

The 20.0 m right-of-way will be the Township standard which has been modified to incorporate a catchbasin infiltration/filtration trench. The location of the trench is such that none of the standard geometry or service locations require modification. Sidewalk will be provided on the same sides of the right-of-way as the watermain to avoid conflicts with the proposed catchbasin infiltration/filtration trenches.

The proposed right-of-way cross-section is provided in **Appendix J**.

7.0 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

During the detailed design stage, erosion and sediment control measures will be designed with a focus on erosion control practices (such as stabilization, track walking, staged earthworks, etc.) as well as sediment controls (such as fencing, mud mats, catchbasin sediment control devices, rock check dams and temporary sediment control ponds). These measures will be designed and constructed as per the "Erosion and Sediment Control Guide for Urban Construction" document (TRCA, 2019). A detailed erosion and sediment control plan will be prepared for review and approval by the Municipality and Conservation Authority prior to any proposed grading being undertaken. This plan will address phasing, inspection and monitoring aspects of erosion and sediment control. All reasonable measures will be taken to ensure sediment loading to the adjacent watercourses and properties are minimized both during and following construction.

8.0 SUMMARY

This Functional Servicing and Stormwater Management Report has been prepared in support of the Draft Plan of Subdivision application for the proposed 7370 Centre Road development in the Township of Uxbridge. The purpose of this report is to demonstrate that the development can be graded and serviced in accordance with the Township of Uxbridge, Lake Simcoe Region Conservation Authority (LSRCA), Region of Durham, and the Ministry of Environment, Conservation and Parks (MECP) design criteria.

General Information

- The existing land use is comprised of agricultural land and natural heritage system;
- The proposed development is located in the Uxbridge Brook subwatershed;
- The proposed development consists of low and medium density residential, parks, natural heritage system, stormwater management block, and road and laneways; and
- Construction of the proposed development will potentially be phased with Phase 1 consisting of the lands east of the NHS and Phase 2 consisting of the lands west of the NHS.

Stormwater Management and Storm Servicing

- Quality Control: MECP Enhanced (Level 1) water quality protection will be provided for the west half of the proposed development by a proposed Wet SWM Pond 1. Quality control will be provided for the east half of the proposed development by catchbasin filtration trenches in the right-of-way boulevard;
- Erosion Control: The runoff volume from a 40 mm rainfall event will be detained over 24 hours for the west half of the proposed development by Wet SWM Pond 1 and for the east half of the proposed development by the Dry SWM Pond 1;
- Quantity Control: Quantity control will be provided for the west half of the proposed development by Wet SWM Pond 1 and for the east half of the proposed development by Dry SWM Pond 1 to control peak flows for the 2 through 100 year storm events;
- Volume Control: The combined volume provided based on the preliminary BMPs is 1,396.0m^3 which corresponds to an equivalent depth of rainfall over the total impervious area of 11.9 mm. This achieves Alternative #2 criteria for volume control. The proposed development is considered a site with restrictions due to proximity to seasonally high groundwater, and low infiltration rates;
- Water Budget: A water budget analysis was completed to demonstrate that the proposed annual infiltration volume will be greater than the existing annual volume;
- Phosphorus Budget: A phosphorus budget analysis was completed using the MECP phosphorus budget tool, which shows that the unmitigated phosphorus export will be reduced by approximately 91.0% through the use of BMPs throughout the proposed development including: rear yard at-surface infiltration trenches, catchbasin infiltration/filtration trenches, a wet SWM pond, a dry SWM pond, and a grassed filter strip;
- Storm Servicing:
    - Storm runoff will be conveyed by storm sewers designed in accordance with Township of Uxbridge and MECP criteria;
    - Storm sewers will generally be designed for the 5 year storm event; and
    - Adequate 100 year overland flow routes will be provided.

- Existing external drainage will be accommodated through the proposed development via a bypass storm sewer crossing Street 'A'.

Sanitary Sewage Disposal

- There are existing municipal sanitary sewers on Bolton Drive and Oakside Drive;
- A potential sanitary sewer connection can be made through the future Phase 2 Mason Lands development;
- The existing downstream sanitary sewer systems were not sized to convey flows from the proposed development, a capacity analysis was prepared to determine remaining capacity in the downstream Mason Phase 1 development system and potential required modifications based on a phased buildout of the proposed development.
- A sanitary monitoring program is proposed to confirm actual sanitary flow rates to reduce the amount of sanitary sewer replacement required to convey flows from the proposed development and Mason Phase 2 development.
- A servicing allocation shortfall is noted in the existing Uxbridge Water Pollution control plant for servicing the entirety of the Uxbridge Phase 2 development area. Several options are presented that allow for the proposed development to proceed.
- Sanitary allocation is required from the Town.

Water Supply

- There are existing municipal watermains on 6th Concession and Centre Road North;
- The development is proposed to be serviced with potential connections to the existing watermains on 6th Concession, Bolton Drive and Centre Road North;
- Municipal Engineering Solutions has completed a watermain hydraulic options analysis to show that there is sufficient domestic and fire flows to service the development, a preferred option was presented for consideration by the Region; and
- Water supply allocation is required from the Town.

Grading

- The proposed development grading has been developed to match to the existing surrounding grades, and provide conveyance of stormwater runoff, including external drainage;
- The road slope has been maximized based on Township criteria to minimize cut and fill throughout the proposed development, an exception to this criteria to increase the allowable slope is recommended and requires further discussion with Township staff; and
- The lot grading will be subject to further grading design at the detailed design stage.

Right-of-Ways and Sidewalks

The proposed municipal roads will be a 20.0 m right-of-way that follows the Township of Uxbridge standards, and has been modified to include BMP measures.

Erosion and Sediment Control during Construction

- An erosion and sediment control plan will be prepared at the detailed engineering stage, in accordance with the "Erosion and Sediment Control Guide for Urban Construction" document (TRCA, 2019).

Respectfully Submitted:

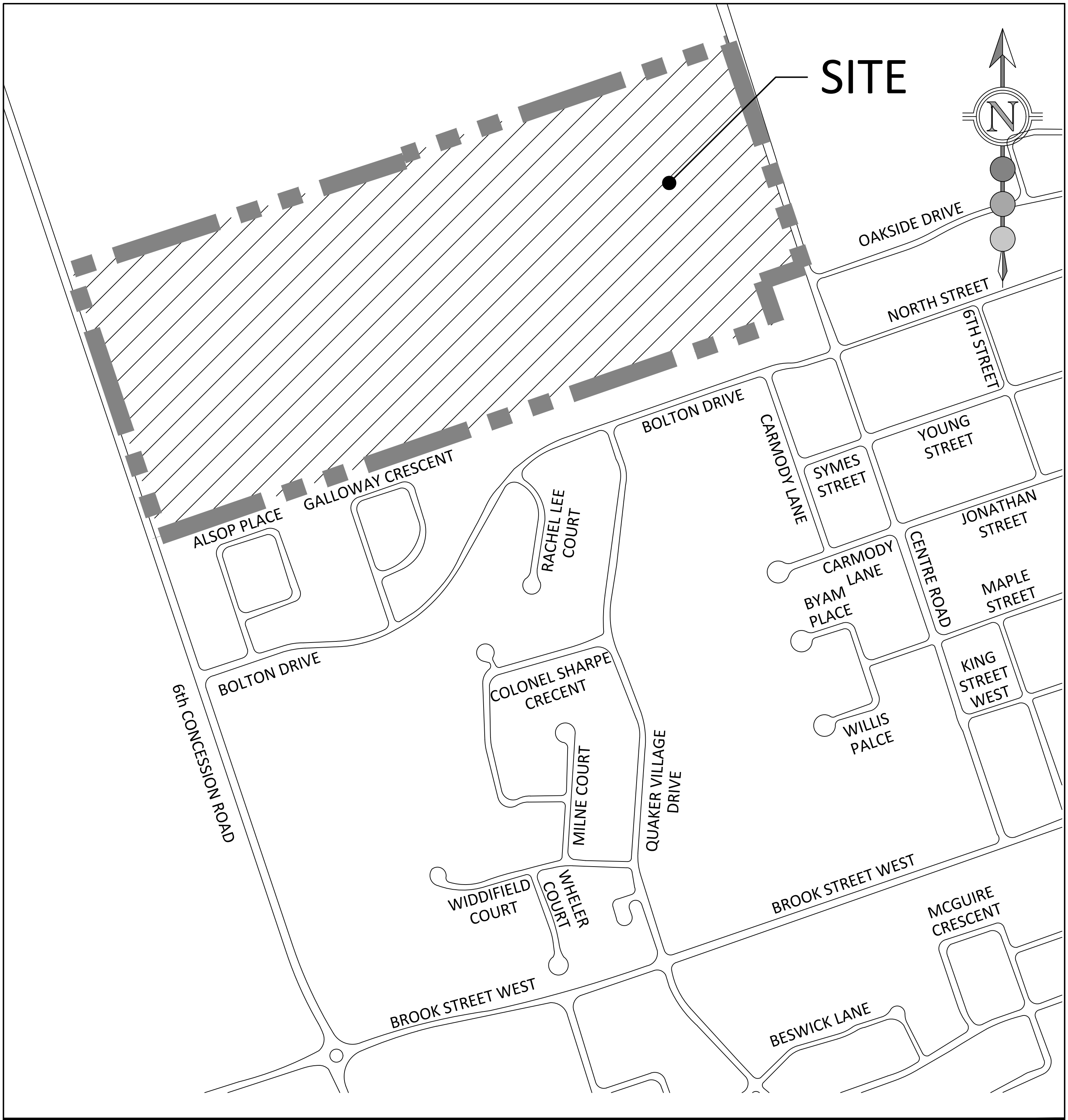
SCS Consulting Group Ltd.

LICENSED PROFESSIONAL ENGINEER
Nick McIntosh
N. D. MCINTOSH
100230564
Feb 27, 2023
PROVINCE OF ONTARIO

Gauri Murria

Gauri Murria,
gmurria@scsconsultinggroup.com

Nicholas McIntosh, M.A.Sc., P. Eng.
nmcintosh@scsconsultinggroup.com



SCS consulting group ltd

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FAX: (905) 475-8335

7370 CENTRE ROAD UXBRIDGE

FSSR

SITE LOCATION PLAN

DESIGNED BY: G.M.

CHECKED BY: N.D.M.

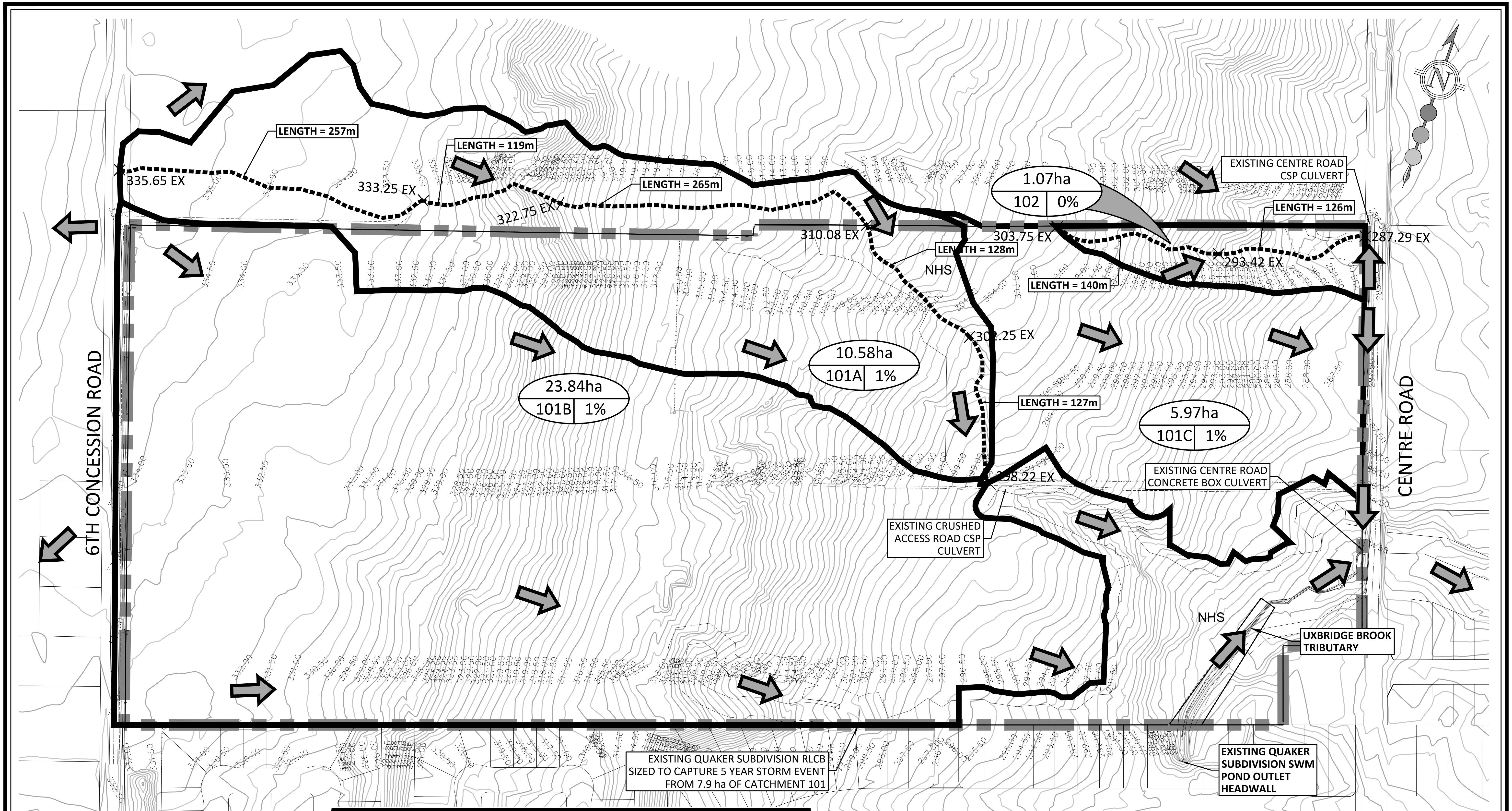
SCALE: N.T.S.

DATE: FEBRUARY 2023

PROJECT No: 2099

FIGURE No: 1.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-LOCT-1.1.dwg - Revised by <SOZDEMIR> : Fri, Feb 10 2023 - 11:56am



*NOTE: DRAINAGE SCHEMATICS BASED ON LIMIT OF DEVELOPMENT

*NOTE: LAYOUT IS SCHEMATIC ONLY. DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

▬ ▬ ▬	LIMIT OF PROPERTY
▬▬▬	STORM DRAINAGE BOUNDARY
▪▪▪▪▪	TIME TO PEAK FLOW PATH
318.00	EXISTING CONTOUR AND ELEVATION
1.07ha	DRAINAGE AREA (HECTARES)
0%	(%) IMPERVIOUS
102	CATCHMENT ID
➡	OVERLAND FLOW DIRECTION
×302.25 EX	EXISTING ELEVATION

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7370 CENTRE ROAD UXBRIDGE

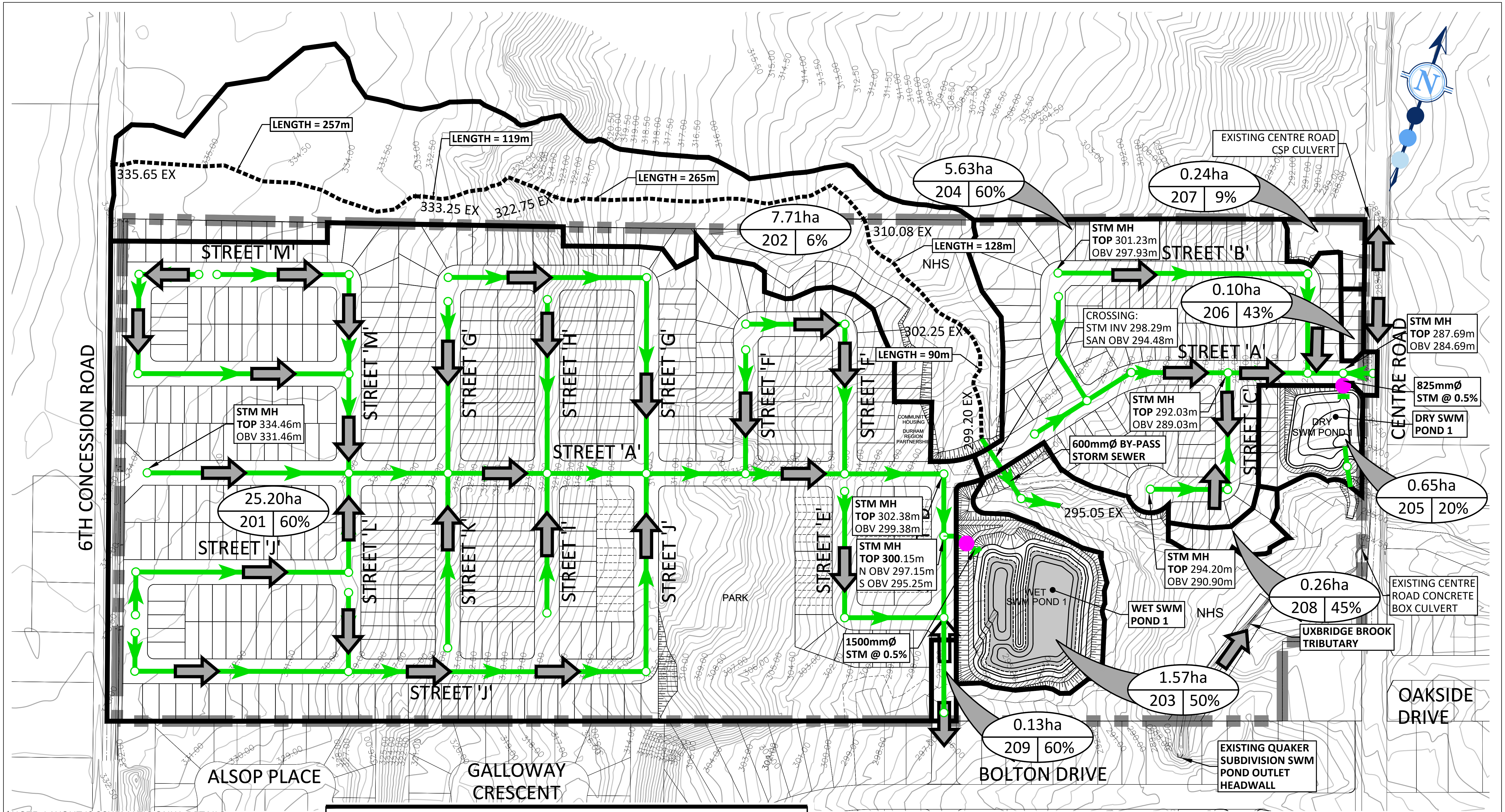
EXISTING STORM DRAINAGE PLAN

DESIGNED BY:	G.M.	CHECKED BY:	N.D.M.
SCALE:	1:3000	DATE:	FEBRUARY 2023

PROJECT No: 2099

FIGURE No: 2.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-STRM-EXST-2.1.dwg — Revised by <SOZDEMIR> : Fri, Feb 10 2023 — 12:00pm



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

●	VORTECH OIL GRIT SEPARATOR
▬ ▬ ▬	LIMIT OF PROPERTY
▬▬▬	PROPOSED STORM DRAINAGE BOUNDARY
—○—➤	STORM SEWER AND MANHOLE
318.00	EXISTING CONTOUR AND ELEVATION
➡	OVERLAND FLOW DIRECTION
⇨	MINOR SYSTEM FLOW DIRECTION

25.20ha — DRAINAGE AREA (HECTARES)
201 | 60% — (%) IMPERVIOUS, CATCHMENT ID

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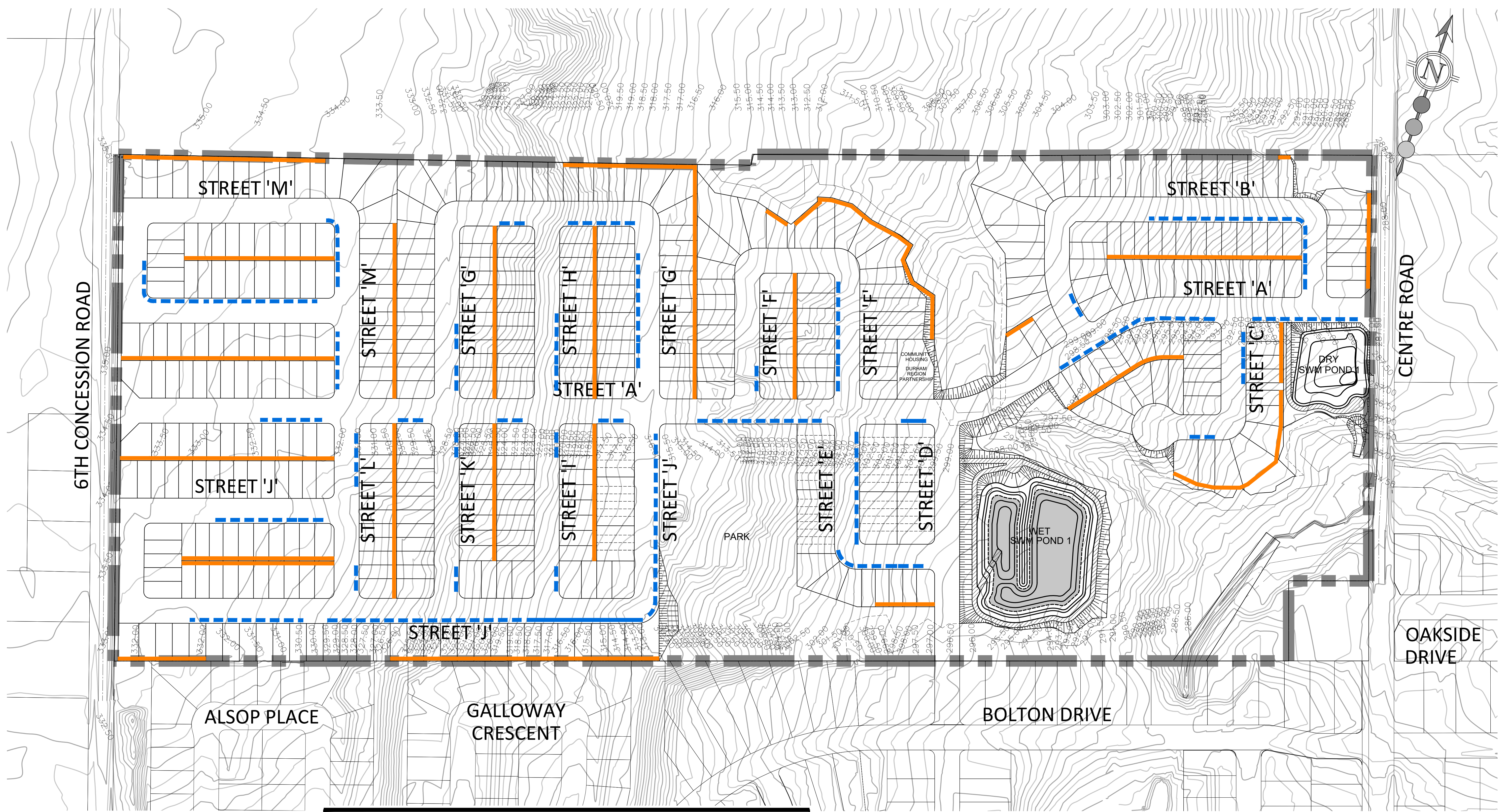
7370 CENTRE ROAD UXBRIDGE

PROPOSED STORM DRAINAGE PLAN

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:3000
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 2.2

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-STRM-PROP-2.2.dwg — Revised by <SOZDEMIR> : Fri, Feb 10 2023 — 12:01pm



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

▬ ▬ ▬	LIMIT OF PROPERTY
━━━	PROPOSED CATCHBASIN INFILTRATION FACILITY WITH CATCHBASIN PRETREATMENT
- - - -	PROPOSED CATCHBASIN FILTRATION FACILITY WITH CATCHBASIN PRETREATMENT
━━━	REAR YARD AT-SURFACE INFILTRATION TRENCH

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7370 CENTRE ROAD UXBRIDGE

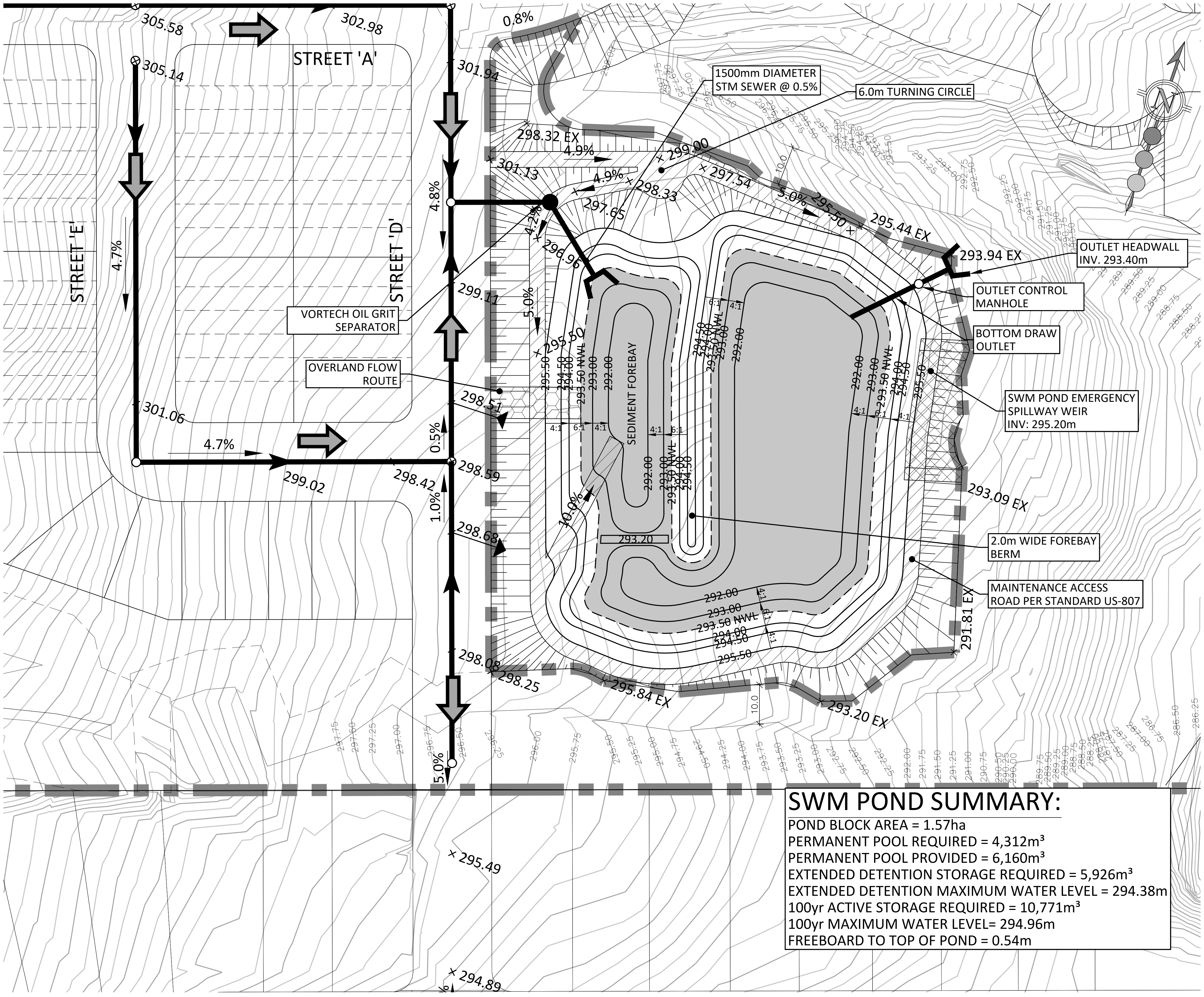
LID LOCATION PLAN

DESIGNED BY:	G.M.	CHECKED BY:	N.D.M.
SCALE:	1:3000	DATE:	FEBRUARY 2023

PROJECT No: 2099

FIGURE No: 2.3

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-LIDS-2.3.dwg — Revised by <SOZDEMIR> : Fri, Feb 10 2023 — 12:02pm



SWM POND SUMMARY:

POND BLOCK AREA = 1.57ha
PERMANENT POOL REQUIRED = 4,312m^3
PERMANENT POOL PROVIDED = 6,160m^3
EXTENDED DETENTION STORAGE REQUIRED = 5,926m^3
EXTENDED DETENTION MAXIMUM WATER LEVEL = 294.38m
100yr ACTIVE STORAGE REQUIRED = 10,771m^3
100yr MAXIMUM WATER LEVEL= 294.96m
FREEBOARD TO TOP OF POND = 0.54m

LEGEND:

▬ ▬ ▬	LIMIT OF PROPERTY
▬ ▪ ▬	LIMIT OF SWM POND BLOCK
━━►━○━	STORM SEWER AND MANHOLE
293.00	EXISTING CONTOUR AND ELEVATION
– – 293.50 NWL – –	PROPOSED NORMAL WATER ELEVATION
295.50	PROPOSED POND CONTOUR
┴┴┴┴	PROPOSED EMBANKMENT (MAX 3:1)
▨	MAINTENANCE ACCESS ROAD
▒	PERMANENT POOL
⬡	OVERLAND FLOW ROUTE/MAINTENACE ACCESS ROAD
▩	EMERGENCY SPILL WAY
× 301.62	PROPOSED ELEVATION
× 296.50SW	PROPOSED SWALE ELEVATION
× 297.88 EX	EXISTING ELEVATION
⇨	OVERLAND FLOW DIRECTION

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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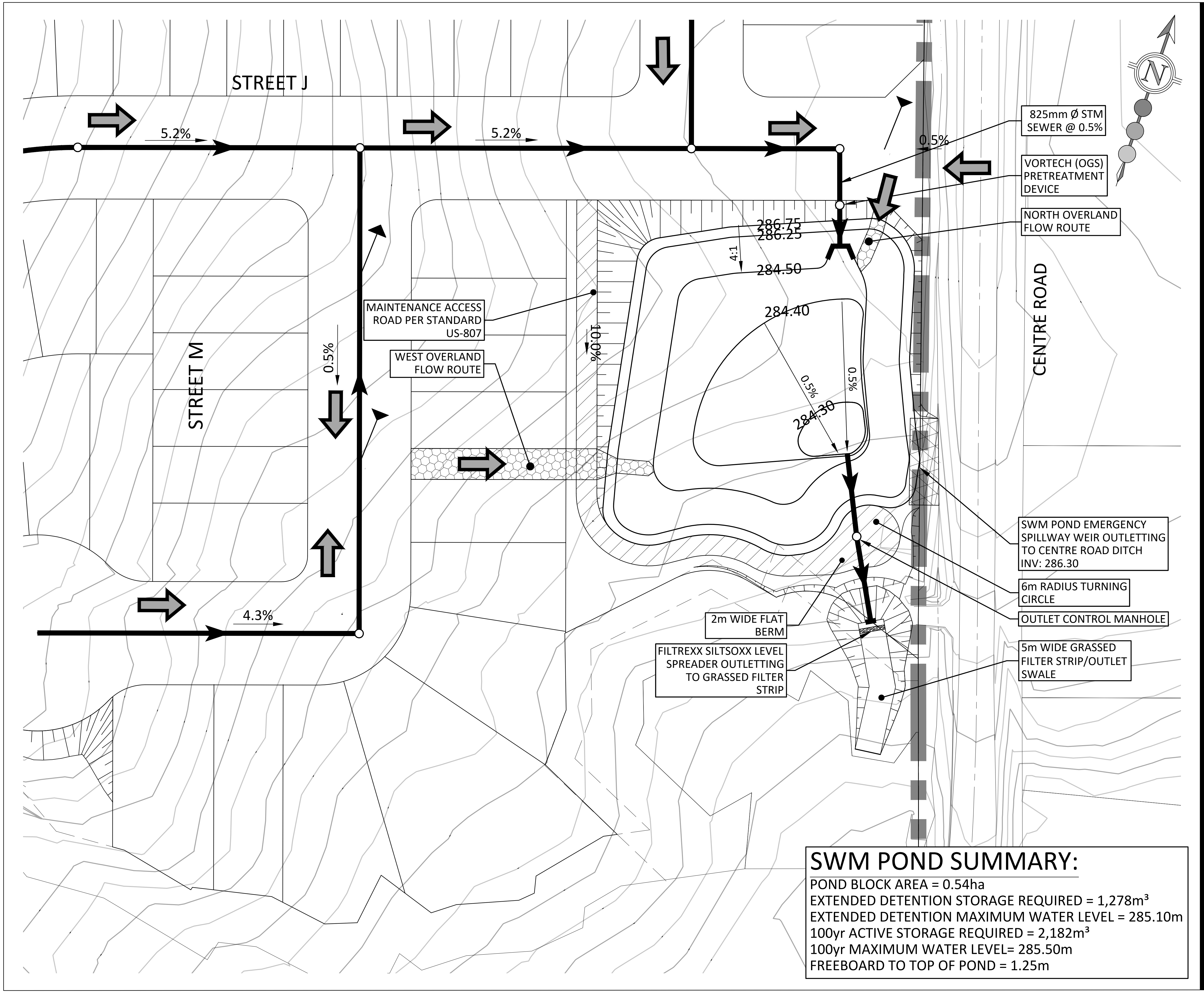
7370 CENTRE ROAD UXBRIDGE

WET STORMWATER MANAGEMENT POND 1

DESIGNED BY:	G.M.	CHECKED BY:	N.D.M.
SCALE:	1:1000	DATE:	FEBRUARY 2023
PROJECT No:	2099	FIGURE No:	2.4

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-POND-2.4.dwg – Revised by <SOZDEMIR> : Fri, Feb 10 2023 – 12:03pm



SWM POND SUMMARY:

POND BLOCK AREA = 0.54ha
EXTENDED DETENTION STORAGE REQUIRED = 1,278m³
EXTENDED DETENTION MAXIMUM WATER LEVEL = 285.10m
100yr ACTIVE STORAGE REQUIRED = 2,182m³
100yr MAXIMUM WATER LEVEL= 285.50m
FREEBOARD TO TOP OF POND = 1.25m

LEGEND:

▬ ▬ ▬	LIMIT OF PROPERTY
▬ ▪ ▬	LIMIT OF SWM POND BLOCK
━━▶━━○━━	STORM SEWER AND MANHOLE
288.00	EXISTING CONTOUR AND ELEVATION
┬┬┬┬┬	PROPOSED EMBANKMENT (MAX 3:1)
▨	MAINTENANCE ACCESS ROAD
⬡	OVERLAND FLOW ROUTE
× 287.77 EX	EXISTING ELEVATION
× 292.60	PROPOSED ELEVATION
× 284.18SW	PROPOSED SWALE ELEVATION
⇨	OVERLAND FLOW DIRECTION

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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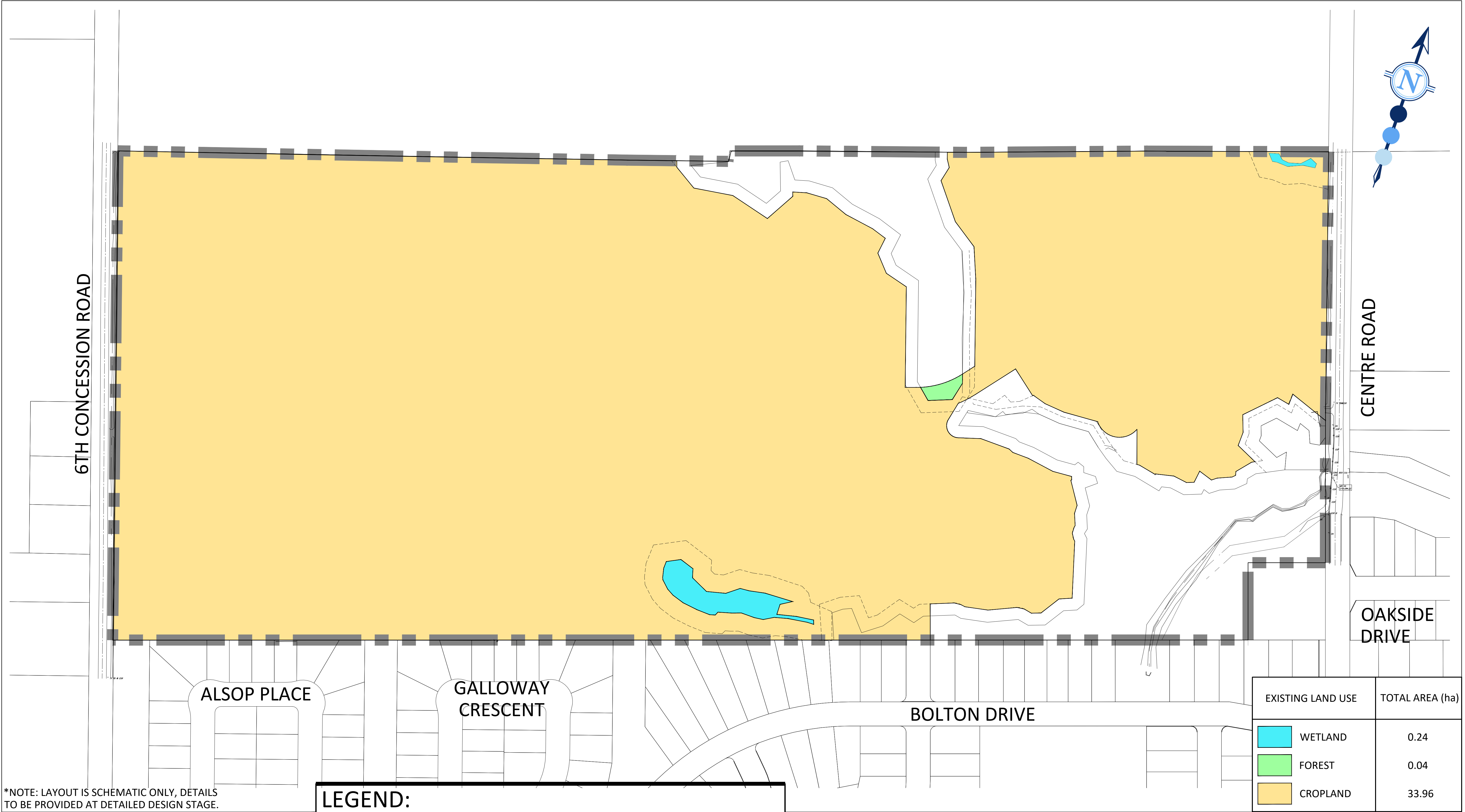
7370 CENTRE ROAD UXBRIDGE

DRY STORMWATER MANAGEMENT POND 1

DESIGNED BY:	G.M.	CHECKED BY:	N.D.M.
SCALE:	1:750	DATE:	FEBRUARY 2023
PROJECT No:	2099	FIGURE No:	2.5

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-POND-2.5.dwg - Revised by <SOZDEMIR> : Fri, Feb 10 2023 - 12:04pm



EXISTING LAND USE		TOTAL AREA (ha)
🟦	WETLAND	0.24
🟩	FOREST	0.04
🟨	CROPLAND	33.96

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

▬ ▪ ▪ ▬ LIMIT OF PROPERTY

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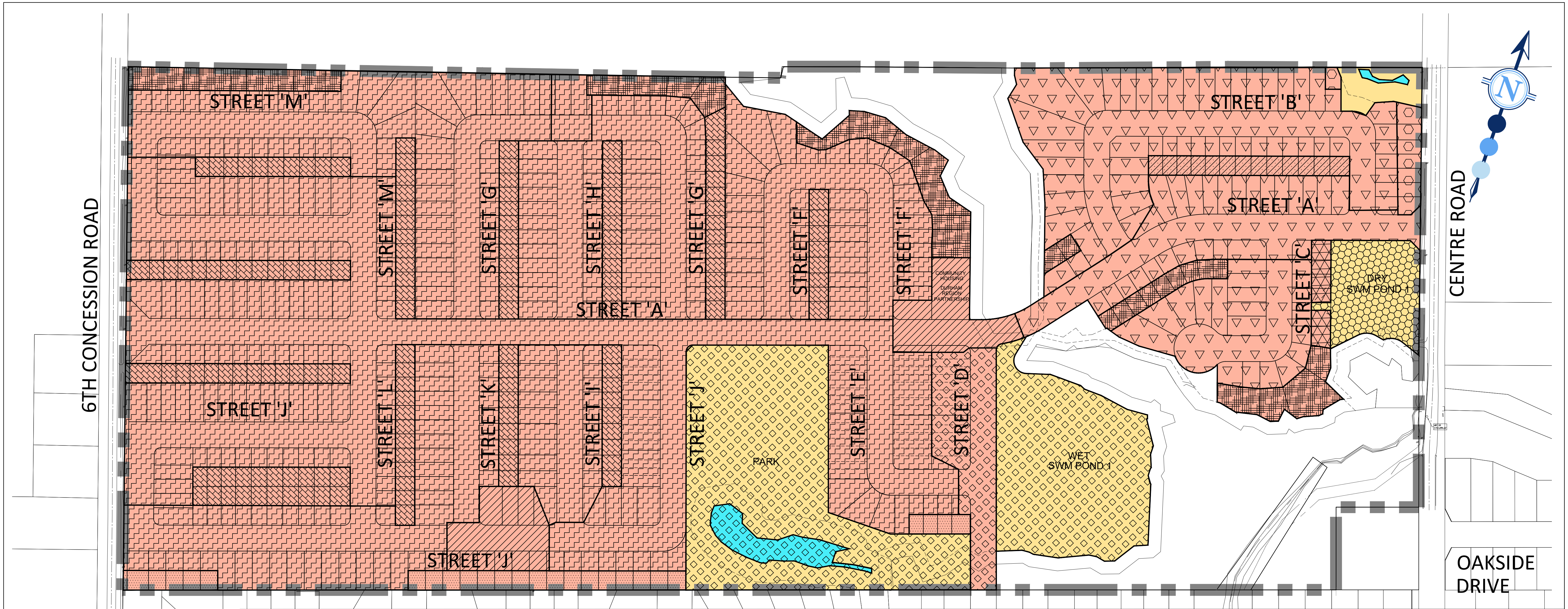
7370 CENTRE ROAD UXBRIDGE

EXISTING PHOSPHORUS BUDGET

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:3000
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 2.6

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-PHSB-EXST-2.6.dwg – Revised by <SOZDEMIR> : Fri, Feb 10 2023 – 12:06pm



PROPOSED LAND USE		TOTAL AREA TO BEST MANAGEMENT PRACTICE (ha)											
		OUTLETTING TO STREAM BUFFER						OUTLETTING TO GRASSED SWALE		OUTLETTING TO GRASSED FILTER STRIP			
		CATCHBASIN INFILTRATION TRENCH TO WET POND	CATCHBASIN FILTRATION TRENCH TO WET POND	REAR YARD AT - SURFACE INFILTRATION TO WET POND	WET SWM POND	REAR YARD AT-SURFACE INFILTRATION TO CATCHBASIN FILTRATION TRENCH TO WET POND	REAR YARD AT - SURFACE INFILTRATION ONLY	UNCONTROLLED	REAR YARD AT - SURFACE INFILTRATION ONLY	CATCHBASIN FILTRATION TRENCH TO DRY SWM POND	REAR YARD AT-SURFACE INFILTRATION TO CATCHBASIN FILTRATION TRENCH TO DRY SWM POND	DRY SWM POND	REAR YARD AT-SURFACE INFILTRATION TO DRY POND
		▨	▤	░	◇	▩	▦	▭	⬡	▽ ▽ ▽	▨	⬢	⨯
🟥	HIGH INTENSITY DEVELOPMENT (RESIDENTIAL)	0.85	17.72	0.50	0.67	2.62	1.31	0.00	0.18	5.13	0.23	0.00	0.11
🟨	LOW INTENSITY DEVELOPMENT (RESIDENTIAL)	0.00	0.00	0.00	3.95	0.00	0.00	0.18	0.00	0.00	0.00	0.54	0.00
🟦	WETLAND	0.00	0.00	0.00	0.22	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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LEGEND:

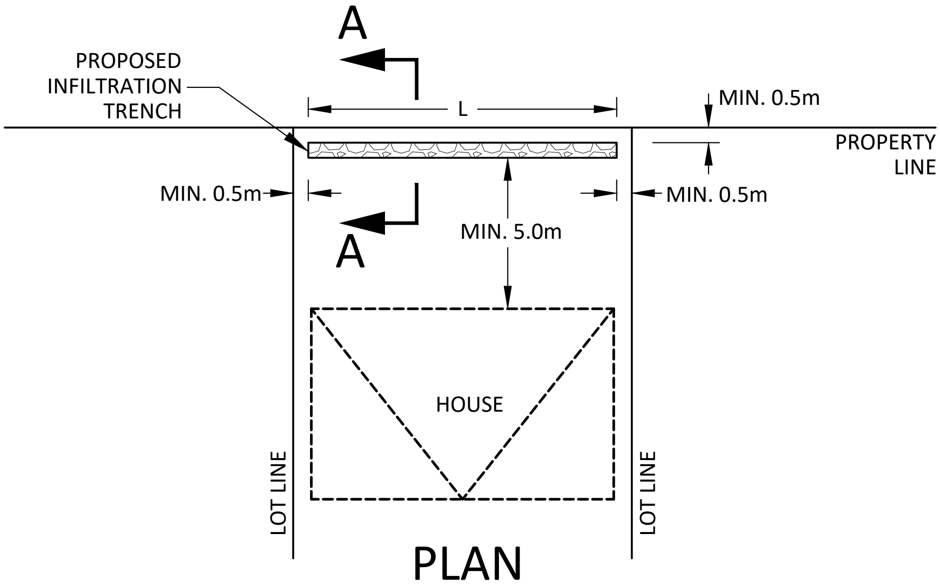
▬ ▪ ▪ ▬ LIMIT OF PROPERTY

7370 CENTRE ROAD UXBRIDGE

PROPOSED PHOSPHORUS BUDGET

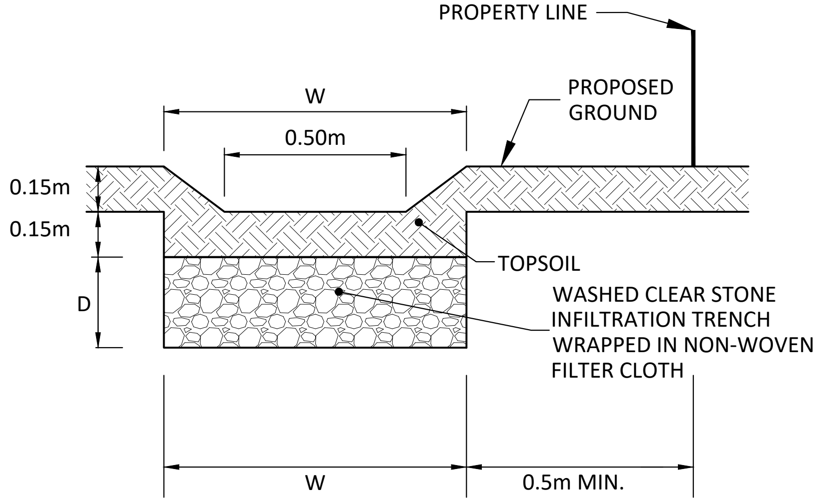
DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:3000
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 2.7

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-PHSB-PROP-2.7.dwg – Revised by <SOZDEMIR> : Fri, Feb 10 2023 – 12:06pm



PLAN

SCALE 1:250



CROSS - SECTION A-A

SCALE: N.T.S.

MAXIMUM TRENCH DIMENSIONS:

MINIMUM TYPICAL LOT FRONTAGE (m)	L (m)	W (m)	D (m)	MAXIMUM INFILTRATION VOLUME PROVIDED (m³)
11.0	10.0	1.0	0.6	3.6
12.2	11.2	1.0	0.6	4.0
13.4	12.4	1.0	0.6	4.5

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REAR YARD INFILTRATION TRENCH DETAILS

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: N.T.S.
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 2.8

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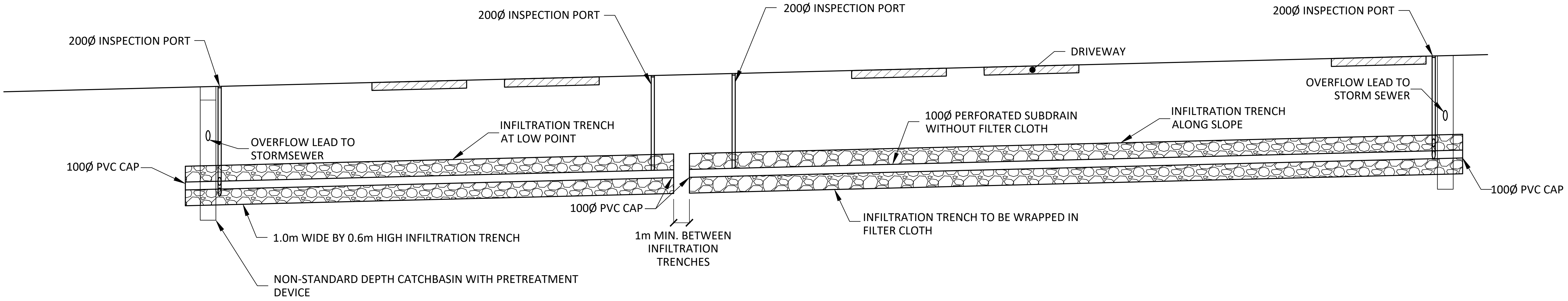
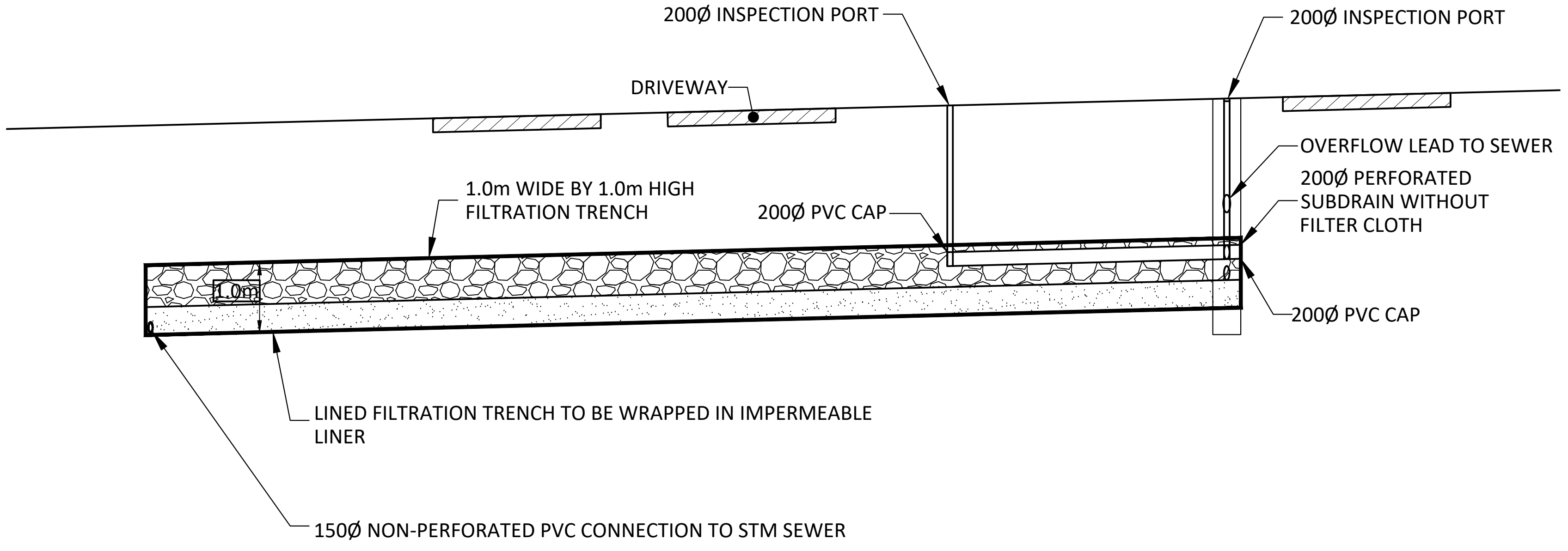


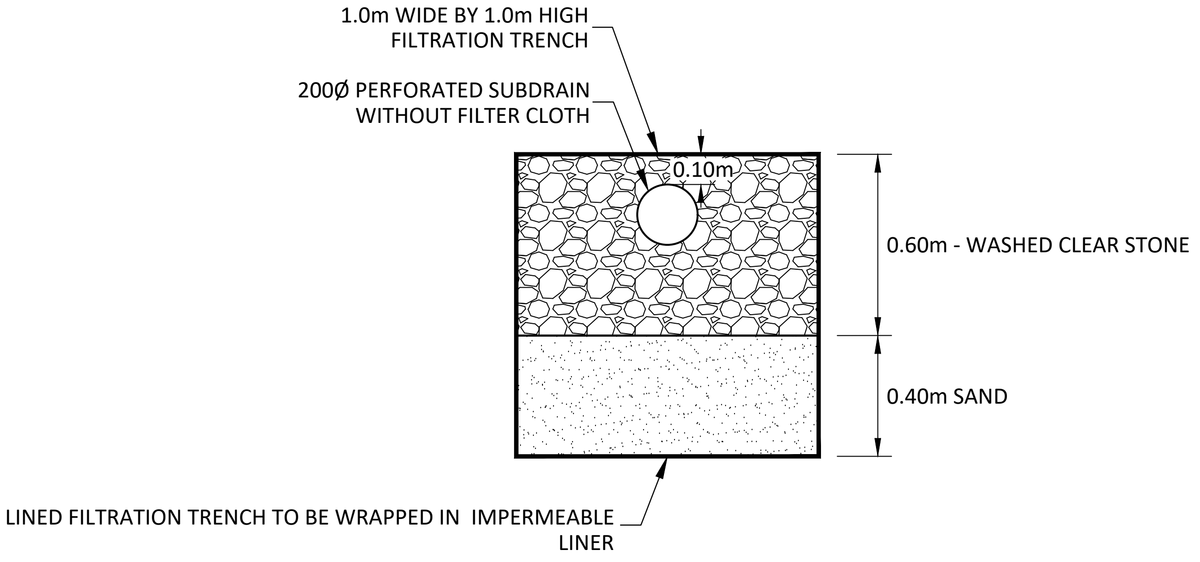
PRELIMINARY INFILTRATION TRENCH - PROFILE VIEW

SCALE: N.T.S.



PRELIMINARY FILTRATION TRENCH - PROFILE VIEW

SCALE: N.T.S.



PRELIMINARY FILTRATION TRENCH CROSS-SECTION

SCALE: N.T.S.

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

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LEGEND:

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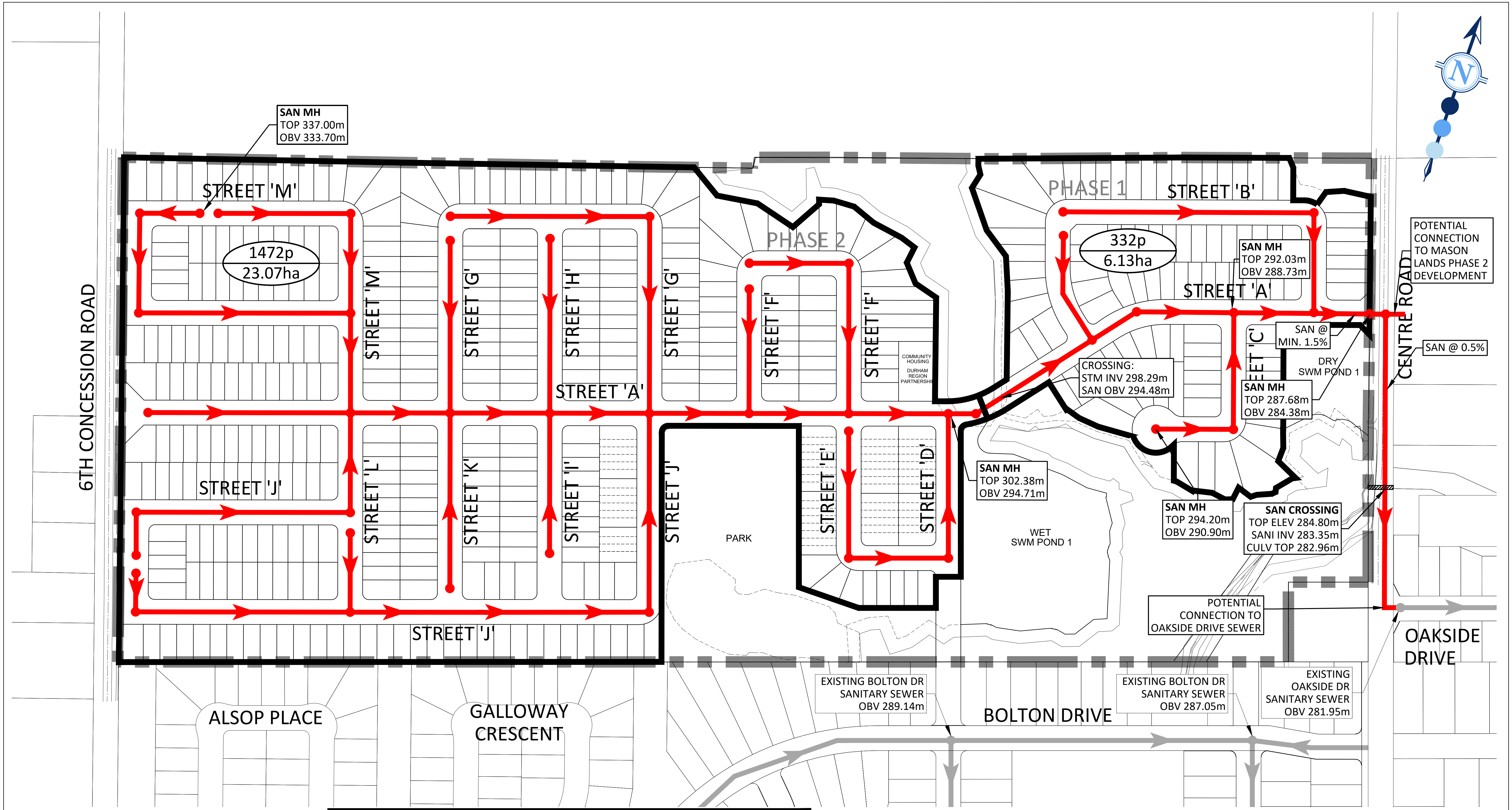
7370 CENTRE ROAD UXBRIDGE

CATCHBASIN INFILTRATION/ FILTRATION TRENCH DETAILS

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:1000
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 2.9

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-INFI-2.9.dwg – Revised by <SOZDEMIR> : Fri, Feb 10 2023 – 12:08pm



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

▬ ▬ ▬	LIMIT OF PROPERTY
▬	SANITARY DRAINAGE BOUNDARY
─●─	PROPOSED SANITARY SEWER AND MANHOLE
─●─	EXISTING SANITARY SEWER AND MANHOLE
⇨	PROPOSED SANITARY FLOW
1472p / 23.07ha	POPULATION (PERSONS) DRAINAGE AREA (HECTARES)

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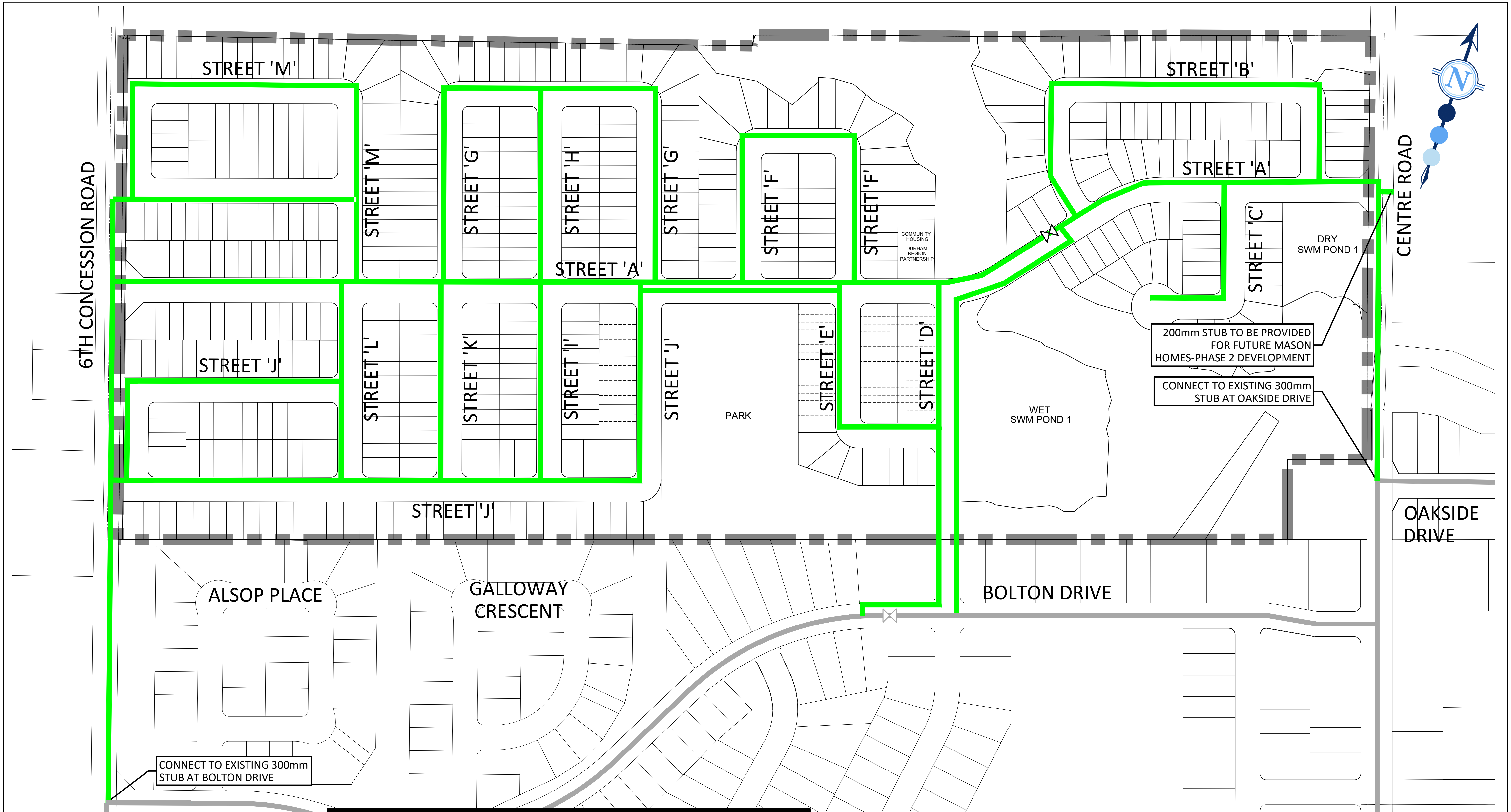
SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

7370 CENTRE ROAD UXBRIDGE

PROPOSED SANITARY DRAINAGE PLAN

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:3000
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 3.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-SANI-3.1.dwg - Revised by <SOZDEMIR> : Mon, Feb 27 2023 - 10:37am



200mm STUB TO BE PROVIDED FOR FUTURE MASON HOMES-PHASE 2 DEVELOPMENT

CONNECT TO EXISTING 300mm STUB AT OAKSIDE DRIVE

CONNECT TO EXISTING 300mm STUB AT BOLTON DRIVE

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE

LEGEND:

▬ ▪ ▪ ▬ LIMIT OF PROPERTY
▬ EXISTING WATERMAIN
🟥 PROPOSED 150Ø WATERMAIN
🟩 PROPOSED 200Ø WATERMAIN
🟧 PROPOSED 300Ø WATERMAIN
⌛ PROPOSED CLOSED VALVE
⌛ EXISTING CLOSED VALVE

FSSR

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

7370 CENTRE ROAD UXBRIDGE

WATER DISTRIBUTION PLAN

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:3000
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 4.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P–WTRM–DIST–4.1.dwg – Revised by <SOZDEMIR> : Fri, Feb 10 2023 – 12:09pm

*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

FSSR

SCS consulting group ltd

30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

LEGEND:

▬ ▬ ▬	LIMIT OF PROPERTY
332.00	EXISTING CONTOUR AND ELEVATION
× 333.50	PROPOSED ELEVATION
× 320.84EX	EXISTING ELEVATION
× 112.75SW	PROPOSED SWALE ELEVATION
330.51	PROPOSED ROAD ELEVATION
3.5% →	ROAD GRADE FLOW DIRECTION
F	FRONT DRAINING LOT
S	SPLIT DRAINING LOT
W/O	WALKOUT LOT
F W/I	FRONT WALK IN LOT

7370 CENTRE ROAD UXBRIDGE

PRELIMINARY GRADING PLAN

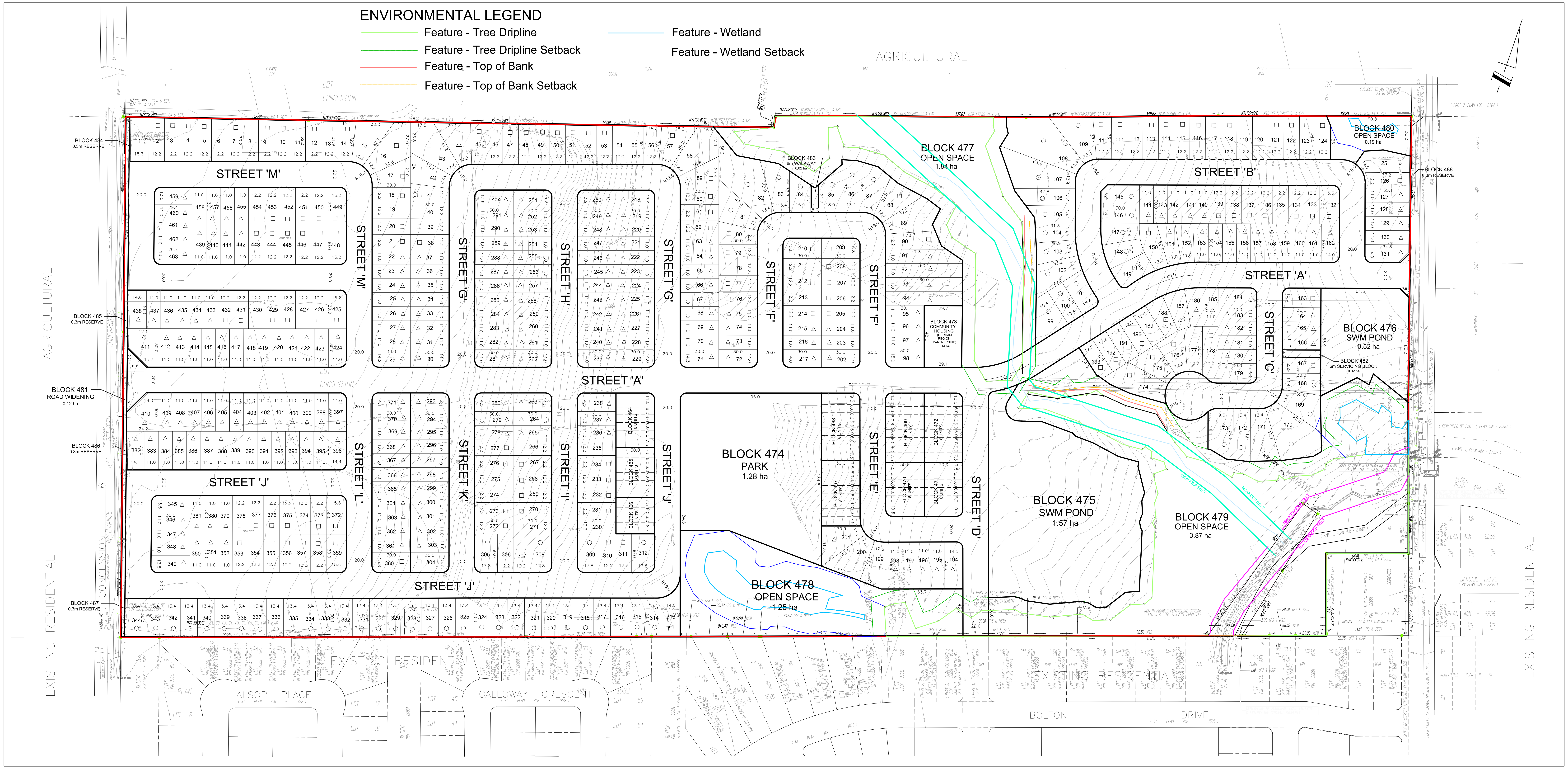
DESIGNED BY: N.D.M.
CHECKED BY: L.C.M.
SCALE: 1:1500
DATE: FEBRUARY 2023
PROJECT No: 2099
FIGURE No: 5.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-GRAD-5.1.dwg - Revised by <SOZDEMIR> : Fri, Feb 10 2023 - 12:09pm

APPENDIX A

DRAFT PLAN OF SUBDIVISION

SCS consulting group ltd



DRAFT PLAN OF SUBDIVISION

FILE: S-U-2021-01

PART OF LOT 33
CONCESSION 6
GEOGRAPHIC TOWNSHIP OF UXBRIDGE
COUNTY OF ONTARIO
NOW IN THE,
TOWNSHIP OF UXBRIDGE
REGIONAL MUNICIPALITY OF DURHAM

SCALE: 1:1500

0 50 100 150m

DEVELOPMENT STATISTICS

PROPOSED LAND USE	Lot/Block No.	Units	ha.
1) Single Family Residential			
11.0m (min) Linked Singles		233	
12.2m (min) Singles	1–463	165	18.63
13.4m (min) Singles		65	
2) 6.0m (min) Townhouses	464–472	60	1.21
3) Community Housing	473		0.14
3) Park	474		1.28
4) Storm Water Management Pond	475–476		2.09
5) Open Space	477–480		7.15
6) Road Widening	481		0.12
7) 6m Servicing Block	482		0.02
8) Walkway	483		0.02
9) 0.3m Reserves	484–488		0.01
10) Roads 4565m @ 20.0 R.O.W.			9.24
TOTAL		523	39.91

OWNER'S AUTHORIZATION

I authorize MOTR Group to prepare and submit this plan for draft approval.

Date: ____________

JOHN SPINA A.S.O.
BRIDGEBROOK CORP.

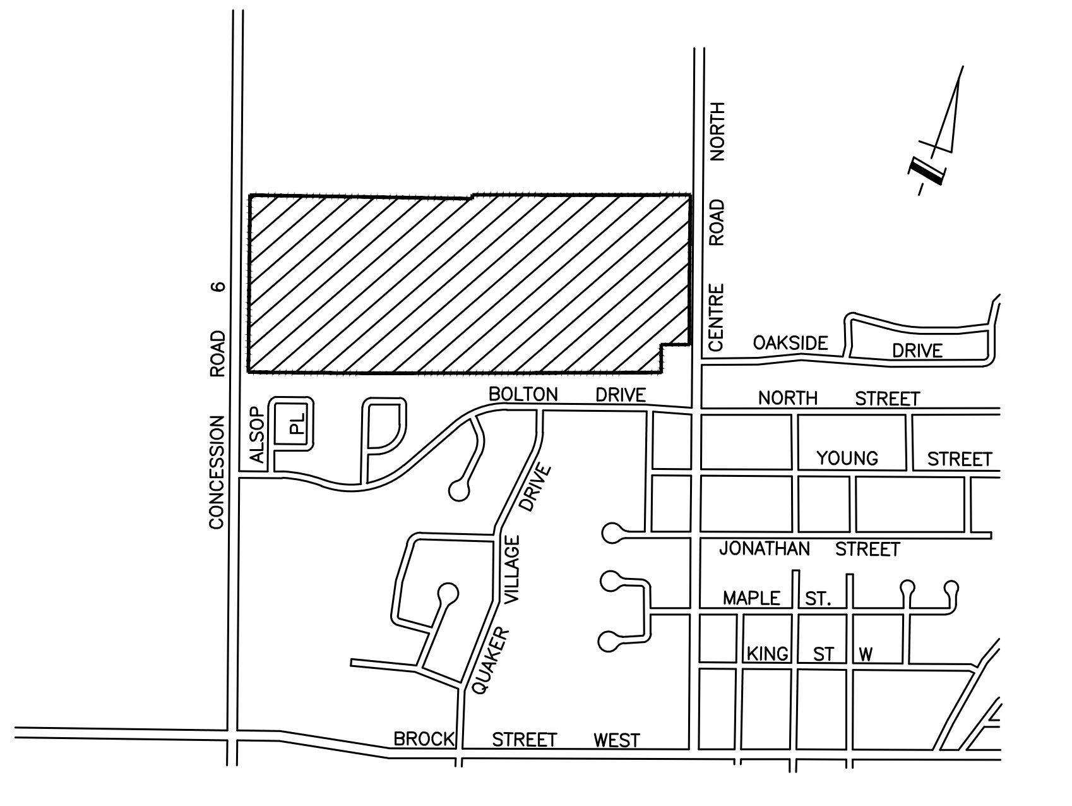
SURVEYOR'S AUTHORIZATION

I hereby certify that the boundaries of the lands being subdivided and their relationship to the adjacent lands are accurately and correctly shown on this plan.

H F Grander

Date: ____________

H. F. GRANDER Co. Ltd.
ONTARIO LAND SURVEYOR



KEY MAP

▨ Subject Property

NTS

ADDITIONAL INFORMATION

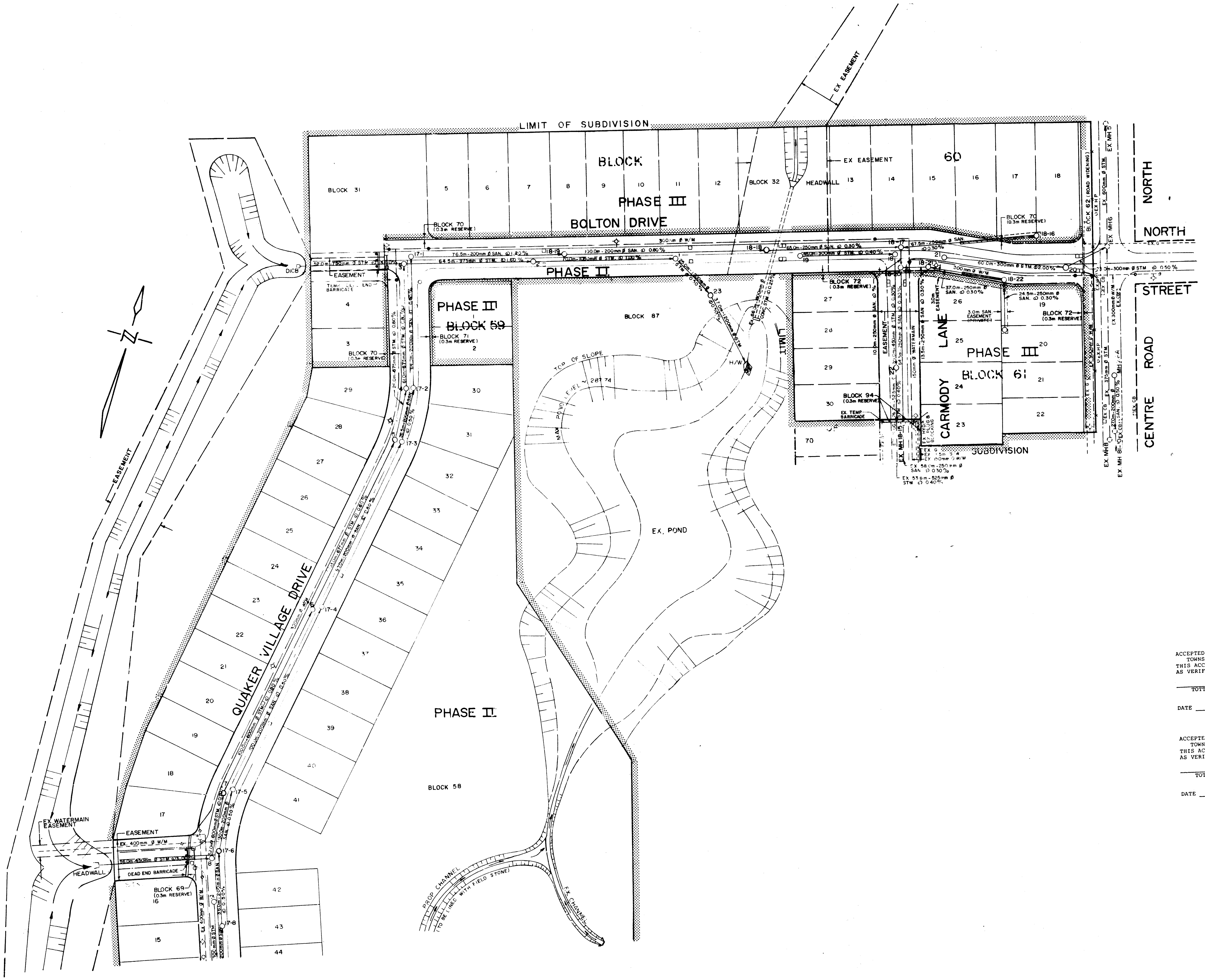
[Section 51(17) of the Planning Act, 1990]
a), b), e), g), and j) – on plan
c) – on key plan
d) – see statistics (f)
h) – piped water to be installed by Developer
i) – silty clay, sandy silt/silt and sand
k) – all municipal services to be made available
l) – nil

No.	REVISIONS	DATE
1		07/03/22
2		11/11/22
		25/01/23

APPENDIX B

RELEVANT EXCERPTS

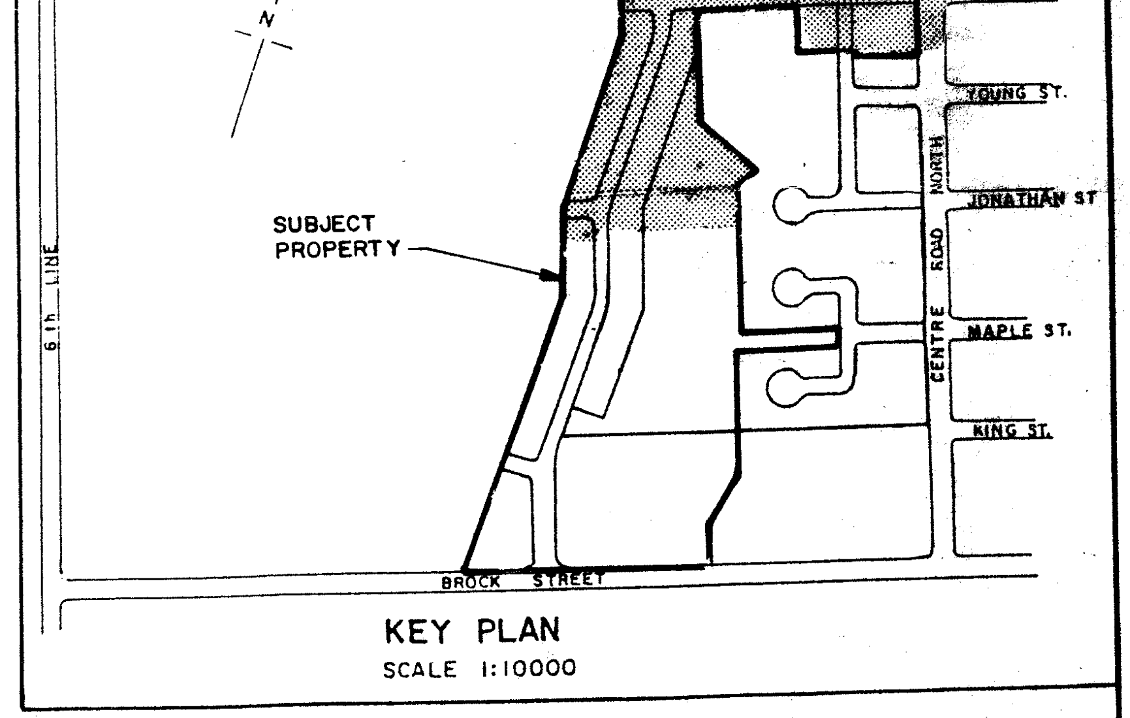
METRIC



SEE DWG No G-103

NOTE

FOR GENERAL NOTES AND LEGEND SEE DWG No. G 101



KEY PLAN
SCALE 1:10000

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES CONCERNED TO BE GIVEN REQUIRED ADVANCE NOTICE PRIOR TO ANY DIGGING, FOR STAKE OUT. THE CONSULTANT ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.

ACCEPTED TO BE IN ACCORDANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT

TOTTEN SIMS HUBICKI ASSOCIATES
(1981) LIMITED

DATE 88/06/15

ACCEPTED TO BE IN ACCORDANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT

TOTTEN SIMS HUBICKI ASSOCIATES
(1981) LIMITED

DATE

APPROVED

______ P Eng
Township Engineer For The
Township of Uxbridge
Date ______

APPROVED

Clifford Curtis
Regional Municipality Of Durham
Date Sept 02, 1988

No	DESCRIPTION	DATE	BY	APPROVED

REVISIONS

CORPORATION OF THE TWP. OF UXBRIDGE
ENGINEERING DEPARTMENT

QUAKER VILLAGE PHASE II

GENERAL PLAN

CONSULTING ENGINEERS
G. M. SERNAS & ASSOC. LTD.
185 BROCK ST. NORTH, SUITE 207
WHITBY, ONTARIO, LIN 4H3
TEL. 668-0764

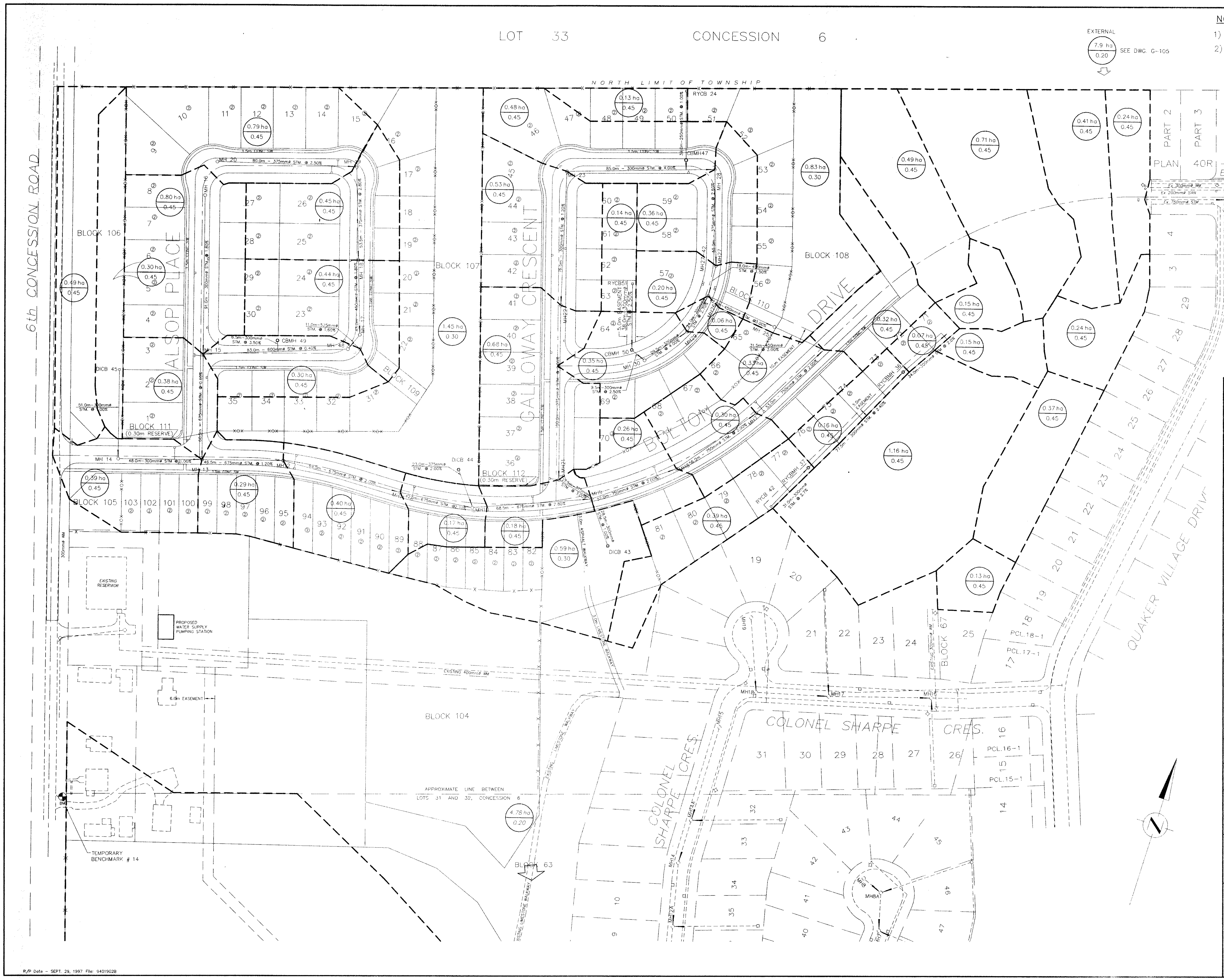
LICENSED PROFESSIONAL ENGINEER
A. S. Y. LI
ONTARIO

SCALE: 1:1000
DRAWN BY: L.J.M.
DESIGNED BY: D.Y.
CHECKED BY: A.L.
DATE: SEPT, 1987

PROJECT No. 8614
DRAWING No. G-102

OCTOBER 13

NOV 1



R/P Date - SEPT. 29, 1997 File: 94019G2B

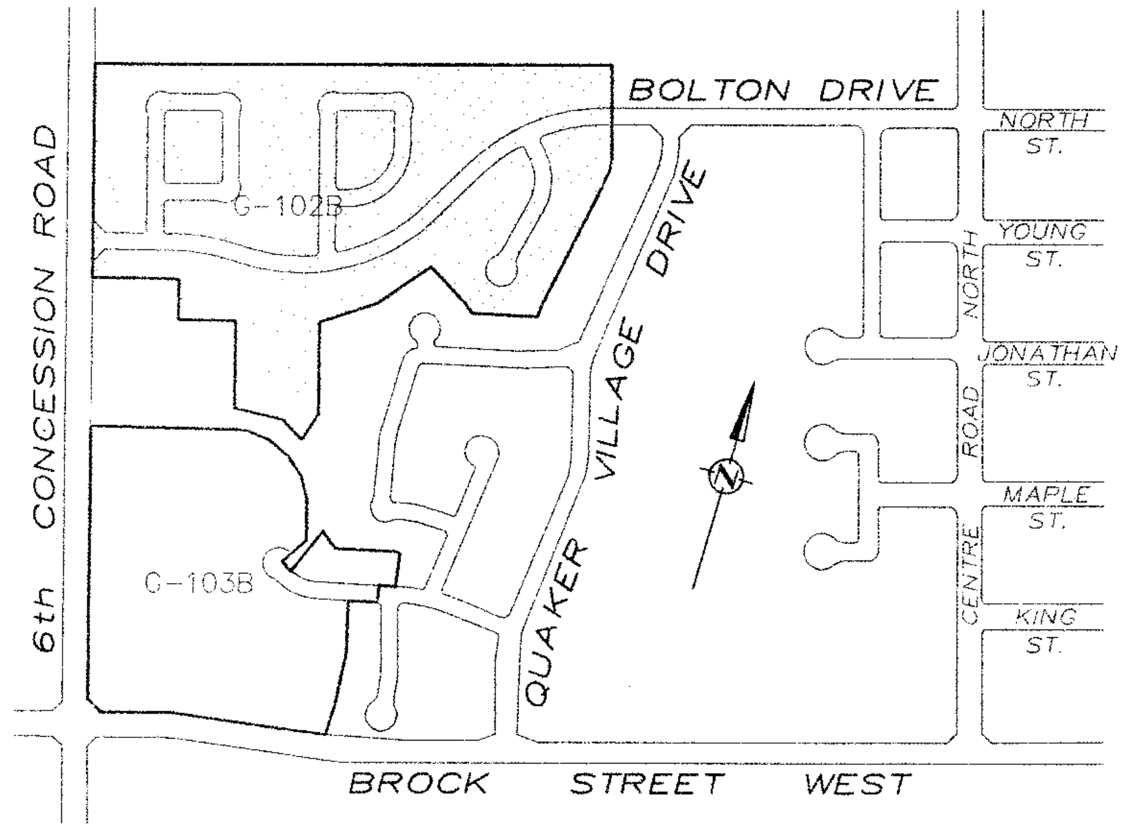
NOTE

1) FOR GENERAL NOTES AND LEGEND SEE DWG. G-101.
2) MEASUREMENTS IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.

LEGEND

0.44 ha	DRAINAGE AREA IN HECTARES
0.45	RUNOFF COEFFICIENT

TOWN OF UXBRIDGE



KEY PLAN
N.T.S.

ACCEPTED TO BE IN GENERAL CONFORMANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT

J.D. McEWEN, P.ENG
J.D. McEwen
TOTTEN SIMS HUBICKI ASSOCIATES
(1991) LIMITED
Date: Oct. 1 ~~25~~, ~~1996~~ 1997

APPROVED
[redacted]
P. Eng.
Department Of Works
Region Of Durham
Date:

REVISIONS

No.	Revision	Date	By	Approved

CORPORATION OF THE TOWNSHIP OF UXBRIDGE
Engineering Department

QUAKER VILLAGE - PHASE V
18T-94016

GENERAL PLAN
STORM DRAINAGE AREA PLAN

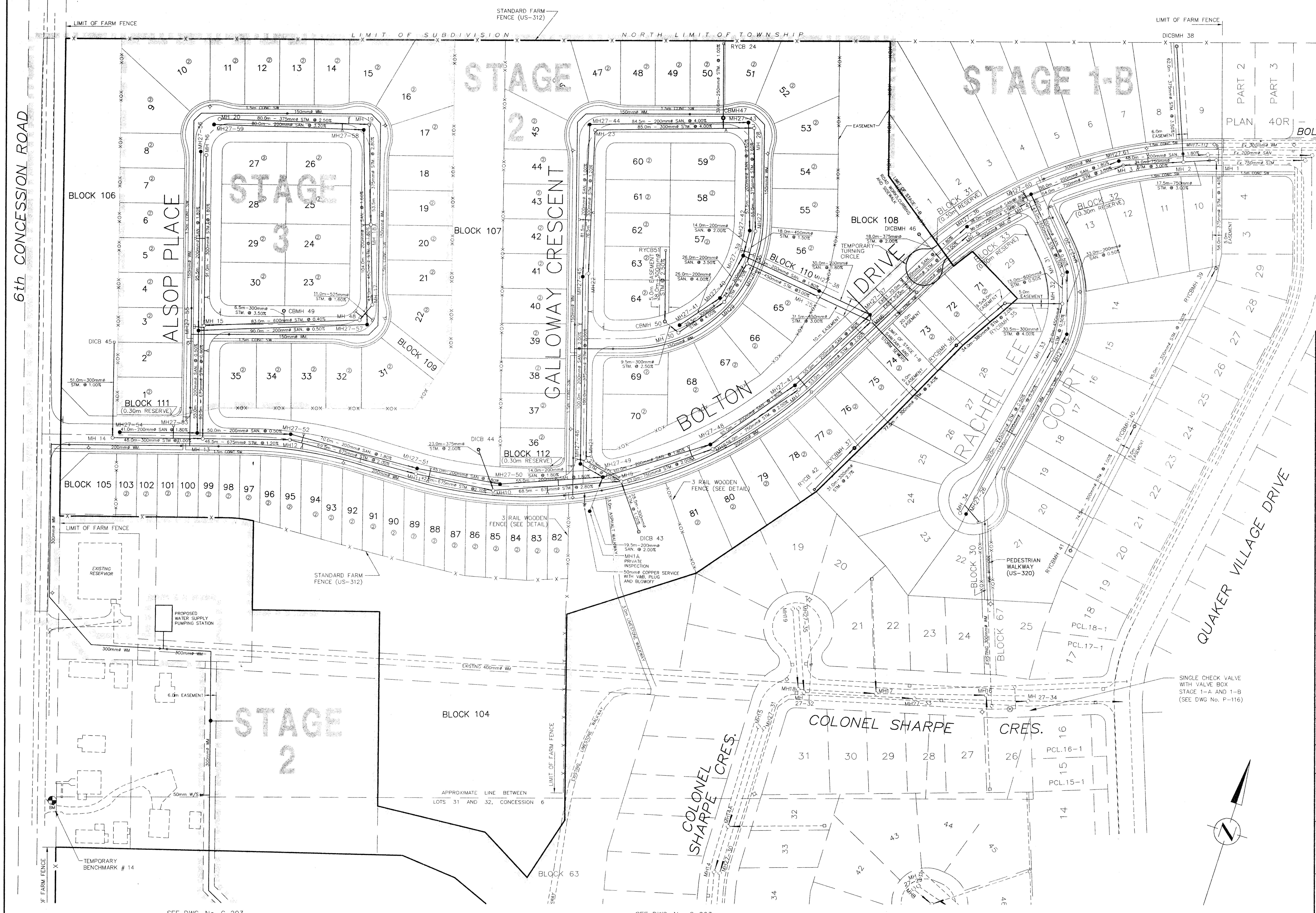
G.M. Sernas & Associates Ltd.
Consulting Engineers & Planners

110 SCOTIA COURT UNIT 41
WHITBY, ONTARIO L1N 8Y7
TEL (905) 432-7878
FAX (905) 432-7877

R.F. TRANQUADA
1-10-97

SCALE : 1 : 1000
DATE : SEPTEMBER, 1997
DRAWN BY : P.W.
DESIGNED BY : D.Y.
CHECKED BY : D.Y./R.F.T.
PROJECT No. 94019
DRAWING No. G-102B

ISSUED FOR CONSTRUCTION OCT 0 6 1997



NOTE

1) FOR GENERAL NOTES AND LEGEND SEE DWG. G-101.

2) MEASUREMENTS IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN.

LEGEND

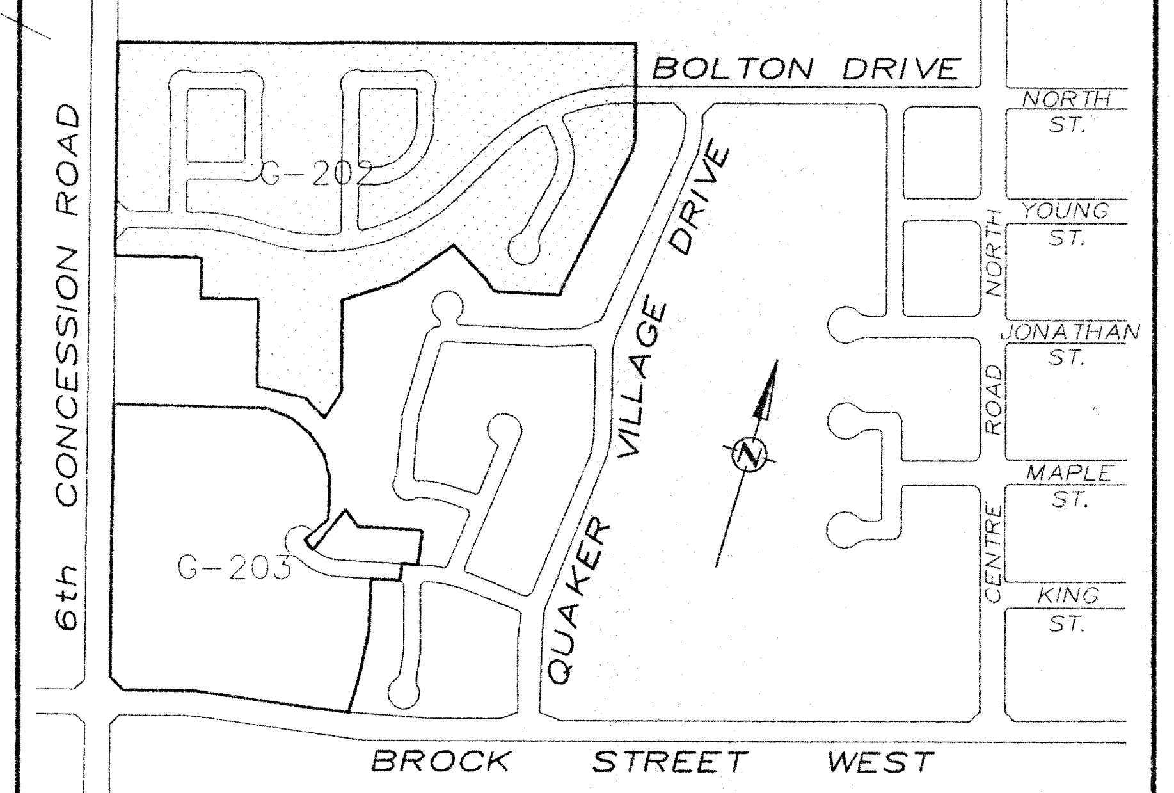
3②	DENOTES STAGE 2 LOTS
	LIMIT OF AREA TO BE SERVICED UNDER REGION OF DURHAM SUBDIVISION AREEMENT

SITE BENCHMARK

TEMPORARY BENCHMARK # 14 ELEV. 329.038m

HEAD OF SPIKE IN SOUTH FACE OF HYDRO POLE AND LIGHT STANDARD, EAST SIDE OF THE 6th CONCESSION ROAD IN FRONT OF THE MUSEUM.

TOWN OF UXBRIDGE



KEY PLAN

N.T.S.

ACCEPTED TO BE IN GENERAL CONFORMANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT

J.D. McEWEN, P.ENG

TOTTEN SIMS HUBICKI ASSOCIATES (1997) LIMITED

Date: OCT. 1, 1997

APPROVED

U. Siksna P. Eng.

Department Of Works

Region Of Durham

Date: OCT. 3, 1997

REVISIONS

No.	Revision	Date	By	Approved

CORPORATION OF THE TOWNSHIP OF UXBRIDGE

Engineering Department

QUAKER VILLAGE - PHASE V

18T-94016 STAGE 2

GENERAL PLAN

G.M. Sernas & Associates Ltd.

Consulting Engineers & Planners

110 SCOTIA COURT UNIT 41
WHITBY, ONTARIO L1N 8Y7
TEL (905) 432-7878
FAX (905) 432-7877

R.F. TRANQUADA
1-10-97

SCALE : 1 : 1000

DATE : SEPTEMBER, 1997

DRAWN BY : P.W.

DESIGNED BY : P.W./D.Y.

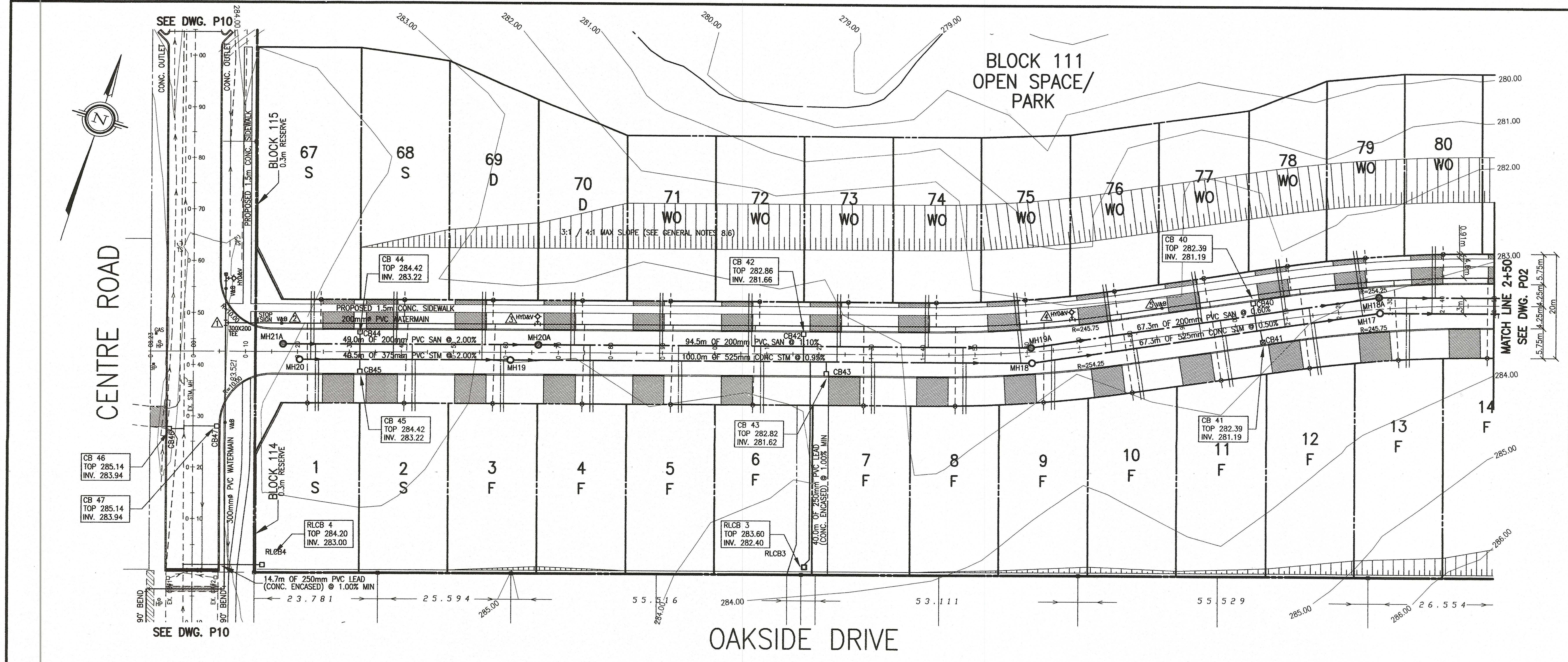
CHECKED BY : D.Y./R.F.T.

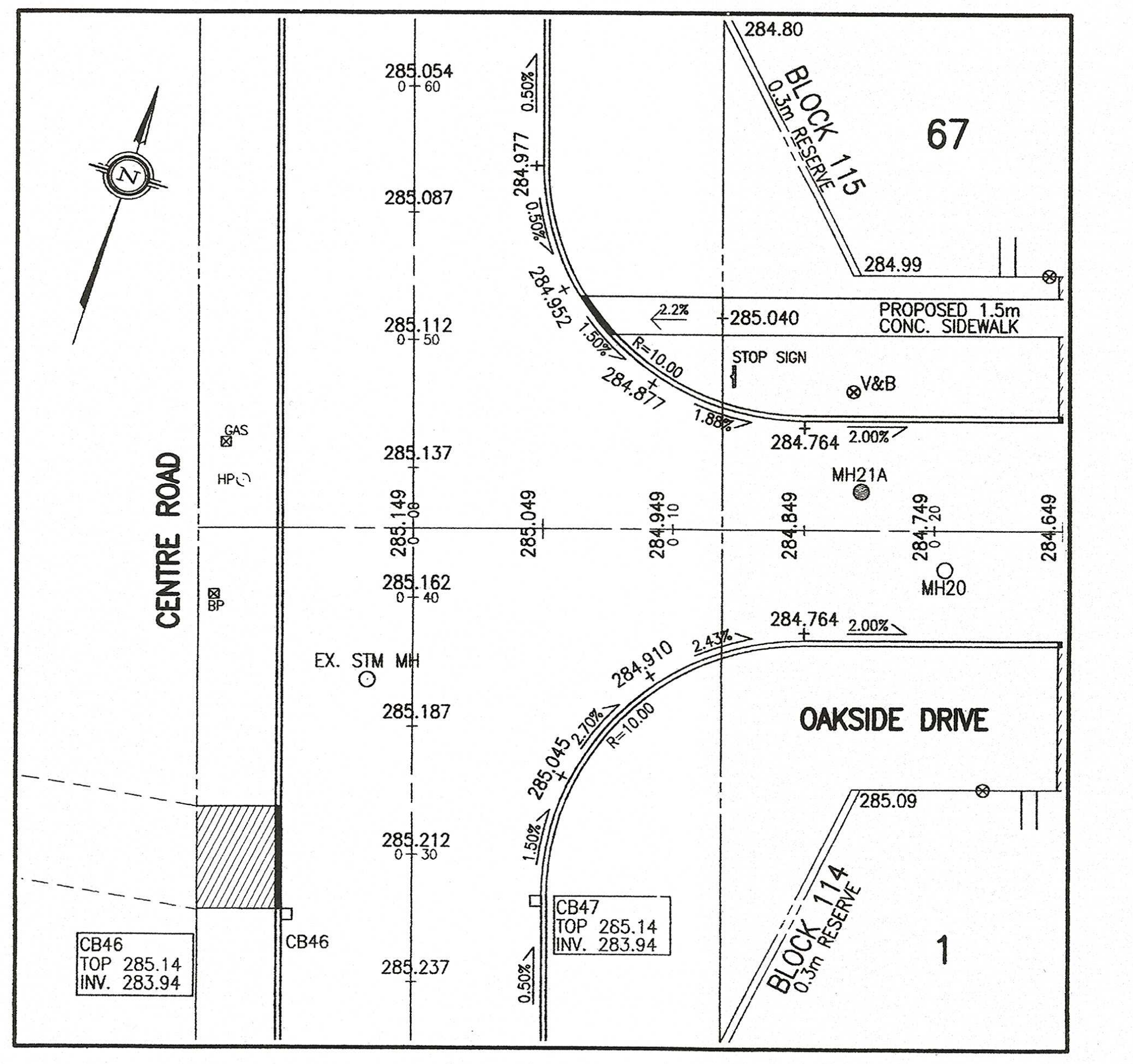
PROJECT No. 94019

DRAWING No. G-202

R/P Date - SEPT. 30, 1997 File: 9419G202

ISSUED FOR CONSTRUCTION OCT 0 6 1997

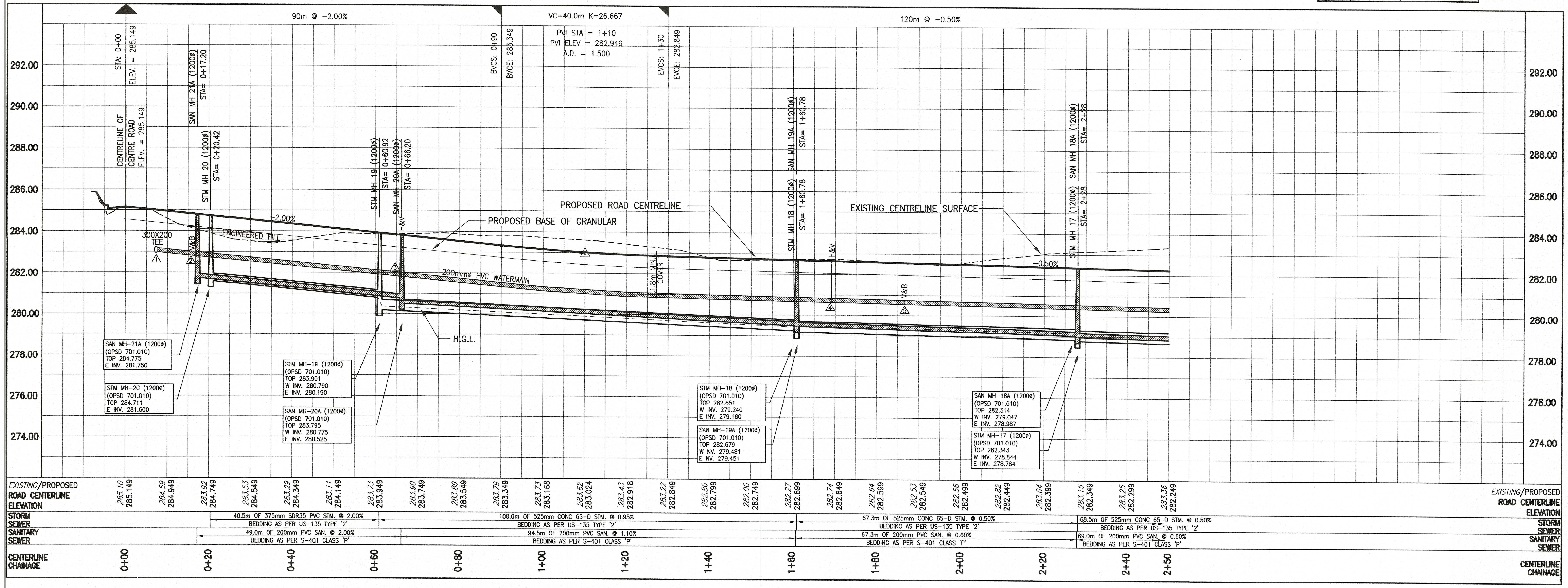


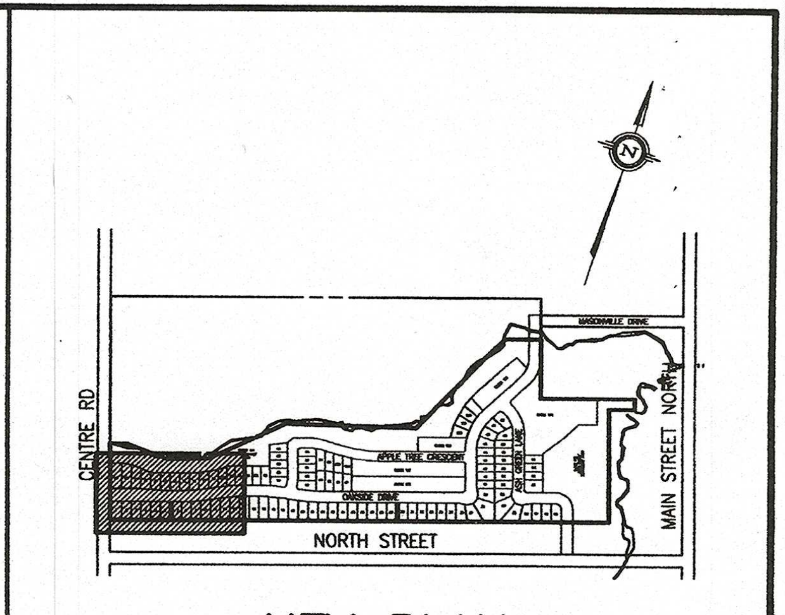


GRADING DETAIL
CENTRE ROAD & OAKSIDE DRIVE
SCALE 1:250

WATERMAIN DATA			
△ MARK	ELEVATION	DESCRIPTION	CHAINAGE
1	283.25	300X200 TEE	0+07
2	283.02	200ø VALVE AND BOX	0+17
3	282.02	HYDRANT AND VALVE	0+66
4	280.85	HYDRANT AND VALVE	1+69
5	280.77	200ø VALVE AND BOX	1+87

RESTRICTED CATCHBASIN		
CB/DCB	CHAINAGE	STREET
CB41	2+05	OAKSIDE DRIVE





KEY PLAN
SCALE 1:12,500

LEGEND

EXISTING CONTOUR	297.00
EXISTING STORM MANHOLE	○
EXISTING SANITARY MANHOLE	●
EXISTING CATCHBASIN	□
PROPOSED SWALE, OR GUTTER LINE	>
PROPOSED DITCH	→ →
PROPOSED STORM MANHOLE	○
PROPOSED SANITARY MANHOLE	●
PROPOSED CATCHBASIN/RESTRICTED	□/⊠
PROPOSED DOUBLE CATCHBASIN	◫
PROPOSED WATER BOX/WATER VALVE	•/⊗
PROPOSED HYDRANT AND VALVE	⊢◇
PROPOSED 4:1/3:1 MAX SLOPE	╨
PROPOSED DRIVEWAY & CURB CUT	▨
PROPOSED WATER SERVICE	- - - - -
PROPOSED SANITARY SERVICE	———
PROPOSED STORM SERVICE	— — —
PROPOSED FRONT DRAINAGE LOT	F
PROPOSED SPLIT DRAINAGE LOT	S
PROPOSED DECK LOT	D
PROPOSED WALKOUT LOT	WO

ROAD PAVEMENT DESIGN

COURSE (OPS SPECIFICATIONS)	THICKNESS (mm)
ASPHALT SURFACE (HL−3)	40
ASPHALT BINDER (HL−8)	50
GRANULAR BASE − GRANULAR 'A'	150
GRANULAR SUB−BASE LOCAL − GRANULAR 'B'	350

NOTE:
REFER TO DRAWINGS DE1 TO DE6 FOR NOTES & DETAILS

SURVEY INFORMATION
TOPOGRAPHIC INFORMATION PROVIDED BY
H.F. GRANDER O.L.S.

BENCHMARK
UXBRIDGE, UNITED CHURCH, TABLET IN SOUTH SIDEWALL, 17.2m FROM SOUTHEAST CORNER, 1.57m BELOW BRICKWORK, MIDWAY BETWEEN TWO LARGE BASEMENT WINDOWS.
GSC − 31U517S − ELEV. 272.440 (1978 ADJUSTED)
GSC − 31U517S − ELEV. 272.528 (1931 ADJUSTED)

ACCEPTED TO BE IN GENERAL CONFORMANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.
MCEWEN, P.ENG
TOTTEN SIMS HUBICKI ASSOCIATES
(1997) LIMITED
DATE OCT. 20, 2004

APPROVAL
Paul Allen
DEPARTMENT OF WORKS
REGIONAL MUNICIPALITY OF DURHAM
DATE Oct 20, 2004

NO.	REVISIONS	DATE	BY
5.	6th SUBMISSION REVISION	04/10/07	ALX
4.	4th SUBMISSION REVISION	04/08/27	Y.K.
3.	3rd SUBMISSION REVISION	04/07/28	Y.K.
2.	2nd SUBMISSION REVISION	04/05/03	Y.K.
1.	REVISED AS PER COMMENTS BY T.S.H.	04/03/12	DLT

MICHAEL A. BELL
Oct 7/04

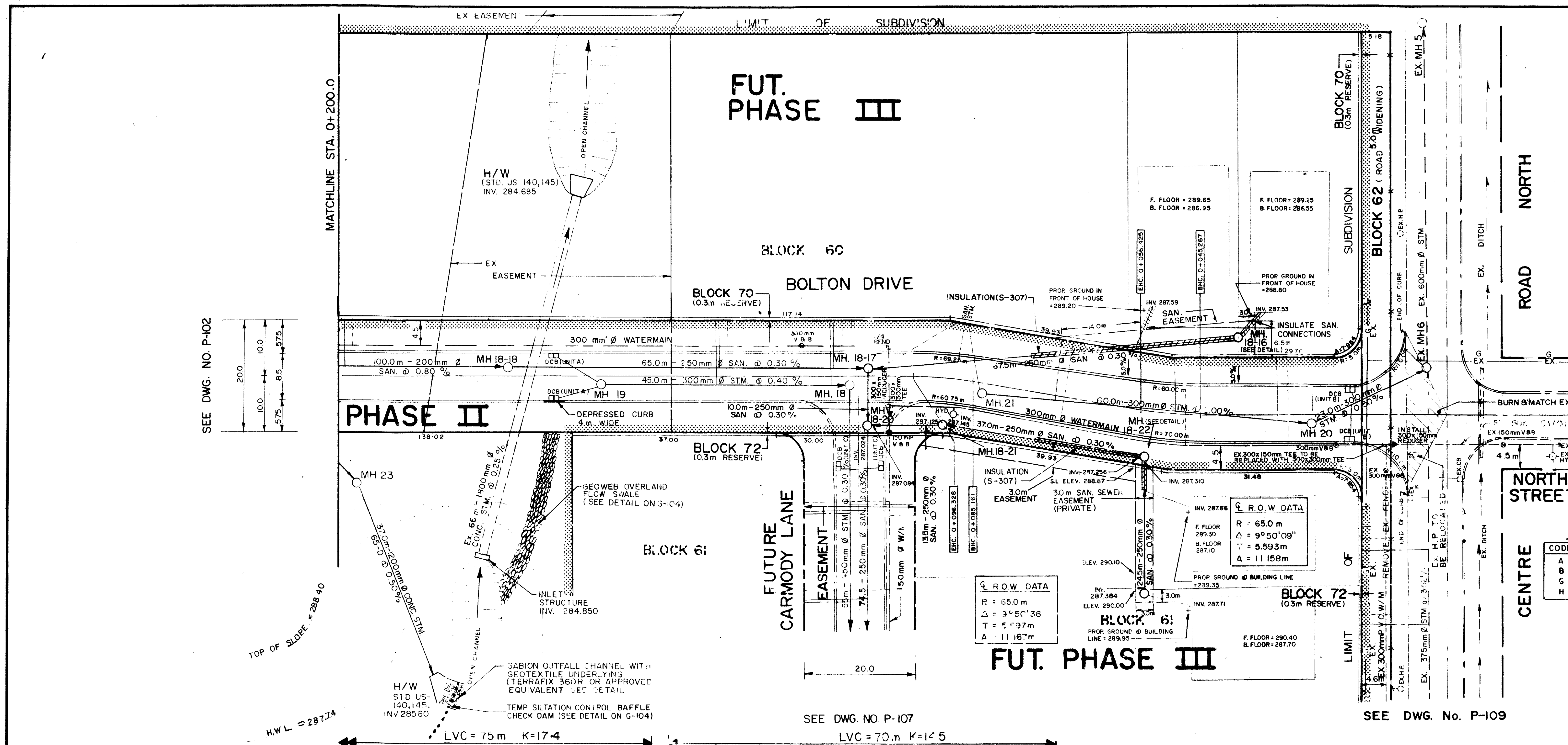
TOWNSHIP OF UXBRIDGE
REGION MUNICIPALITY OF DURHAM

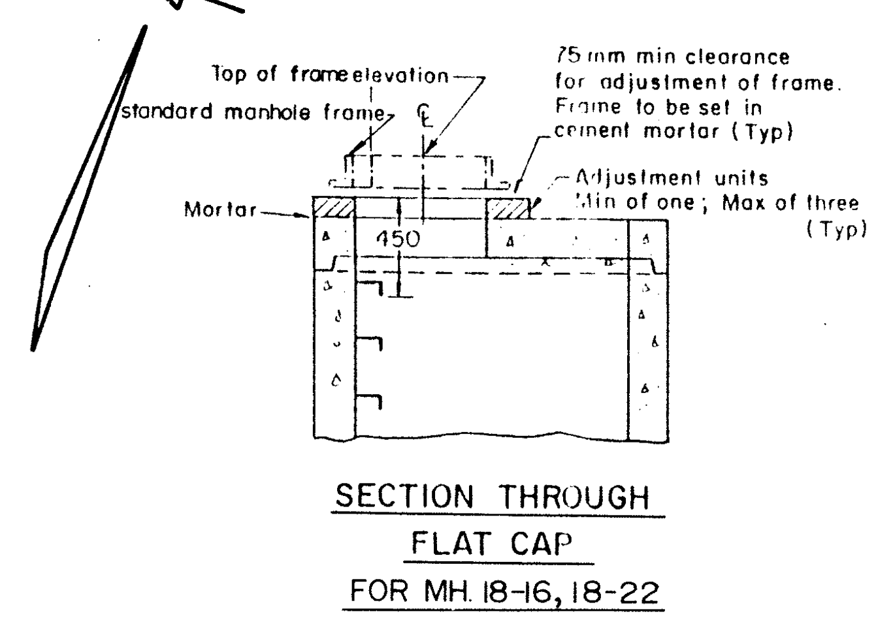
PLAN AND PROFILE
OAKSIDE DRIVE STA −0+10 TO 2+50
PROPOSED RESIDENTIAL SUBDIVISION
MASON HOMES
PART OF LOT 33, CONCESSION 6

Roberts Bell *Engineering Limited*
PROFESSIONAL ENGINEERS & LAND DEVELOPMENT SERVICES www.rbeng.ca
37 SANDIFORD DRIVE UNIT 102 STOUFFVILLE ONTARIO L4A 7X5
T: 905.640.2100 F: 905.640.5100 E: info@rbeng.ca

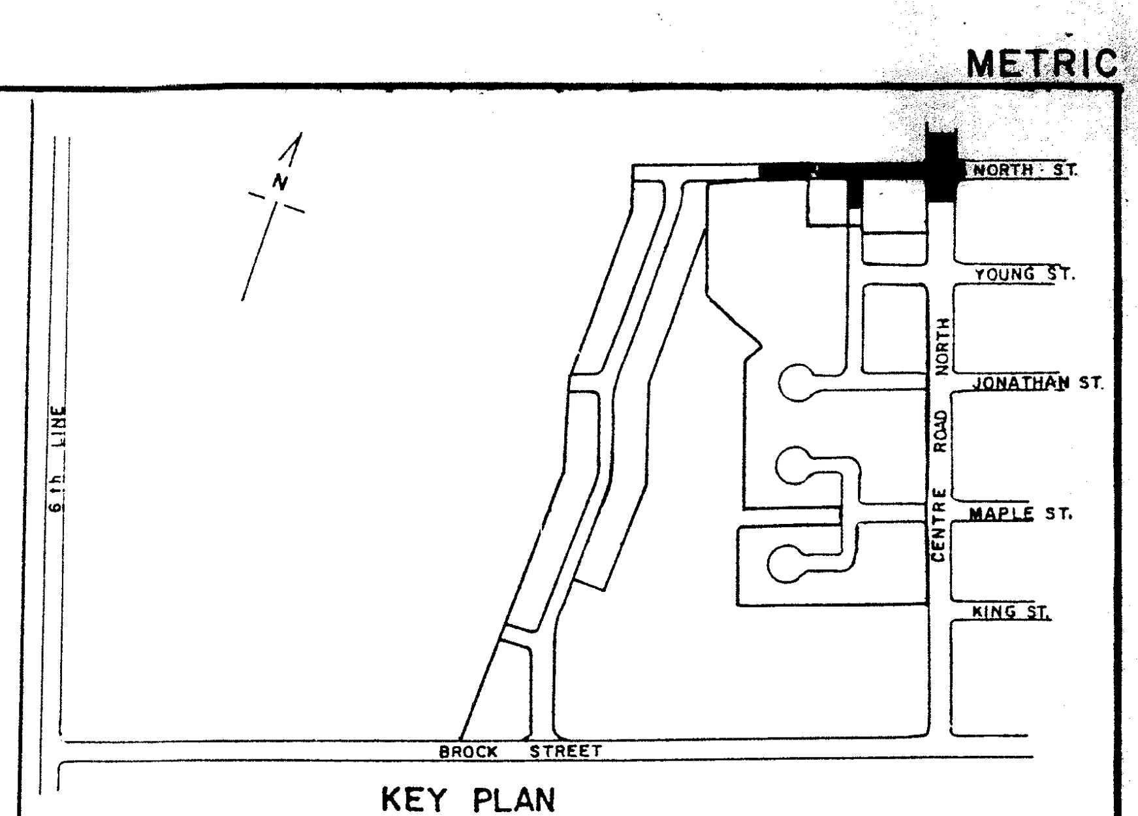
SCALE: H 1:500 V 1:100	PROJECT NO: 02−1579
DRAWN BY: DLT	
DESIGNED BY: ALX	DRAWING NO: P01
CHECK BY: MAB	
DATE: JUNE 1, 2003	

METRIC





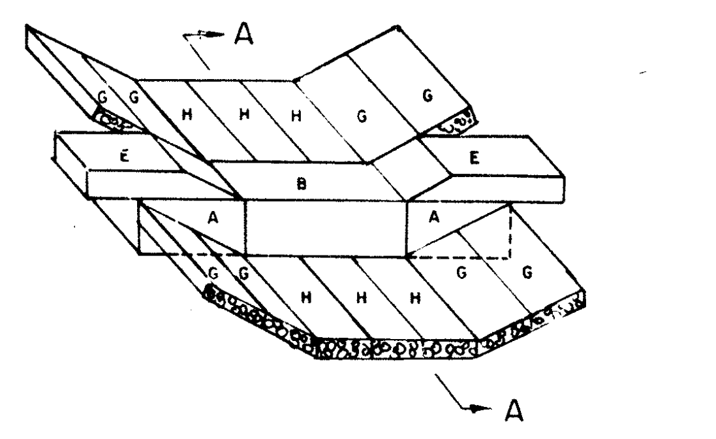
SECTION THROUGH FLAT CAP FOR MH. 18-16, 18-22



KEY PLAN
SCALE 1:10000

NOTE:

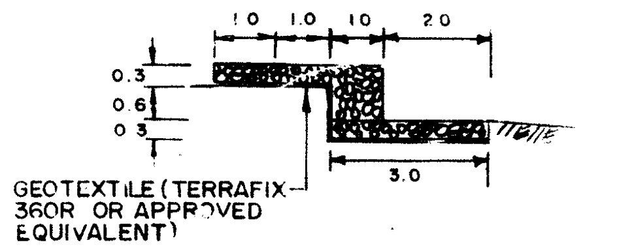
1. FOR GENERAL NOTES & LEGEND SEE DWG NO. G-101.
2. PAVEMENT & BOULEVARD RESTORATION SHALL BE DONE TO THE SATISFACTION OF THE TOWN ENGINEER.
3. THE CONTRACTOR IS RESPONSIBLE FOR THE STAKE OUT OF ALL EXISTING U/G & OVERHEAD UTILITIES 72 HOURS PRIOR TO ANY COMMENCEMENT OF WORKS ON BROCK ST. THE CONSULTING ENGINEER ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.



GABION LIST		
CODE	SIZE	NO.
A	2x1x1	2
B	3x1x1	1
G	2x1x0.3	8
H	3x1x0.3	6

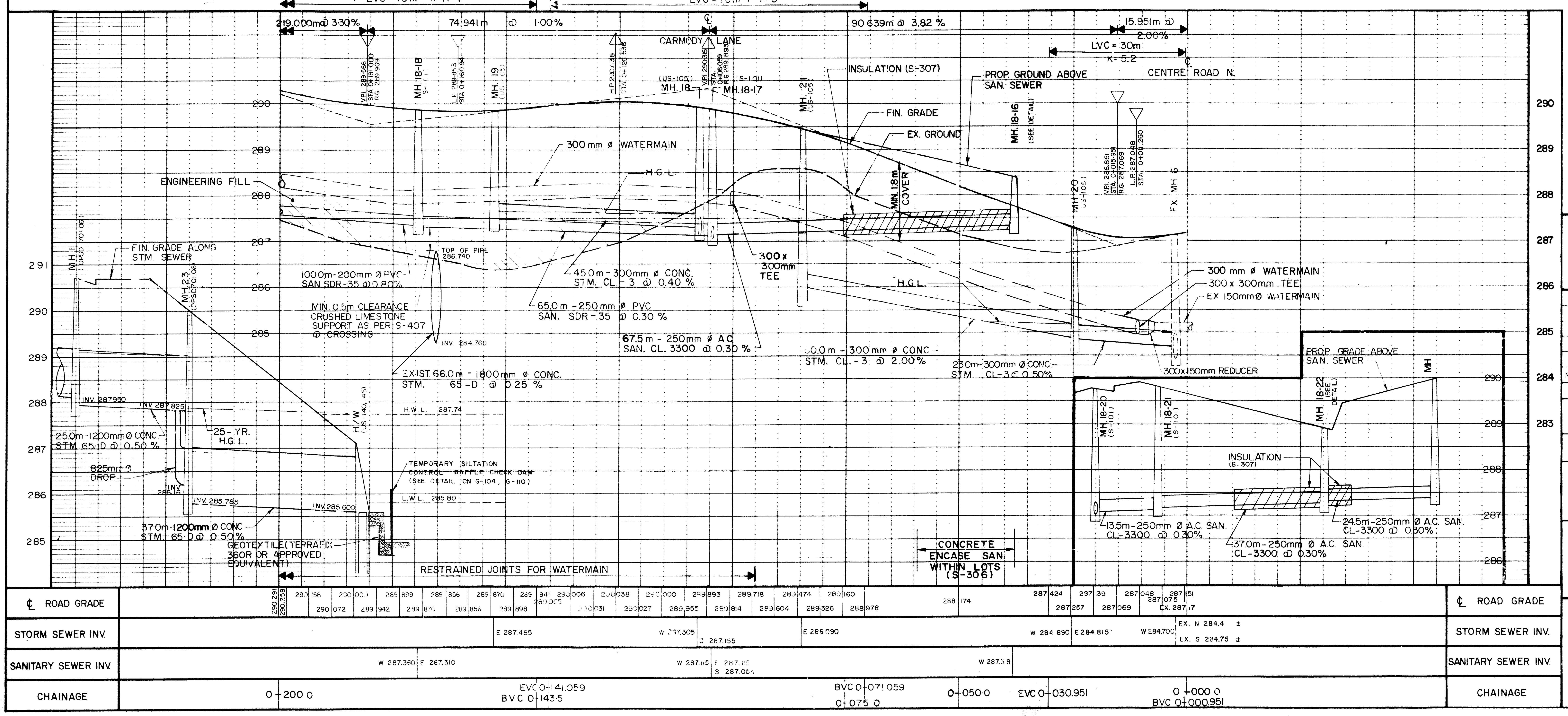
GABION OUTFALL CHANNEL
N.T.S.

ACCEPTED TO BE IN ACCORDANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS
THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT
TOTTEN SIMS HUBICKI ASSOCIATES (1981) LIMITED
DATE



SECTION A-A

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES CONCERNED TO BE GIVEN REQUIRED ADVANCE NOTICE PRIOR TO ANY DIGGING, FOR STAKE OUT. THE CONSULTANT ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.



APPROVED	APPROVED
P Eng Township Engineer For The Township of Uxbridge Date	Clifford Curtis Regional Municipality Of Durham Date Oct 11/88

No	DESCRIPTION	DATE	BY	APPROVED

REVISIONS

CORPORATION OF THE TWP. OF UXBRIDGE
ENGINEERING DEPARTMENT

QUAKER VILLAGE PHASE II

BOLTON DRIVE
FROM STA 0 + 000.0 TO STA. 0 + 200.0

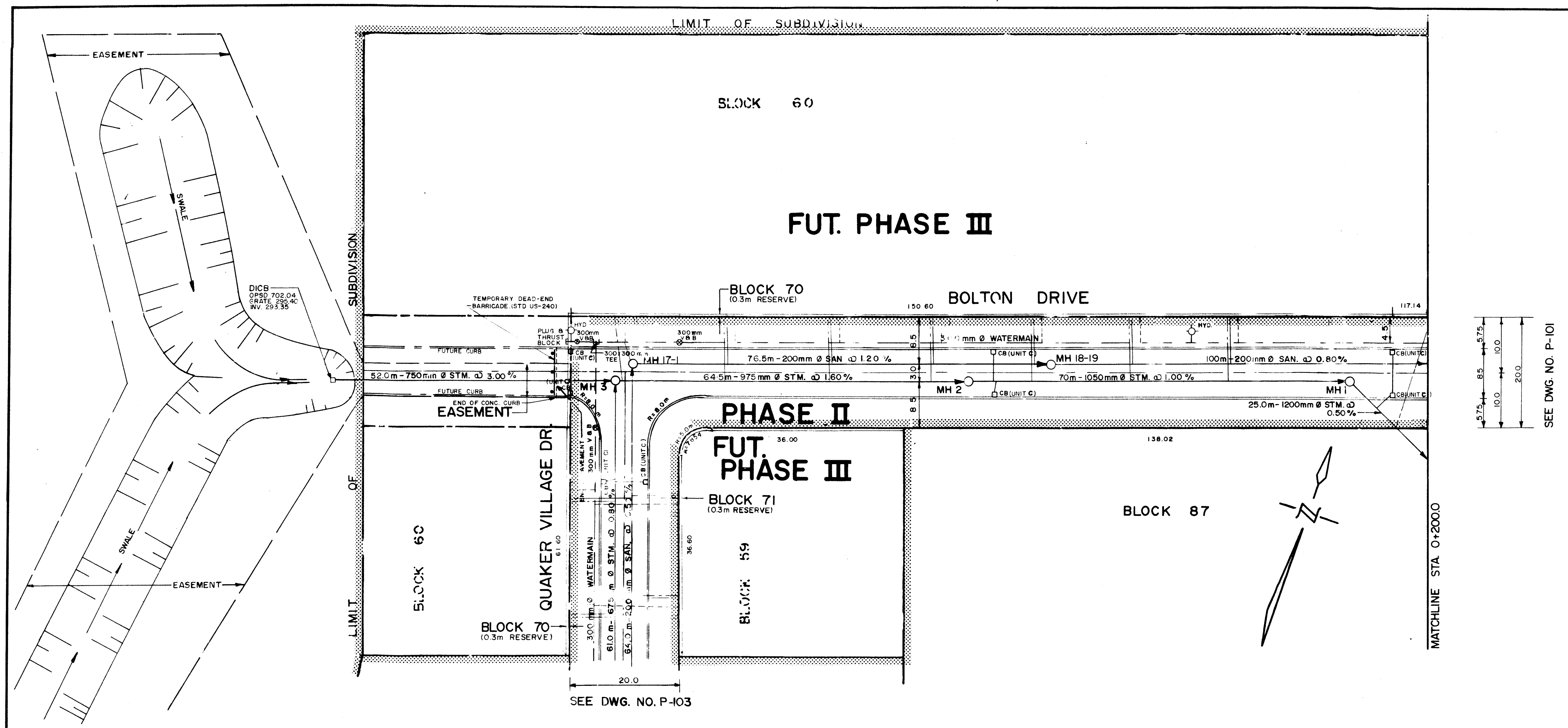
CONSULTING ENGINEERS
G. M. SERNAS & ASSOC. LTD.
185 BROCK ST. NORTH, SUITE 207
WHITBY, ONTARIO, L1N 4H3
TEL. 668-0764

LICENSED PROFESSIONAL ENGINEER
A. S. Y. LI
ONTARIO

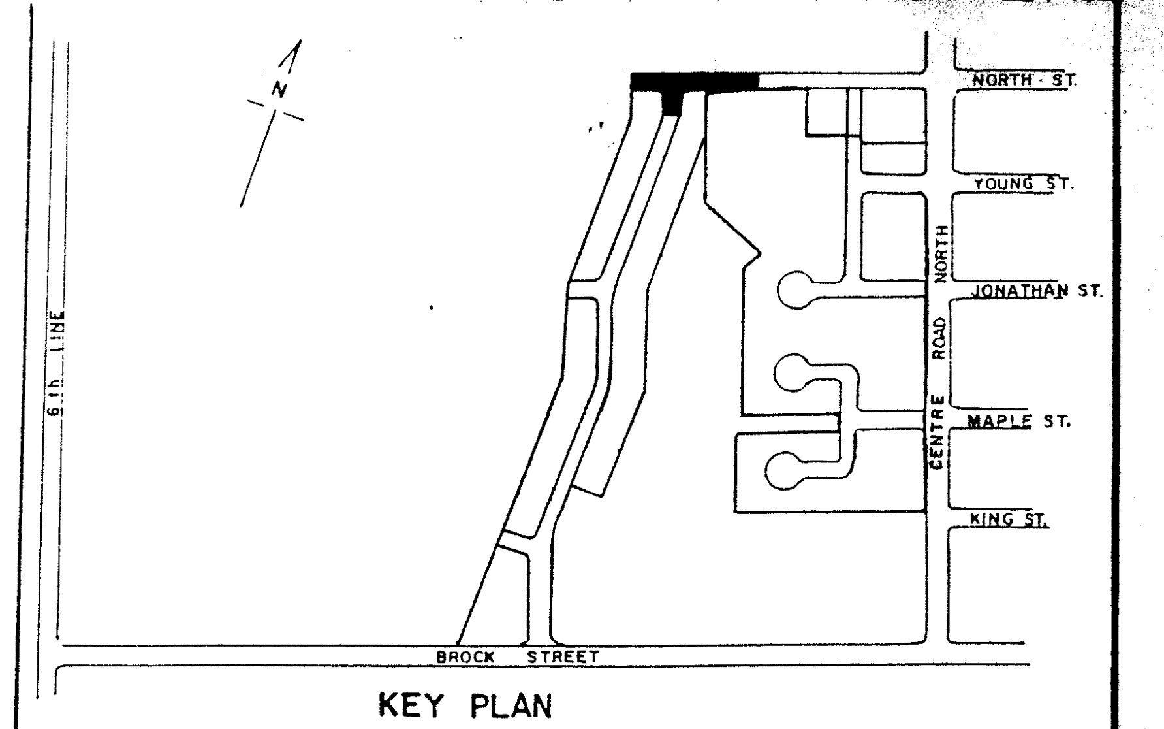
SCALE:	1:500 HORIZ. 1:50 VERT.
PROJECT No.	8614
DRAWN BY:	R.E.
DESIGNED BY:	D.Y.
CHECKED BY:	A.L.
DATE:	SEPT, 1987
DRAWING No.	P-101

Oct 13 88
NOV 1 1988

METRIC



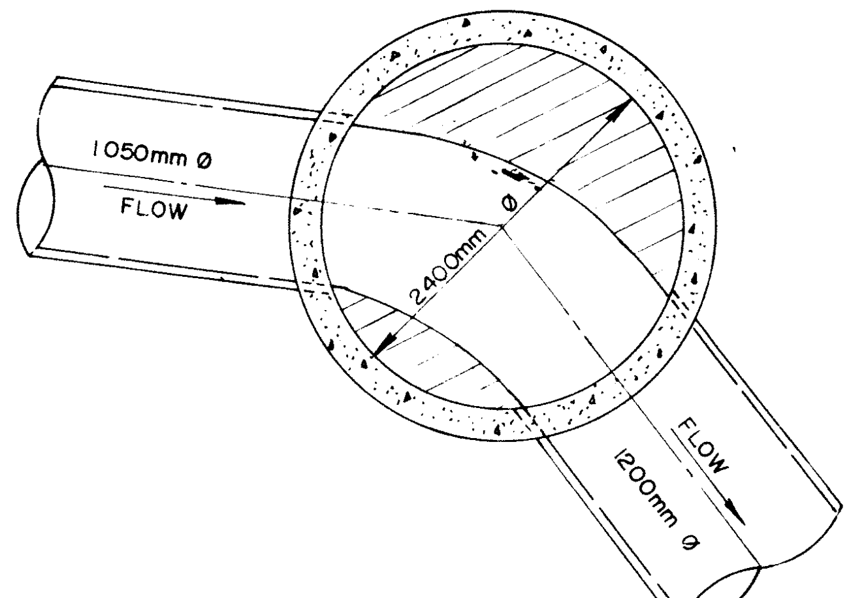
ACCEPTED TO BE IN ACCORDANCE WITH THE
TOWNSHIP OF UXBRIDGE STANDARDS
THIS ACCEPTANCE IS NOT TO BE CONSTRUED
AS VERIFICATION OF ENGINEERING CONTENT
R. Ratchole
TOTTEN SIMS HUBICKI ASSOCIATES
(1981) LIMITED
DATE



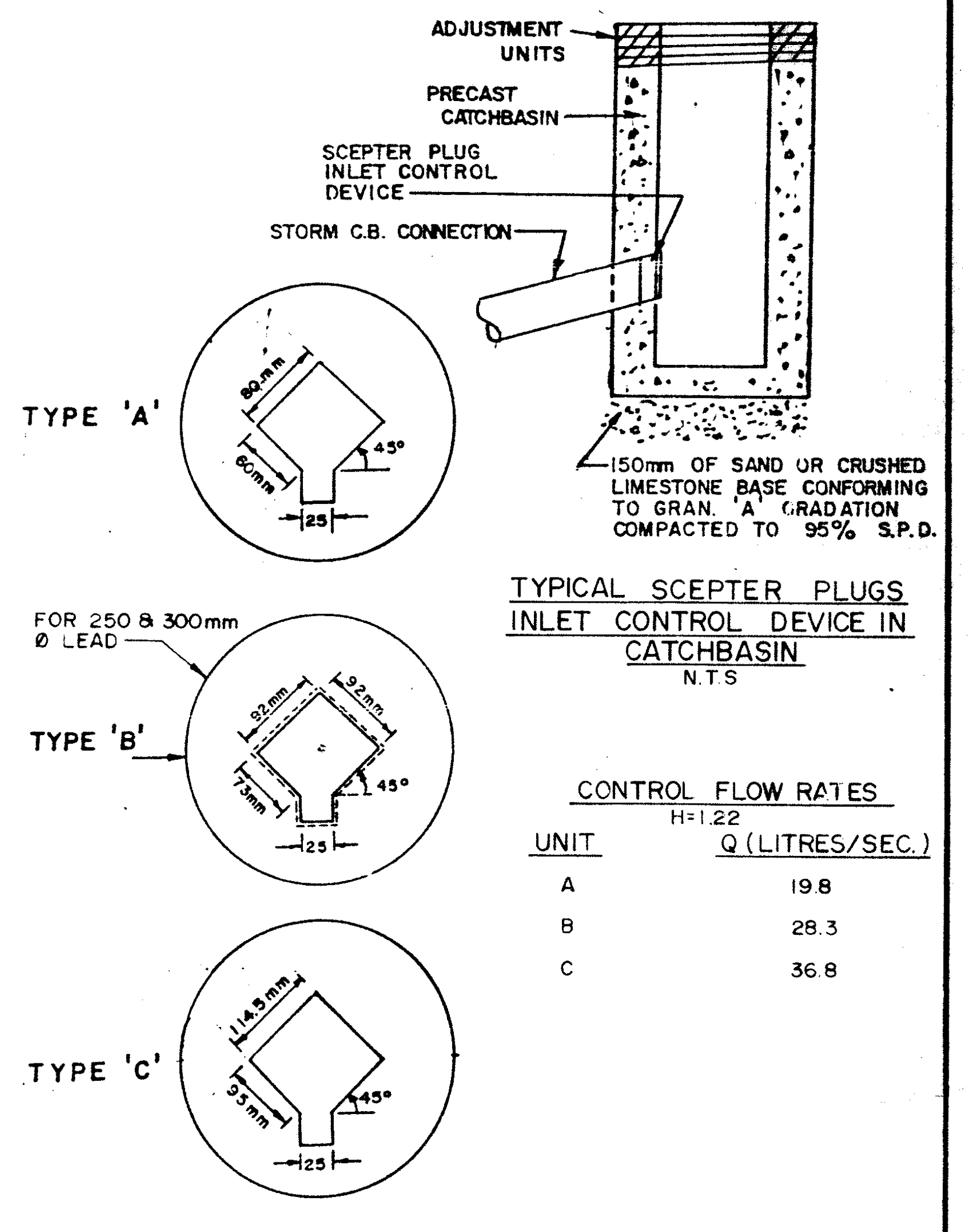
KEY PLAN
SCALE 1:10000

NOTE:

1. FOR GENERAL NOTES & LEGEND SEE DWG. NO. G-101.



BENCHING DETAIL FOR MANHOLE 1
N.T.S.



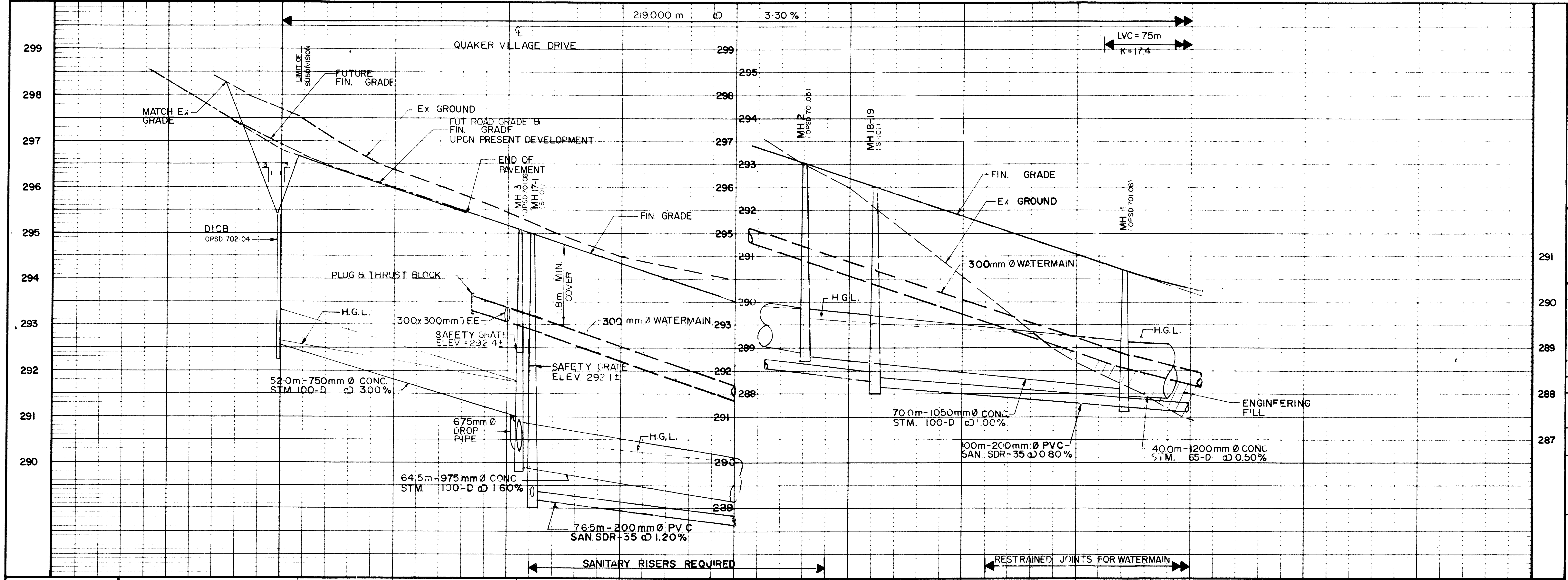
TYPICAL SCEPTER PLUGS INLET CONTROL DEVICE IN CATCHBASIN
N.T.S

INLET CONTROL DEVICES
N.T.S.

CONTROL FLOW RATES
H=1.22

UNIT	Q (LITRES/SEC.)
A	19.8
B	28.3
C	36.8

CONTRACTOR TO BE RESPONSIBLE FOR LOCATION OF ALL EXISTING U/G & OVERHEAD UTILITIES. VARIOUS UTILITIES CONCERNED TO BE GIVEN REQUIRED ADVANCE NOTICE PRIOR TO ANY DIGGING, FOR STAKE OUT. THE CONSULTANT ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OF THE LOCATION OF EXISTING UTILITIES AS INDICATED ON THIS DRAWING.



℄ ROAD GRADE	296.698 295.968 295.063 295.143 294.318 293.493 292.668 291.843 291.019 290.804 290.646 290.502 290.373 290.291	℄ ROAD GRADE
STORM SEWER INV.	292.565 675mm Ø DROP W. 290.212 W. 5.005 S 290.212 E 289.912 288.880 288.800 288.100 287.950	STORM SEWER INV.
SANITARY SEWER INV.	S 289.230 E 289.138 288.220 288.160	SANITARY SEWER INV.
CHAINAGE	LIMIT OF SUBDIVISION 0+395.582 0+375.0 0+350.0 0+347.582 0+325.0 0+300.0 0+275.0 0+250.0 0+225.0 EVC 0+218.5 0+200.0	CHAINAGE

APPROVED	APPROVED
P Eng Township Engineer For The Township of Uxbridge Date	Regional Municipality Of Durham Date 87-11/88

No	DESCRIPTION	DATE	BY	APPROVED

REVISIONS

CORPORATION OF THE TWP. OF UXBRIDGE
ENGINEERING DEPARTMENT

QUAKER VILLAGE PHASE II

BOLTON DRIVE

FROM STA 0 + 200.0 TO STA. 0 + 396.080

CONSULTING ENGINEERS
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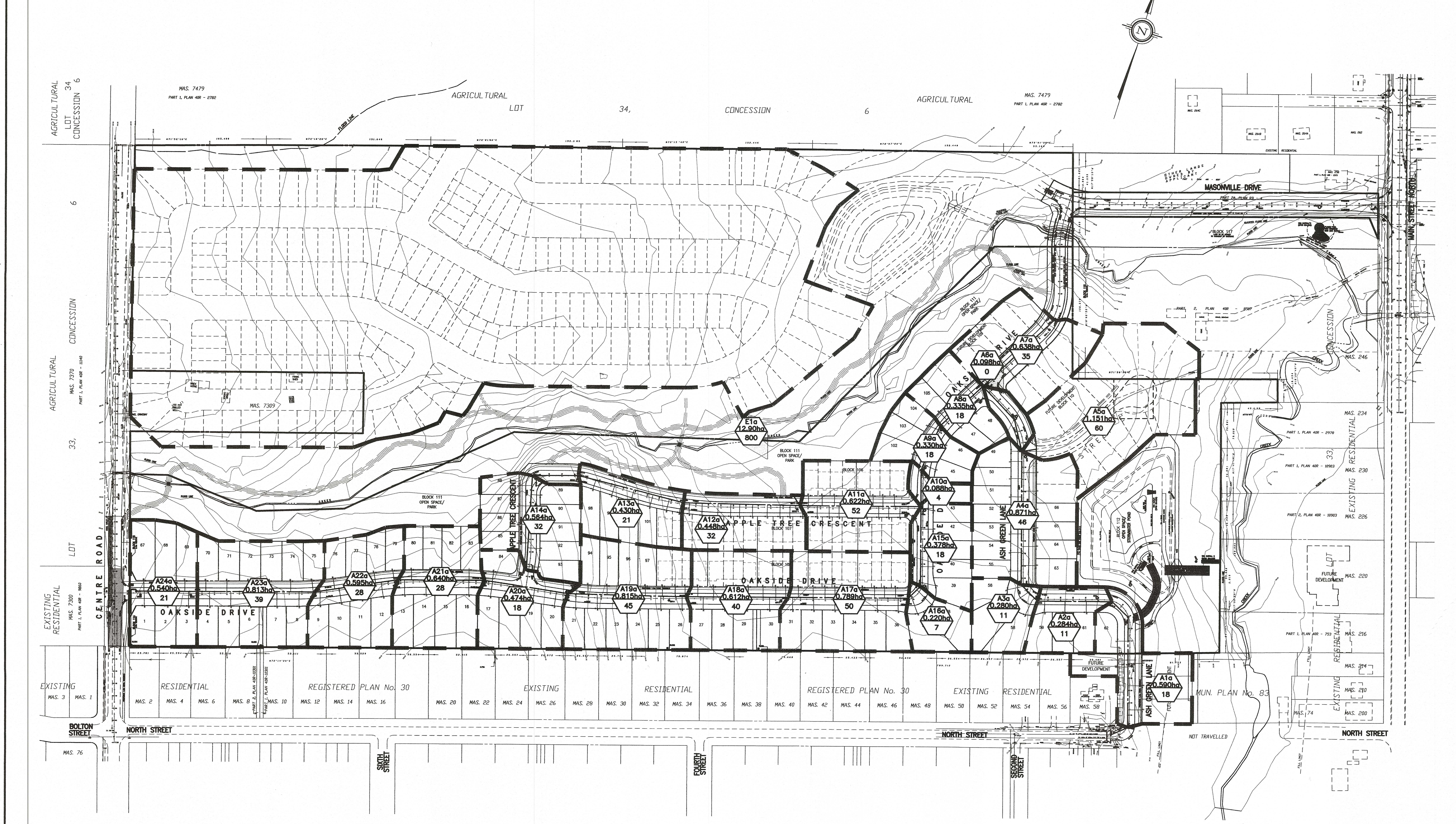
185 BROCK ST. NORTH, SUITE 207
WHITBY, ONTARIO, L1N 4H3
TEL. 668-0764

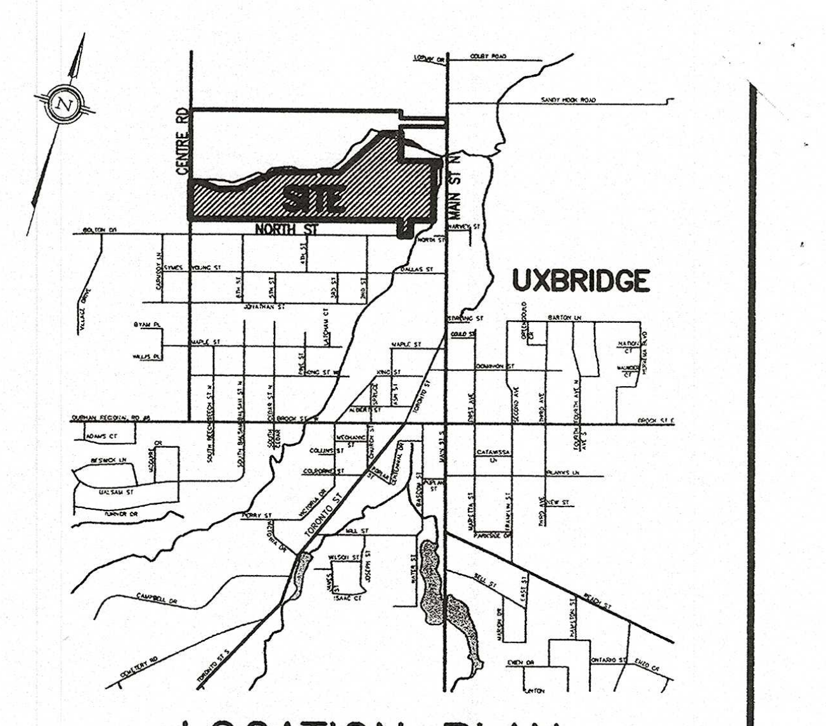
LICENSED PROFESSIONAL ENGINEER
A. S. Y. LI
ONTARIO

SCALE: 1:500 HORIZ. 1:50 VERT.
DRAWN BY: D.K.
DESIGNED BY: D.Y.
CHECKED BY: A.L.
DATE: SEPT 1987
PROJECT No. 8614
DRAWING No. P-102

OCTOBER 13 '88

NOV 1





LOCATION PLAN

SCALE 1:30,000

LEGEND

EXISTING CONTOUR
EXISTING STORM MANHOLE ○
EXISTING SANITARY MANHOLE ◉
EXISTING CATCHBASIN ▫
PROPOSED STORM MANHOLE ○
PROPOSED SANITARY MANHOLE ◉
PROPOSED CATCHBASIN/RESTRICTED ▪
PROPOSED DOUBLE CATCHBASIN
PROPOSED SANITARY SERVICE
SANITARY DRAINAGE BOUNDARY

SANITARY DRAINAGE AREA NUMBER — A1a
DRAINAGE AREA (ha) — 0.513ha
POPULATION — 14

NOTE:
REFER TO DWGS DE1 TO DE6 FOR NOTES & DETAILS

SURVEY INFORMATION

TOPOGRAPHIC INFORMATION PROVIDED BY
H.F. GRANDER O.L.S.

BENCHMARK

UXBRIDGE, UNITED CHURCH, TABLET IN SOUTH SIDEWALL, 17.2m FROM SOUTHEAST CORNER, 1.57m BELOW BRICKWORK, MIDWAY BETWEEN TWO LARGE BASEMENT WINDOWS.
GSC – 31U517S – ELEV. 272.440 (1978 ADJUSTED)
GSC – 31U517S – ELEV. 272.528 (1931 ADJUSTED)

ACCEPTED TO BE IN GENERAL CONFORMANCE WITH THE TOWNSHIP OF UXBRIDGE STANDARDS THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

J.D. McEWEN, P.ENG
TOTTEN SIMS HUBICKI ASSOCIATES
(1997) LIMITED
DATE Oct. 20, 2004

APPROVAL

Paul Allen
DEPARTMENT OF WORKS
REGIONAL MUNICIPALITY OF DURHAM
DATE Oct 20, 2004

NO.	REVISIONS	DATE	BY
4.	4th SUBMISSION REVISION	04/08/27	Y.K.
3.	3rd SUBMISSION REVISION	04/07/28	Y.K.
2.	2nd SUBMISSION REVISION	04/05/03	Y.K.
1.	REVISED AS PER COMMENTS BY T.S.H.	04/03/12	DLT

LICENSED PROFESSIONAL ENGINEER
MICHAEL A. BELL
Sept. 21/04
PROVINCE OF ONTARIO

TOWNSHIP OF UXBRIDGE
REGION MUNICIPALITY OF DURHAM

SANITARY DRAINAGE AREA PLAN

PROPOSED RESIDENTIAL SUBDIVISION
MASON HOMES
PART OF LOT 33, CONCESSION 6

Roberts Bell *Engineering Limited* RBE
PROFESSIONAL ENGINEERS & LAND DEVELOPMENT SERVICES www.rbeng.ca
37 SANDIFORD DRIVE UNIT 102 STOUFFVILLE ONTARIO L4A 7X5
T: 905.640.2100 F: 905.640.5100 E: info@rbeng.ca

SCALE:	1:1500	PROJECT NO:	02–1579
DRAWN BY:	DLT		
DESIGNED BY:	ALX	DRAWING NO:	SAN
CHECKED BY:	MAB		
DATE:	JUNE 1, 2003		

SCS consulting group ltd

MEETING MINUTES

File #: **2099**
Date: **October 14, 2020**

Project:	**7370 Centre Road, Uxbridge**
Purpose:	**Rainscaping Charrette**
Date/Time of Meeting:	**August 25, 2020 – 10:00 am – 12:00 pm**
Location:	**SCS Consulting Group – Virtual Boardroom #2**
Next Meeting:	**TBD**

	Recipient(s):	Email:
Attendees:	Mr. John Spina, MDTR	john@mdtrgroup.com
	Ms. Tina Fang, MDTR	tina@mdtrgroup.com
	Ms. Lindsay Chen, MDTR	lindsay@mdtrgroup.com
	Mr. Steve Schaefer, SCS	sschaefer@scsconsultinggroup.com
	Mr. Nick McIntosh, SCS	nmcintosh@scsconsultinggroup.com
	Mr. Matthew Cory, MGP	mcory@mgp.ca
	Mr. Zen Keizars, Beacon	zkeizars@beaconenviro.com
	Ms. Julianna MacDonald, Beacon	jmacdonald@beaconenviro.com
	Mr. Peter Middaugh, AECOM (Township)	peter.middaugh@aecom.com
	Mr. Dave Ruggle (LSRCA)	d.ruggle@lsrca.on.ca
	Ms. Renata Sadowska (LSRCA)	r.sadowska@lsrca.on.ca
	Ms. Shelly Cuddy (LSRCA)	s.cuddy@lsrca.on.ca

The following is considered to be a true and accurate record of the items discussed. Any errors or omissions in these minutes should be provided in writing to the author immediately.

Item:	**Action:**
Below is a summary of the items discussed at the RainScaping meeting and the various potential low impact development (LID) and stormwater management (SWM) measures that may be considered to be utilized in the proposed development. It is noted that the Draft Plan has not been finalized and the final LID and SWM solution(s) will be developed through the Draft Plan (Functional Servicing and Stormwater Management Report) and subsequent detailed design processes and may not be exactly as presented at the RainScaping meeting.	

Item:	**Action:**
1.0 General	
1.1 Natural Heritage	
- Existing land use is predominantly agricultural - A headwater drainage feature is located in the central area of the site, conveying external drainage from the north to the existing wetland and tributary in the southeast corner of the site. - A tributary of the Uxbridge Brook conveys flows through the southeast wetland from a culvert under Bolton Drive to a Culvert under Centre Road. - A second smaller existing wetland is located in the approximate centre of the southern edge of the site. - A third small existing wetland is located at the northeast corner of the site. - Natural Heritage investigations and site staking is ongoing. - LSRCA Recommendations (See **Attachment A** for original LSRCA Comments): o Separate comments on previous meeting minutes have been provided to MDTR. They have been provided in **Attachment A** for reference.	Info
1.2 Geotechnical Investigation	
- Preliminary Geotechnical Investigation prepared by Soil Engineers Ltd., February, 2018. - 14 boreholes advanced to depth of 6.3 to 15.7 m from November to December, 2017. - ~0.6-1.5 m topsoil/Plowed soil. - Site is generally underlain by a complex stratigraphy of stiff to hard silty clay, hard silty clay till, and generally compact silty sand till, with layers of loose to very dense sand and compact to very dense silt deposits. - Silty Sand Till identified in several locations: east edge of site, the approximate location of the proposed western park block, and the southwest corner of the site.	Info
1.3 Hydrogeological Investigation	
- Depths ranging from 0.15 to 4.65 m below ground - Groundwater level generally follows existing topography, higher elevations on west side of site, lower elevations on east side of site - Groundwater level ranges from approximately 0.2 mbgs to 8.92mbgs, consistently deeper in BH13 (at approximately location of proposed park block) - LIDs expected to be within 1-2 m of the native silty clay soil - Groundwater level will fluctuate with the seasons	Info

Item:	**Action:**
→ Site is located in WHPA-Q1 and Q2 and Significant groundwater recharge area. → Site is not located in Wellhead Protection Area. → LSRCA Recommendations (See **Attachment A** for original LSRCA Comments): o Site design should include maintaining drainage (overland flow) and infiltration supporting all features that will be preserved onsite (water course/headwaters and vegetated areas/buffers). o It would be beneficial if the site concept plan could be updated to allow for infiltration facilities where groundwater/soil conditions are less constraining.	
1.4 Draft Plan	
→ Site is located within Uxbridge Urban Area (Special Study Area 6). → Draft Plan to be composed of single detached and townhouse residences, two park blocks, municipal roads, and two stormwater management blocks. → Draft Plan is preliminary and may be subject to modifications through Draft Plan application process.	Info
1.5 Stormwater Management and Grading	
→ Proposed lot and road grades will range between 0.5% and 5.0%. → Road grades from east to west are steep (5.0%) throughout site. → Drainage function of the headwater drainage feature to be retained, will require culvert underneath road or storm sewer connection. → 3:1 sloping to match existing in open space blocks/buffers (may limit LID opportunities). → SWM Criteria o Quantity Control: Control proposed peak flows to existing peak flows for the 2 through 100 year storm events (MECP/Uxbridge). o Quality Control: Enhanced Level (80% TSS Removal) (Uxbridge). o Erosion Control: minimum 24 hour detention of the 40mm storm event (Uxbridge SWM Master Plan). o Water Budget: maintain proposed to existing to the extent feasible (LSRCA). o Phosphorus: "Zero" export target (LSRCA) with offsetting for any remaining balance, minimum 90% removal (Uxbridge SWM Master Plan). o Volume Control: On-site retention of the 25mm rainfall runoff from all impervious surfaces (LSRCA).	Info

Item:	**Action:**
•→ Confirm SWM Criteria conformance with subwatershed study as part of Functional Servicing Report. •→ LSRCA Recommendations (See **Attachment A** for original LSRCA Comments): o SWM opportunities should be confirmed upon approval of the NH features and associated requirements. o There may be some benefit in locating the park block adjacent to the SWM block at the south end of the plan. o Infiltration opportunities should be maximized within the central area of the site and may require consideration of the designated SWM block or corridor. o LIDs along the buffer areas, outside of the private properties and with provision of a maintenance access, may further support the SWM plan.	SCS Info
Item:	**Action:**
2.0 Right-of-Way (ROW) LID and SWM Measures	
The following potential LID and SWM options were considered for the proposed right-of-ways (refer to Attached **Figure 1**):	
•→ Raingardens/Bioswales are a surface based infiltration/filtration measure that can be provided in open space blocks, side flankages, single loaded roads, and backing onto rear lot lines. •→ Catchbasins can be equipped with deeper sumps and potentially catchbasin inserts (i.e. CB Shield© - http://www.cbshield.com/ Litta Trap - http://www.imbriumsystems.com/stormwater-treatment-solutions/littatrap) that will minimize turbulence in the CB and allow sediment and pollutants to settle out and stay captured in the deeper sump until the CB's are cleaned out. •→ CB's can have a piped connection to a stone-filled infiltration/filtration trench in the boulevard with a perforated pipe running along the trench to distribute flows.	Info
2.1 Township Comments (See **Attachment B** for Township Comments provided prior to the meeting)	
•→ Raingarden/Bioswale: o Work Department uses sand and salt and have concerns regarding sand filling up and plugging system quickly leading to potential for nuisance complaints o They should not be implemented in well head protection areas o A maximum road grade guideline would need to be developed to manage the application to preferred locations. o Provide example for a single CB Application	Info SCS

Item:	**Action:**
→ Catchbasin Pretreatment Insert: o Not desirable as individual measure to be implemented in new draft plan of subdivision. o Note: Township requires all new end-of-pipe SWM quantity/quality control measures to include a Stormceptre (OGS) device for pre-treatment. o Consideration may be given on a site specific basis. o Can potentially implement on temporary basis to intercept litter and debris from temporary land use/construction activities.	Info
→ Catchbasin Infiltration/Filtration Trench o Do not implement infiltration measures in Well Head Protection Areas. o Works Department would like to have trench moved to outside edge of road allowance.	Info
3.0 Private Lot LID Measures	
The following potential LID and SWM options were considered for the proposed private lots (refer to Attached **Figure 1**):	
→ Rear yard infiltration trenches may be utilized in internal split draining and walkout lots pending confirmation of foundation setbacks for Phosphorous and water balance controls (no credit for water quality or quantity control).	Info
3.1 Township Comments (See **Attachment B** for Township Comments provided prior to the meeting)	
→ Rear Yard Infiltration Trenches: o Would only be considered on split drainage lots o Township will not take easements and assume are a private measure o should not be implemented in well head protection areas o A maximum road grade guideline would need to be developed to manage the application to preferred locations.	Info
3.2 LSRCA Comments (See **Attachment A** for original LSRCA Comments)	
→ Rear Yard Infiltration Trenches: o Cannot be approved for quality or quantity control without municipal easement, can be approved for water balance, phosphorus, and volume control. *Comment was provided verbally during meeting and is not noted in **Attachment A**.*	Info

Item:	**Action:**
4.0 SWM Block LID and SWM Measures	
The following potential LID and SWM options were considered for the SWM Blocks (refer to Attached **Figure 1**):	
→ Dry and Wet Ponds presented as standard SWM solutions. → Underground Infiltration/Active Storage Facilities, can use concrete (StormTrap) or plastic chamber systems (Cultec), Pre-treatment provided upstream of the facility if used for infiltration (OGS, Isolator Inlet Row). → Downstream Filtration Facility, can use manhole insert system (Jellyfish) or chamber system (StormFilter).	Info
4.1 Township Comments (See **Attachment B** for Township Comments provided prior to the meeting)	
→ Underground Infiltration/Active Storage Facilities: o Infiltration not to be implemented in the well head protection areas o Consideration would be given adjacent to parkland dedications, not in parkland dedications o Site specific geotechnical investigations required to address feasibility o SCS to prepare Cost/Benefit analysis for Township	Info SCS
→ Downstream Filtration Facility: o Not desirable as individual measure to be implemented in new draft plan of subdivision. o Note: Township requires all new end-of-pipe SWM quantity/quality control measures to include a Stormceptre (OGS) device for pre-treatment. o Consideration may be given on a site specific basis such as smaller infill type developments, as evaluated on a case by case basis.	Info
5.0 Park Block LID and SWM Measures	
The following potential LID and SWM options were considered for the proposed Park Blocks (refer to Attached **Figure 1**):	
→ Raingardens/Bioswales are a surface based infiltration/filtration measure that can be provided backing onto rear lot lines. → Underground Infiltration/Active Storage Facilities, can be provided underneath park blocks to provide dual functionality of land allowing for additional lots and DC/property tax revenue, can use concrete (StormTrap) or plastic chamber systems (Cultec), Pre-treatment provided upstream of the facility if used for infiltration (OGS, Isolator Inlet Row).	Info

Item:	**Action:**
5.1 Township Comments (See **Attachment B** for Township Comments provided prior to the meeting)	
●→ Raingarden/Bioswale: o See recommendations in **Section 2.1**. ●→ Underground Infiltration/Active Storage Facilities: o See recommendation in **Section 4.1**.	
6.0 Next Steps	
●→ Township and LSRCA to provide feedback based on the items above.	Town/LSRCA
●→ The Functional Servicing design of the LIDs will be initiated and submitted as part of a Draft Plan Application	SCS

SCS Consulting Group Ltd.

Nick McIntosh

Nicholas McIntosh, M.A.Sc., P. Eng.
nmcintosh@scsconsultinggroup.com

Attachments: Figure 1 – Rainscaping Summary Figure
Attachment A – LSRCA Rainscaping Recommendations
Attachment B – Township Preliminary LID Review Comments
Attachment C – August 25, 2020 Presentation Slides

P:\2099 7370 Centre Road Uxbridge\Correspondence\Minutes of Meetings\2020 10(Oct) 14 - Rainscaping Meeting Minutes\2020 10(Oct) 14 - 7370 Centre Road Uxbridge Rainscaping Meeting Minutes-NDM.docx

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FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

A REPORT TO
BRIDGE BROOK CORP.

A GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

7370 CENTRE ROAD

TOWN OF UXBRIDGE

REFERENCE NO. 1711-S047

FEBRUARY 2018

DISTRIBUTION

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6.0 DISCUSSION AND RECOMMENDATIONS

The investigation revealed that beneath a veneer of topsoil and ploughed soils, the site is generally underlain by a complex stratigraphy consisting of stiff to hard, generally very stiff silty clay; firm to hard, generally hard silty clay till and loose to very dense, generally compact silty sand till, with layers of loose to very dense, generally compact sand and compact to very dense, generally compact silt deposits at various depths and locations. The wet sand and silts are water-bearing.

Upon the completion of borehole drilling, groundwater was recorded in the boreholes between El. 273.0 m and El. 330.9 m, dropping in the east southeast direction. The stabilized groundwater in the monitoring wells was recorded between El. 286.6 m and El. 332.4 m. The groundwater within the saturated sand and silt generally represents the permanent groundwater regime at the site. Perched water also exists in certain areas at shallower depths. The groundwater level will fluctuate with seasons.

In excavation, groundwater yield from the clay and tills will be slow and limited in quantity, whereas the groundwater yield from the saturated sand and silts below the water level will be appreciable and persistent.

It is understood that the property will be developed into a residential subdivision. Detailed design of the development, however, is not available at the time this report is prepared. The geotechnical findings which warrant special consideration are presented below:

1. The topsoil and ploughed soil must be removed for the development. The thickness of topsoil and ploughed soil may vary or becomes thicker in some areas, especially in the treed areas and depressed areas. In order to prevent

overstripping, a diligent control of the stripping operation will be required. A test pit programme can be carried out prior to or during construction to determine the thickness of the topsoil and ploughed soils.

2. The topsoil is void of engineering value. It must not be buried within the building envelope or deeper than 1.2 m below the exterior finished grade of the development. It can only be used for landscaping and landscape contouring purposes.
3. The weathered soils are not suitable to support any structure sensitive to movement. They must be subexcavated and sorted free of topsoil inclusions or deleterious materials before it is reused as engineered fill or structural backfill.
4. The sound natural soils below the topsoil, ploughed soil, and weathered soils, are suitable for normal spread and strip footing construction for the proposed buildings. The footings must be designed in accordance with the recommended bearing pressures in Section 6.1 and the footing subgrade must be inspected by a geotechnical engineer to ensure that its condition is compatible with the design of the foundations.
5. The footings must be maintained at least 0.5 m above the groundwater levels. If groundwater seepage is encountered during excavation, or where the subgrade of the normal foundations is found to be wet, the subgrade should be protected by a concrete mud-slab immediately after exposure. Dewatering may be required prior to and during construction.
6. Where earth fill is required to raise the site, or where extended footings are necessary, it is generally more economical to place engineered fill for normal footing, sewer and road construction.
7. A Class 'B' bedding, consisting of compacted 20-mm Crusher-Run Limestone, or equivalent, is recommended for the construction of the underground services. The pipe joints should be leak proof or wrapped with a

waterproof membrane. Where saturated soils are present or extensive dewatering is required, a Class ‘A’ bedding will be required.

8. All excavation should be carried out in accordance with Ontario Regulation 213/91.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 Foundations

It is assumed that the site will be regraded for the proposed development. It is generally more economical to place engineered fill for normal footing, sewer and pavement construction. Soil bearing pressures of 150 kPa (SLS) and 250 kPa (ULS) are recommended for the design of building foundations, consisting of normal spread and strip footings founded on the engineered fill or on the sound native soil stratum. The requirements for engineered fill construction are discussed in Section 6.2.

The appropriate founding levels in the natural soils range from 1.0± to 2.5± m from the prevailing ground surface, depending on the location.

The recommended soil pressures (SLS) incorporate a safety factor of 3. The total and differential settlements of the footings are estimated to be 25 mm and 15 mm, respectively.

One must be aware that the recommended bearing pressures are given as a guide for foundation design and the soils at the bearing level must be confirmed by inspection

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Hydrogeological Investigation, Water Balance and Catchment-Based Water Balance

7370 Centre Road, Uxbridge, Ontario

Preliminary Report

Prepared For:

Bridge Brook Corporation

Prepared By:

Beacon Environmental Limited

Date:	*Project:*
March 2021	**217431.2**

Table 1. Summary of Groundwater Monitoring Well Conditions

Location ID	Reported Date of Construction	Approximate Location		Approximate Ground Surface	Reported Screened Interval	Soils Reported at Screened Interval	Approximate SPT N-Value at Screened Interval
		Latitude	Longitude	SoilEng, 2018 (Beacon, 2019)[3]	mbgl (masl)[5]		
BH3 [1]	*December 15, 2017*	44.1130°	-79.1416°	*305.0* (304.421)	*2.4 to 6.1* *(302.0 to 298.3)*	*Silty Clay Till*	*37 to 27*
BH6 (S) [2]	- [2]	- [2]	- [2]	(288.078)	- [2]	BOW 7.01 m on March 16, 2020 [2]	- [2]
BH6 (D)	*December 12, 2017*	44.1148°	-79.1378°	*287.9* (288.075)	*11.6 to 15.2* *(276.4 to 272.9)*	*Silty Clay Till*	*42 to 74*
BH7	*December 15, 2017*	*44.1138°*	*-79.1399°*	*297.8* (297.606)	*2.4 to 6.1* *(295.2 to 291.5)*	*Silty Sand Till*	*20 to 48*
BH9 (S) [2]	- [2]	- [2]	- [2]	(323.17)	- [2]	BOW 6.95 m on March 16, 2020 [2]	- [2]
BH9 (D)	*December 20, 2017*	44.1135°	-79.1447°	*321.9* (323.343)	11.6 to 15.2 (311.7 to 308.1)	Silty Clay Till to Silt	68 to 74
BH10	*December 21, 2017*	44.1129°	-79.1474°	*332.6* (332.254)	2.4 to 6.1 (329.8 to 326.1)	Silty Sand Till to Silty Clay Till	18 to >100
BH11	*November 27, 2017*	44.1158°	-79.1380°	*291.4* (289.224)	2.4 to 6.1 (286.8 to 283.1)	Silty Sand Till	35 to >100
BH13	*January 15, 2018*	44.1148°	-79.1448°	322.6 (322.284)	2.4 to 6.1 (319.8 to 316.8)	Sand to Silty Clay Till	62 to >100

Italics – indicates data collected by others (SoilEng, 2018)

BOW – “bottom of well”

[1] BH3 was confirmed destroyed

[2] borehole logs were not provided in the geotechnical report

[3] ground elevations provided by SoilEng.

[4] elevation measurements from survey carried out March 19, 2020.

[5] masl measurements corrected to survey carried out March 19, 2020 using the mbgl measurements in SoilEng, 2018.

Table 2. Summary of Measured Groundwater Levels

Location ID	Approximate Top of Pipe	Approximate Ground Surface Elevation	Groundwater Measurements									
			Upon Completion	2018					2019	2020		
				Jan 31	Mar 22	June19 and July 4	Sept 6	Dec 4	Sept 11	Mar 16	Apr 28	Aug 25
	masl (mbgl)	masl	mbgs (masl)	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl)	mbgs (masl)	mbgs (masl)	mbgs (masl)
BH3		(304.421)	302.3	0.4 (304.0)	*0.5 (303.9)*	*1.1 (303.3)*	*0.7 (303.7)*	*0.2 (304.2)*	confirmed destroyed			
BH6 S	+ 0.83	(288.078)	- [2]	- [2]	*1.2 (286.8)*	*1.4 (286.6)*	*1.8 (286.2)*	*0.9 (287.2)*	2.44 (285.63)	**0.87 (287.13)**	1.2 (286.87)	2.49 (285.59)
BH6 D	+0.70	(288.075)	273.0	1.3 (286.7)	*1.4 (286.6)*	*1.6 (286.4)*	*2.0 (286.0)*	*1.1 (286.9)*	2.81 (285.26)	**0.98 (287.10)**	1.45 (286.63)	2.80 (285.27)
BH7	+0.80	(297.606)	293.0	0.9 (296.7)	*1.1 (296.5)*	*2.2 (295.4)*	*2.5 (295.1)*	*0.5 (297.1)*	3.91 (293.70)	**1.04 (296.56)**	1.71 (295.90)	3.95 (293.65)
BH9 S	+ 0.82	(323.170)	- [2]	- [2]	*1.0 (322.1)*	*2.1 (321.0)*	*2.3 (320.8)*	*0.7 (322.4)*	3.39 (319.78)	**1.30 (321.87)**	1.50 (321.67)	3.20 (319.97)
BH9 D	+ 0.82	(323.343)	*307.3*	*7.4 (315.9)*	*7.5 (315.8)*	*7.9 (315.4)*	*8.1 (315.2)*	*7.4 (315.9)*	8.9 (314.44)	**7.53 (315.81)**	7.74 (315.60)	8.92 (314.42)
BH10	+ 0.93	(332.254)	*329.0*	*0.2 (332.0)*	*0.9 (331.3)*	*1.7 (330.5)*	*1.4 (330.8)*	*0.3 (331.9)*	2.39 (329.85)	**0.52 (331.73)**	1.20 (331.05)	2.22 (330.03)
BH11	+ 0.91	(289.224)	290.2	1.1 (288.1)	*1.1 (288.1)*	*1.4 (287.8)*	*1.8 (287.4)*	*0.7 (286.6)*	2.56 (286.66)	**0.54 (288.68)**	1.07 (288.15)	2.56 (286.66)
BH13	+ 0.73	(322.284)	319.0	3.5 (318.8)	*3.3 (319.0)*	*3.2 (319.0)*	*3.7 (318.6)*	*3.7 (317.8)*	4.47 (317.81)	**3.08 (319.20)**	3.24 (319.04)	4.59 (317.69)

Italics – indicates data collected by others (SoilEng, 2018)

Grey shading - indicates water level measured at the time of drilling completion - water levels measured at the time of completion are not directly comparable to the other measurements.

Bold values – indicates the highest measured groundwater levels

[2] reference to the shallow nested wells were not provided in the geotechnical report (SoilEng, 2018) – water levels are found in the subsequent monitoring program letters.

[3] masl measurements corrected to survey carried out March 19, 2020 using the mbgl measurements in SoilEng, 2018.

Table 4. Summary of Estimated Infiltration Rates

Location ID	Soil Description	Approximate Test Depth	Estimated Field-Saturated Hydraulic Conductivity	Theoretical K_{fs} @ 4°C "freshet"	Theoretical K_{fs} @ 24°C "summer"	Estimated Infiltration Rate[1]	Correction Factor Used	Estimated Design Infiltration Rate[2]
		(mbgl)	K_{fs} (cm/s)	K_{fs} (cm/s)	K_{fs} (cm/s)	(mm/hr)		(mm/hr)
PT20-1 (near BH6)	Brown silty sand, rootlets, moist	0.42	9×10^{-5}	8×10^{-5}	1×10^{-4}	49	2.5	20
PT20-2 (near BH7)	Brown silty sand, rootlets, moist	0.26	4×10^{-5}	3×10^{-5}	6×10^{-5}	42	2.5	17
PT20-3 (near BH11)	Brown silty sand, rootlets, moist	0.62	4×10^{-5}	3×10^{-5}	5×10^{-5}	42	2.5	17

Notes:
mbgl = metres below ground surface
cm/s = centimetres per second
mm/hr = millimetres per hour
[1] – based on Estimated Field-Saturated Conductivity and Table C1 from TRCA and CVCA (2010).
[2] – correction factor in accordance with Table C2 from TRCA and CVCA (2010).

4.2 Global Site-Specific Water Balance

4.2.1 Pre-Development Constraints

The existing pre-development conditions of the subject property includes three general vegetation types, including ‘moderately rooted crops’ (corn), ‘mature forest’, and ‘swamps and marshes’, as summarized in **Table 6.** A small amount of land dedicated to a dirt driveway bisects the property and is characterized as impermeable, due to long term compaction**.**

Table 6. Existing Pre-Development Conditions

Existing Catchment Land Use	Approximate Pervious Land Area (m^2)	Approximate Impervious Land Area (m^2)	Sums (m^2)
Principle Area – (corn fields)	349,668	-	349,668
Mature Forest Areas (areas defined as FOD [1])	41,220	-	41,220
Marshes and Swamp Areas (areas defined as MAS2-1 [1] and SWT-2 [1])	9,984		9,984
Driveway (4 metres wide by 732 metres long)	-	2,928	2,928
Total Areas	**400,872**	**2,928**	**403,800**

FOD – ‘deciduous forest areas’

MAS2-1 – ‘Cattail Mineral Shallow Marsh’SWT-2 – ‘Willow Mineral Thicket Swamp’

[1] Source: Figure 2 – Existing Conditions (Beacon; August, 2020)

As summarized in **Table 6**, the area of the subject property used in the calculations was 403,800 m^2 in area, which includes approximately 2,928 m^2 of impermeable area.

4.2.2 Post-Development Constraints

Post-development conditions for Phase One Conditions were based on drawings provided by SCS, dated December 2020 (**Figure**; **Appendix A**). The proposed conditions of the subject property include one general vegetation type which have been classified as Urban Lawn/Shallow Rooted Crops, as well as impervious lands comprised of concrete pavements, asphalt pavements, and building structures, as summarized in **Table 7.**

Table 7. Proposed Post-Development Conditions

Proposed Land Uses [1, 2]	Approximate Pervious Land Area (m^2)	Approximate Impervious Land Area (m^2)	Sums (m^2)
	Area within FOI Catchment	Area within FOI Catchment	
Catchment 201	104,632	150,568	255,200
Catchment 202	21,120	1,880	23,000
Catchment 203 (Wet SWMP 1)	8,700	8,700	17,400
Catchment 204	21,318	34,782	56,100
Catchment 205 (Dry SWMP 1)	3,213	3,087	6,300
Catchment 206	371	329	700
Catchment 207	1,590	1,410	3,000
Catchment 208	1,007	893	1,900
Uxbridge Brook NHS	40,200	-	40,200
Total	**202,941**	**201,649**	**403,800**

[1] Based on information provided by SCS (December 2020).

[2] These represent the area of each catchment limited to the subject property that are interpreted to flow toward the FOI.SWMP – storm water management pond

The subject property remains approximately 403,800 m^2 in area. Impermeable areas are increasedfrom approximately 1% of the subject property in pre-development conditions, to approximately 50% of the subject property in post-development conditions.

4.2.3 Comparison of Pre-Development and Post-Development Water Balance Conditions

The pre-development hydrologic budget and post-development hydrologic budget for the subject property was estimated based on the existing catchment conditions summarized above. The estimated pre-development conditions are compared to anticipated post-development conditions in **Table 8,** below.

Table 8. Theoretical Average Annual Water Budgets

Component	Pre-Development Conditions	Post-Development Conditions	
	(m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)
(P) Precipitation	329,905	329,905	-
(ET) Evapotranspiration	292,285	150,568	-141,717
(Q_G) Infiltration	60,883	31,668	-29,215
(Q_S) Run-off	59,532	258,987	+199,455

Based on the summary of analyses provided in **Table 8,** it is noted that the proposed changes to the subject property are anticipated to result in an annual infiltration decrease of approximately 27,764 m^3, and an annual runoff increase of approximately 199,455 m^3 in comparison to existing conditions. Further details, including a monthly resolution breakdown, are provided in **Appendix D**.

Estimated decreases in infiltration volume and increases in run-off volume are interpreted to be due to relatively greater proposed impermeable area, as well as an exchange of moderately rooted crops (e.g. corn) with shallow rooted crops (e.g. urban lawns), which have a lower assigned water holding capacity (re: **Table 5**, above).

4.2.4 Low Impact Development (LID) Measures and Influence of SWMPs

Low Impact Development Measures located within the subject property area are proposed. These include Catchbasin Infiltration/Filtration Trenches and Rear Yard At-Surface Infiltration Trenches which effectively convert runoff volume from impermeable areas to infiltration volume. As well, a wet SWMP is proposed (Catchment 203) and a dry SWMP is proposed (Catchment 205). The wet SWMP contributes to evapotranspiration processes, and has an impermeable ratio of 50% (SCS, 2020). The dry SWMP contributes to evapotranspiration processes and infiltration processes.

The combined monthly influence of these proposed mitigation methods are provided in **Appendix D**.As shown, the LID measures appear to be least active during winter months, June, and September (limited by available runoff), and are most effective during the freshet months and fall rains.

4.2.5 Comparison of Pre-Development and Post-Development Catchment-Based Water Balance Conditions (Including Mitigations)

The pre-development hydrologic budget for the subject property was estimated based on the existing catchment conditions summarized above, and the post-development hydrologic budgets were estimated based on the Post-Development Drainage Plan and related mitigation measures, summarized above. The estimated pre-development conditions are compared to anticipated post-development conditions in **Table 9,** below. A more detailed analysis of the values summarized in **Table 9** is provided at monthly resolution in **Appendix D**.

Table 9. Theoretical Average Catchment-Based Water Budgets

Component	Pre- Development FOI Catchment	Proposed Post-Development Conditions		Proposed Post-Development Conditions with Mitigation Measures (Ultimate Conditions)	
	(m^3 per annum)	(m^3 per annum)	Relative Difference from Pre- Development (m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)
(P) Precipitation	329,905	329,905	-	329,905	-
(ET) Evapotranspiration	292,285	150,568	-141,717	150,568	-141,717
(Q$_G$) Infiltration	60,883	31,668	-29,215	160,246	+99,363
(Q$_S$) Run-off	59,532	258,987	+199,455	130,409	+70,877

Based on the summary of analyses provided in **Table 9,** it is noted that the ultimate proposed conditions for the subject property are anticipated to result in an annual increase of infiltration by approximately 99,363 m^{3,} and an annual increase in runoff by approximately 70,877 m^3 in comparison to existing conditions.

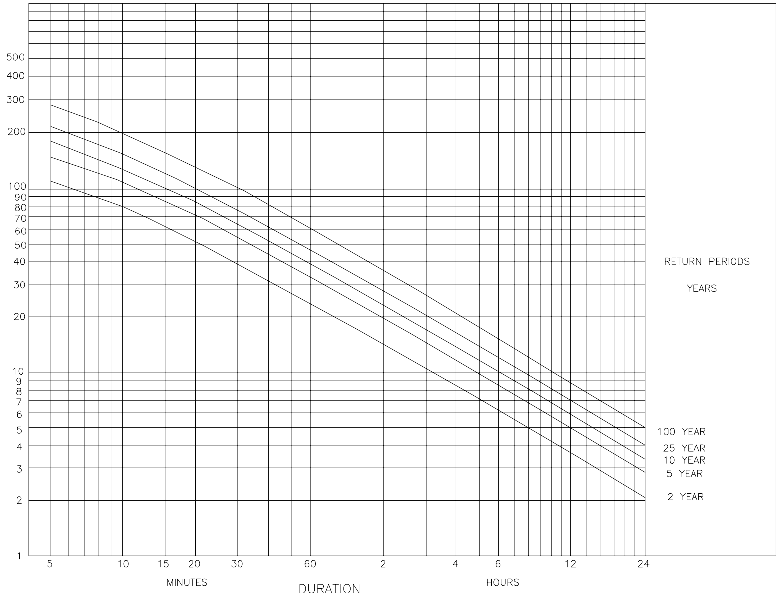
As shown in **Appendix D**, LID measures convert approximately 4,262 m^3 to 18,498 m^3 of theoretical runoff volume to theoretical infiltration per month. Resulting monthly infiltration trends appear to have generally higher infiltration volumes. Controlled runoff volumes result in more extreme wet periods, a longer freshet period and a drier summer season.

It is acknowledged that the values and coefficients presented above are standardized estimates. It is important to understand that infiltration rates and water holding capacities are dependent upon the effective porosity and hydraulic conductivity of the surficial soils which may vary over several orders of magnitude. As such, the resulting run-off and infiltration estimates inherit potentially large margins of error. These margins of error are recognized, but for the purposes of this assessment, the numbers used in the water balance calculations are considered reasonable estimates based on the site-specific conditions and useful for comparison of pre- to post- development conditions.

4.3 Catchment-Based Water Balance

A Catchment-Based Water Balance (CBWB) assessment was carried out for Beacon by Terrapex, limited to the catchment area belonging to the Feature of Interest (FOI). For the purposes of this report, the FOI is the portion of Uxbridge Brook located within the bounds of the subject property.

The purpose of the catchment-based water balance assessment is to compare the hydrological conditions of the proposed development conditions on the surfacewater reaching/‘feeding’ the FOI. For the purposes of this assessment, the FOI is defined as the portion of Uxbridge Brook and associated lower banks (presumed spring flood tier) located at the southeast corner of the subject property.



1. EQUATION FOR TYPICAL INTENSITY–DURATION–FREQUENCY CURVES: T–TIME(MINUTES)
I – INTENSITY (mm/hr)

$$I_2 \quad \frac{645}{(T+5)^{0.786}} \qquad I_5 \quad \frac{904}{(T+5)^{0.788}} \qquad I_{10} \quad \frac{1065}{(T+5)^{0.788}} \qquad I_{25} \quad \frac{1234}{(T+4)^{0.787}} \qquad I_{100} \quad \frac{1799}{(T+5)^{0.810}}$$

2. THE ABOVE EQUATION ARE ONLY VALID FOR T=10 MINUTES TO 1440 MINUTES

APPROVED

REVISION

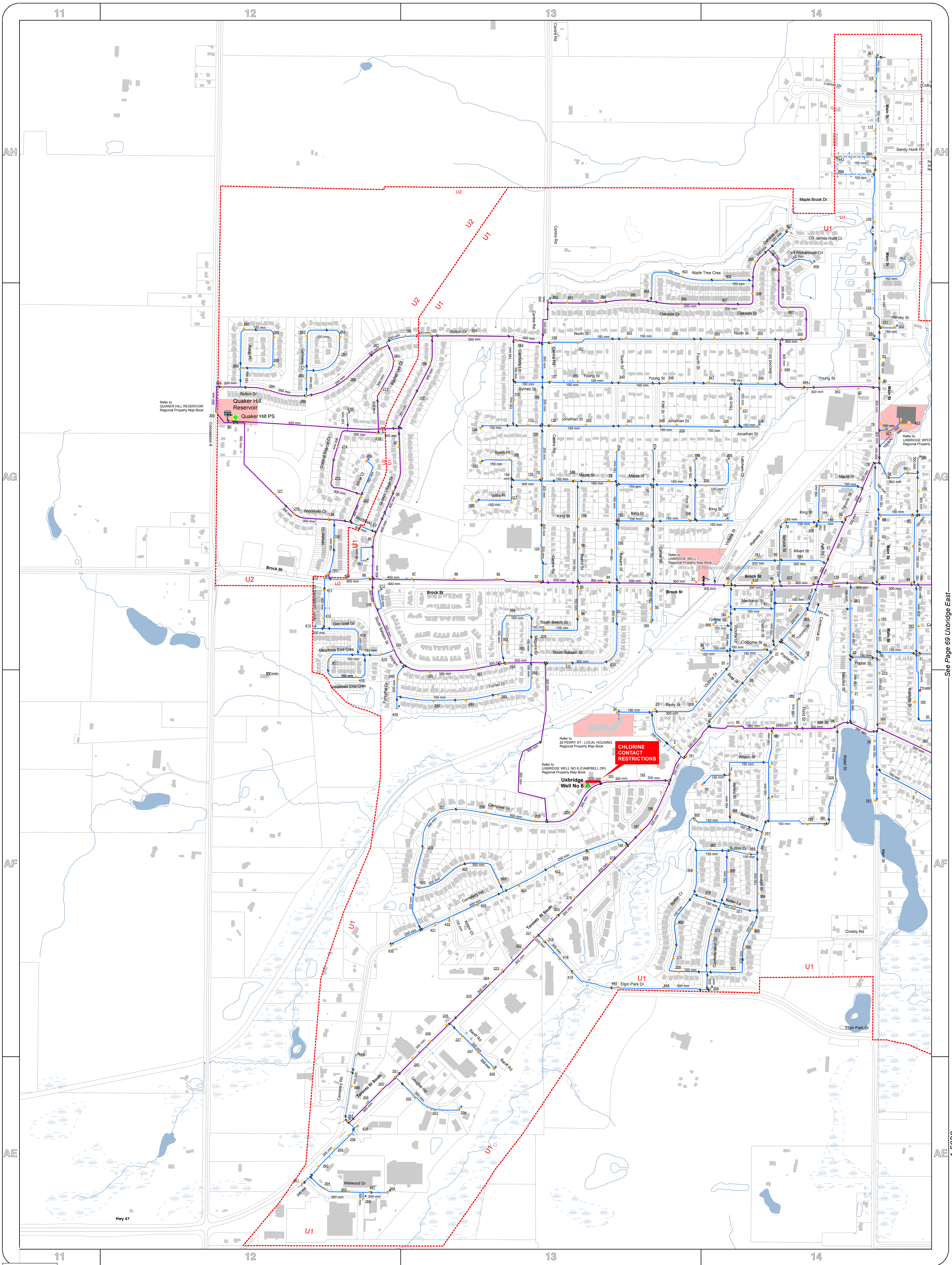
DATE OF REVISION

TOWNSHIP OF UXBRIDGE

RAINFALL INTENSITY DURATION CURVES

DATE OF ISSUE
MARCH 1989

DRAWING No.
US–600



1:5000

0 50 100 200 300 400 500 Meters

Produced by Durham Region under License with the Ontario Ministry of Natural Resources, © Queen's Printer for Ontario, 2009. Drainage 2010 provided by © First Base Solutions 2010

The Regional Municipality of Durham
Works Department
WATER SUPPLY SYSTEM

Servicing Note: This map depicts proximity of services only. It is not to be used to determine individual site servicing or availability of capacity within the system. For detailed site servicing information please contact the development approvals section of the works department.

Township of Uxbridge

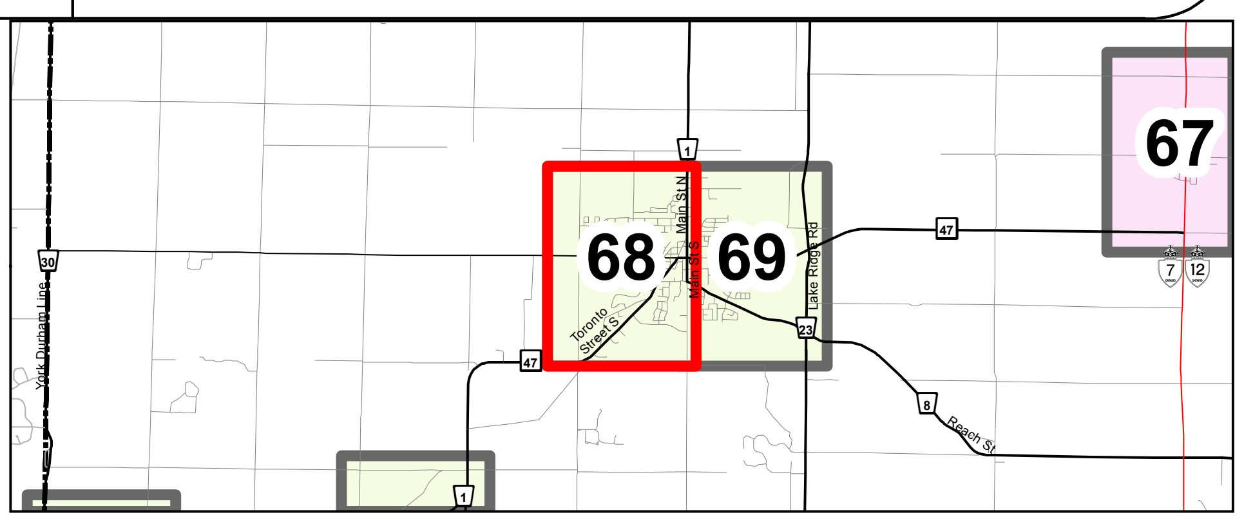
Uxbridge West

- Water Main - Assumed or In Service
- Water Main - Maintenance
- Water Main - Issued for Construction
- Water Main - Not In Service
- Feeder Main - Assumed or In Service
- Feeder Main - Maintenance
- Feeder Main - Issued for Construction
- Fireline
- Service
- Pressure Zone Edge
- Underground Pipelines
- Municipal Boundary

- Hydrant
- Flushing Hydrant
- Hydrant with Anti-tampering Device
- Flushing Hydrant with Anti-tampering Device
- Temporary Flushing Hydrant
- Temporary Flushing Hydrant with Anti-tampering Device
- Private Hydrant
- Water Pumping Station - Proposed
- Water Pumping Station - Not in Service
- Water Pumping Station - Not Applicable
- Water Pumping Station - Assumed/In Service/Maintenance
- Water Pumping Station - Abandoned

- Control Valve
- Curbstop Non Residential
- Zone Valve
- Blow Off
- Air Release, Check, Drain or Pressure Relief
- Municipal Well - In Service
- Municipal Well - Abandoned
- Municipal Well - Not in Service
- Municipal Well - Not Applicable
- Reservoir - In Service
- Reservoir - Not in Service
- Storage Tank - In Service
- Wet Well - Assumed

- Easement (Water)
- Easement (Combined)
- Regional Property



Scugog and Sunderland Depot

printed Friday, March 22, 2019
Uxbridge West.PDF

APPENDIX C

HYDROLOGY MODELLING

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DIGITAL REPORT AND MODELLING FILES

The following secure link is being provided by **SCS Consulting Group** to share 7370 Centre Road, Uxbridge related digital data:

https://filesafecloud.scsconsultinggroup.com/url/daymvjqxfcht7bdy

Please click on the link and download all files from this location.

- Visual Otthymo 6.2 Modelling

SCS consulting group ltd

EXISTING CONDITIONS
VO6 MODEL SCHEMATIC

Project Name:Centre Road
Project No.: 2099
Date: December 2022
Designer: C.M.D.

Existing Conditions
VO Parameter Summary

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

NASHYD

Number	**101**	**102**
Description		
DT(min)	2	2
Area (ha)	40.26	1.07
CN*	86.0	86.0
IA(mm)	8.0	8.0
TP Method	Uplands	Uplands
TP (hr)	0.44	0.07

SCS consulting group ltd

Existing Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Site Soils: (per Geotechnical Investigation Report prepared by Soil Engineers Ltd. dated February 16, 2018)

Soil Type	**Hydrologic Soil Group**
Silty Clay	C

TABLE OF CURVE NUMBERS (CN's)**

Land Use	Hydrologic Soil Type							Manning's 'n'	Source
	A	AB	B	BC	C	CD	D		
Meadow "Good"	30	44	58	64.5	71	74.5	78	0.40	MTO
Woodlot "Fair"	36	48	60	66.5	73	76	79	0.40	MTO
Gravel	76	80.5	85	87	89	90	91	0.30	USDA
Lawns "Good"	39	50	61	67.5	74	77	80	0.25	USDA
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	MTO
Crop	66	70	74	78	82	84	86	0.13	MTO
Fallow (Bare)	77	82	86	89	91	93	94	0.05	MTO
Low Density Residences	57	64.5	72	76.5	81	83.5	86	0.25	USDA
Streets, paved	98	98	98	98	98	98	98	0.01	USDA

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. USDA (1986), Urban Hydrology for Small Watersheds, Table 2.2-Runoff Curve Numbers for Urban Areas

HYDROLOGIC SOIL TYPE (%)

Catchment	Hydrologic Soil Type							TOTAL
	A	AB	B	BC	C	CD	D	
101					100			100
102					100			100

LAND USE (%)

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
101	0.5	3.3				95.3			0.9	100.0
102		0.9				99.1				100.0

Note: Where STANDHYD command used (shaded), impervious fraction is not considered in CN determination, since %Imp directly input in STANDHYD command

CURVE NUMBER (CN)

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Weighted CN
101	0.4	2.4	0.0	0.0	0.0	78.1	0.0	0.0	0.9	82
102	0.0	0.7	0.0	0.0	0.0	81.2	0.0	0.0	0.0	82

** AMC II assumed

SCS consulting group ltd

Existing Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Input Values

Step				
	Subcatchment:	101		102
1	**CN (AMC II):**	**82**		**82**
2	CN (AMC III) =	92		92
3	100 Year Precipitation, P =	104.07	mm	104.07

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S} \qquad S = \frac{(P - Ia)^2}{Q} - (P - Ia)$$

Q = rainfall excess or runoff, mm
S = potential maximum retention or available storage, mm

$$CN = \frac{25400}{S + 254} \qquad S = \frac{25400}{CN} - 254$$

CN* = modified SCS curve # that better reflects Ia conditions in Ontario

Output Values

	Subcatchment:	101		102
	S_{III} =	22.09	mm	22.09
	SCS Assumption of 0.2 S = Ia =	4.42	mm	4.42
4	Q_{III} =	81.57	mm	81.57
	Preferred Initial Abstraction, Ia =	8.0	mm	8.0
5	S^*_{III} =	17.06	mm	17.05
6	CN^*_{III} =	93.71	mm	93.71
	CN^*_{III}=	**94**	Rounded	**94**
7	**CN^*_{II}=**	**86**	convert	**86**

Explanation of Procedure

1 Determine CN based on typical AMC II conditions (attached)
2 Convert CN from AMC II to AMC III conditions (standard SCS tables)
3 Get precipitation depth P for 100 year storm
4 Using CN_{III} with Ia = 0.2S, compute Q_{III} for 100 year precipitation
5 For the same Q_{III}, compute S^*_{III} using Ia=1.5mm (or otherwise determined)
6 Compute CN^*_{III} using S^*_{III}
7 Calculate CN^*_{II} using SCS conversion table

Existing Conditions
IA Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

LAND USE (%) - Existing Conditions

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
101	0.5	3.3				95.3			0.9	100.0
102		0.9				99.1				100.0

IA VALUES (mm) - Existing Conditions

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
IA (mm)	8	10	2	5	8	8	3	2	2	
101	0.0	0.3				7.6			0.0	8.0
102		0.1				7.9				8.0

* IA values based on LSRCA guidelines

Existing Conditions
Time to Peak Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

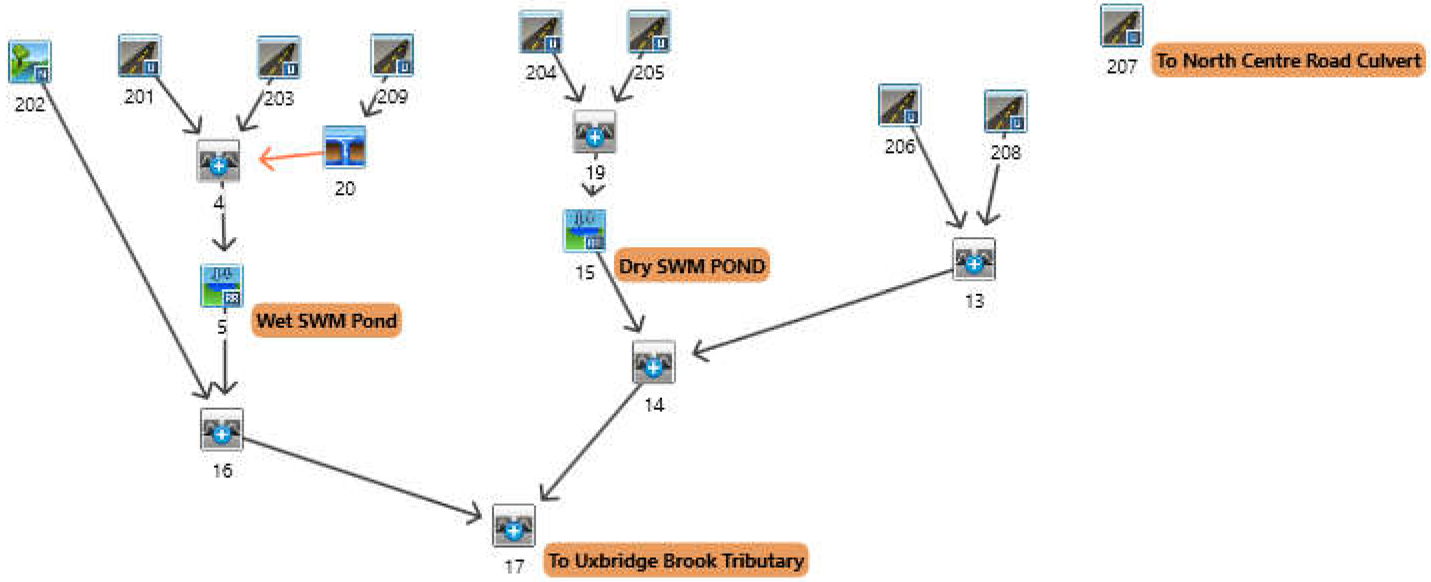
Uplands Method:

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Land Cover Type	Velocity (m/s)	Time of Concentration (s)	Time of Concentration (hr)	Time to Peak (hr)
101a	335.65	333.25	257	0.93	Cultivated Straight Row	0.27	951.0	0.26	0.18
101b	333.25	322.75	119	8.82	Cultivated Straight Row	0.83	144.2	0.04	0.03
101c	322.75	310.08	265	4.78	Cultivated Straight Row	0.61	435.4	0.12	0.08
101d	310.08	302.25	128	6.12	Woodland	0.37	343.0	0.10	0.06
101e	302.25	298.22	127	3.17	Woodland	0.27	472.2	0.13	0.09
101									**0.44**
102a	303.75	293.42	140	7.38	Cultivated Straight Row	0.76	185.4	0.05	0.03
102b	293.42	287.29	126	4.87	Cultivated Straight Row	0.61	205.2	0.06	0.04
102									**0.07**

SCS consulting group ltd

PROPOSED CONDITIONS
VO6 MODEL SCHEMATIC

Project Name:Centre Road
Project No.: 2099
Date: December 2022
Designer: C.M.D.



SCS consulting group ltd

Proposed Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

NASHYD

Number	**202**
Description	
DT(min)	2
Area (ha)	7.71
CN*	86.0
IA(mm)	8.0
TP Method	Uplands
TP (hr)	0.41

STANDHYD

Number	**201**	**203**	**204**	**205**	**206**	**207**	**208**	**209**
Description								Major/Minor Split to Bolton Drive
DT(min)	2	2	2	2	2	2	2	2
Area (ha)	25.20	1.57	5.63	0.65	0.10	0.24	0.26	0.13
XIMP[1,2]	0.29	0.50	0.24	0.01	0.01	0.01	0.01	0.45
TIMP[2]	0.60	0.50	0.60	0.20	0.43	0.09	0.45	0.60
CN*	73.0	73.0	73.0	73.0	73.0	73.0	73.0	73.0
IA(mm)	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
SLPP(%)	5	2	5	2	2	2	2	2
LGP(m)	40	40	40	40	40	40	40	40
MNP	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
DPSI (mm)	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
SLPI(%)	5	2	5	2	2	2	2	2
LGI(m)	409.88	102.31	193.74	65.83	25.82	40.00	41.63	29.44
MNI	0.013	0.013	0.013	0.013	0.013	0.013	0.013	0.013

[1] Note that where there is NO directly connected area (ie: roof runoff to grassed areas), the hydrology program does not accept XIMP=0%, therefore, XIMP = 1% has been used

[2] Note that where there is NO pervious area, the hydrology program does not accept TIMP and XIMP=100%, therefore, TIMP and XIMP = 99% has been used

SCS consulting group ltd

Proposed Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Site Soils: (per Geotechnical Investigation Report prepared by Soil Engineers Ltd. dated February 16, 2018)

Soil Type	**Hydrologic Soil Group**
Silty Clay	C

TABLE OF CURVE NUMBERS (CN's)**

Land Use	Hydrologic Soil Type							Manning's 'n'	Source
	A	AB	B	BC	C	CD	D		
Meadow "Good"	30	44	58	64.5	71	74.5	78	0.40	MTO
Woodlot "Fair"	36	48	60	66.5	73	76	79	0.40	MTO
Gravel	76	80.5	85	87	89	90	91	0.30	USDA
Lawns "Good"	39	50	61	67.5	74	77	80	0.25	USDA
Pasture/Range	58	61.5	65	70.5	76	78.5	81	0.17	MTO
Crop	66	70	74	78	82	84	86	0.13	MTO
Fallow (Bare)	77	82	86	89	91	93	94	0.05	MTO
Low Density Residences	57	64.5	72	76.5	81	83.5	86	0.25	USDA
Streets, paved	98	98	98	98	98	98	98	0.01	USDA

1. MTO Drainage Manual (1997), Design Chart 1.09-Soil/Land Use Curve Numbers
2. USDA (1986), Urban Hydrology for Small Watersheds, Table 2.2-Runoff Curve Numbers for Urban Areas

HYDROLOGIC SOIL TYPE (%)

Catchment	Hydrologic Soil Type							TOTAL
	A	AB	B	BC	C	CD	D	
202					100			100
201					100			100
203					100			100
204					100			100
205					100			100
206					100			100
207					100			100
208					100			100
209					100			100

LAND USE (%)

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
202	0.0	16.3	0.0	0.0	0.0	78.0	0.0	0.0	5.7	100.0
201	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
203	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
204	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
205	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
206	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
207	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
208	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0
209	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	100.0

Note: Where STANDHYD command used (shaded), impervious fraction is not considered in CN determination, since %Imp directly input in STANDHYD command

CURVE NUMBER (CN)

Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Weighted CN
202	0.0	11.9	0.0	0.0	0.0	63.9	0.0	0.0	5.6	81
201	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
203	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
204	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
205	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
206	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
207	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
208	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74
209	0.0	0.0	0.0	74.0	0.0	0.0	0.0	0.0	0.0	74

** AMC II assumed

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Proposed Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Input Values

Step	Subcatchment:	202		201	203	204	205	206	207	208	209
1	**CN (AMC II):**	**81**		**74**	**74**	**74**	**74**	**74**	**74**	**74**	**74**
2	CN (AMC III) =	92		88	88	88	88	88	88	88	88
3	100 Year Precipitation, P =	104.07	mm	104.07	104.07	104.07	104.07	104.07	104.07	104.07	104.07

$$Q = \frac{(P - Ia)^2}{(P - Ia) + S} \qquad S = \frac{(P - Ia)^2}{Q} - (P - Ia)$$

Q = rainfall excess or runoff, mm
S = potential maximum retention or available storage, mm

$$CN = \frac{25400}{S + 254} \qquad S = \frac{25400}{CN} - 254$$

CN* = modified SCS curve # that better reflects Ia conditions in Ontario

Output Values

Step	Subcatchment:	202		201	203	204	205	206	207	208	209
	S_{III} =	22.09	mm	34.64	34.64	34.64	34.64	34.64	34.64	34.64	34.64
	SCS Assumption of 0.2 S = Ia =	4.42	mm	6.93	6.93	6.93	6.93	6.93	6.93	6.93	6.93
4	Q_{III} =	81.57	mm	71.61	71.61	71.61	71.61	71.61	71.61	71.61	71.61
	Preferred Initial Abstraction, Ia =	8.0	mm	5.0	5.0	5.0	5.0	5.0	5.0	5.0	5.0
5	S^*_{III} =	17.09	mm	37.99	37.99	37.99	37.99	37.99	37.99	37.99	37.99
6	CN^*_{III} =	93.69	mm	86.99	86.99	86.99	86.99	86.99	86.99	86.99	86.99
	CN^*_{III}=	**94**	Rounded	**87**	**87**	**87**	**87**	**87**	**87**	**87**	**87**
7	**CN^*_{II}=**	**86**	convert	**73**	**73**	**73**	**73**	**73**	**73**	**73**	**73**

Explanation of Procedure

1 Determine CN based on typical AMC II conditions (attached)
2 Convert CN from AMC II to AMC III conditions (standard SCS tables)
3 Get precipitation depth P for 100 year storm
4 Using CN_{III} with Ia = 0.2S, compute Q_{III} for 100 year precipitation
5 For the same Q_{III}, compute S^*_{III} using Ia=1.5mm (or otherwise determined)
6 Compute CN^*_{III} using S^*_{III}
7 Calculate CN^*_{II} using SCS conversion table

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Proposed Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

LAND USE (%)										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
202		16.3				78.0			5.7	100.0
201				100.0						100.0
203				100.0						100.0
204				100.0						100.0
205				100.0						100.0
206				100.0						100.0
207				100.0						100.0
208				100.0						100.0
209				100.0						100.0

IA VALUES (mm)										
Catchment	Meadow	Woodlot	Gravel	Lawns	Pasture Range	Crop	Fallow (Bare)	Low Density Residences	Impervious	Total
IA (mm)	8	10	2	5	8	8	3	2	2	
202		1.6				6.2			0.1	8.0
201				5.0						5.0
203				5.0						5.0
204				5.0						5.0
205				5.0						5.0
206				5.0						5.0
207				5.0						5.0
208				5.0						5.0
209				5.0						5.0

* IA values based on LRSCA guidelines

Proposed Conditions
CN Calculations

Uplands Method:

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Land Cover Type	Velocity (m/s)	Time of Concentration (s)	Time of Concentration (hr)	Time to Peak (hr)
202a	335.65	333.25	257	0.93	Cultivated Straight Row	0.27	951.0	0.26	0.18
202b	333.25	322.75	119	8.82	Cultivated Straight Row	0.83	144.2	0.04	0.03
202c	322.75	310.08	265	4.78	Cultivated Straight Row	0.61	435.4	0.12	0.08
202d	310.08	302.25	128	6.12	Woodland	0.37	343.0	0.10	0.06
202e	302.25	299.20	90	3.39	Woodland	0.28	323.8	0.09	0.06
202									**0.41**

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Proposed Conditions
CN Calculations

			StandHyd IDs							
			201	203	204	205	206	207	208	209
Catchment Area (ha)			25.20	1.57	5.63	0.65	0.10	0.24	0.26	0.13
Land Use Areas	**Timp**	**Ximp**								
SWM Pond	50%	50%		1.57						
Dry SWM Pond	15%	0%				0.54				
Community Housing	90%	90%	0.14							
11.0m Frontage - Single Detached 1[1]	55%	11%	6.85		0.83					
11.0m Frontage - Single Detached 1 (Front Half)[1]	70%	24%	0.13		0.15					
11.0m Frontage - Single Detached 1 (Rear Half)[1]	43%	0%				0.05	0.10			
12.2m Frontage - Single Detached 1[1]	56%	10%	4.05		1.62					
12.2m Frontage - Single Detached 1 (Front Half)[1]	70%	22%	0.48		0.06					
12.2m Frontage - Single Detached 1 (Rear Half)[1]	44%	0%				0.04		0.02		
13.4m Frontage - Single Detached 2[1]	56%	9%	1.80		0.95					
13.4m Frontage - Single Detached 1 (Front Half)[1]	70%	20%	0.11		0.20					
13.4m Frontage - Single Detached 1 (Rear Half)[1]	45%	0%				0.02		0.03	0.26	
Townhouse Fronting Standard R.O.W.	63%	30%	1.21							
20.0m R.O.W.	60%	45%	9.29		1.59					0.13
Single Detached Driveways Within R.O.W.	100%	100%	0.90		0.23					
Townhouse Driveways Within R.O.W.	100%	100%	0.07							
Existing 6th Concession Road Imperviousness	100%	100%	0.17							
Open Space	0%	0%						0.19		
		Total Land Use =	25.20	1.57	5.63	0.65	0.10	0.24	0.26	0.13
		Timp =	60%	50%	60%	20%	43%	9%	45%	60%
		Ximp =	29%	50%	24%	0%	0%	0%	0%	45%

[1] Lot percent impervious (TIMP & XIMP) calculations per Figures C.1 - C.3.

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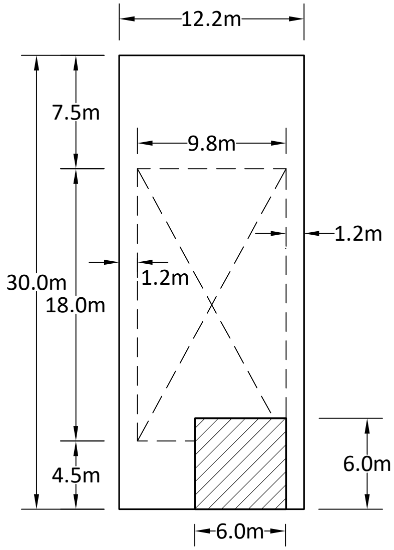
TYPICAL 12.2m x 30.0m SINGLE DETACHED 1

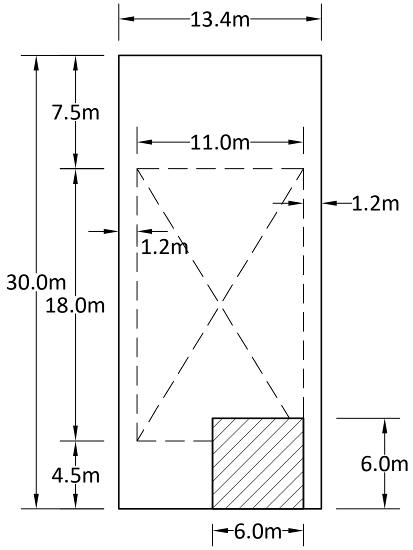


FRONT DRAINAGE AREA = 164.7 m^2
FRONT DRAINAGE ROOF AREA = 79.4 m^2
DRIVEWAY AREA = 36.0 m^2
FRONT DRAINAGE PERCENT IMPERVIOUS = 70%
FRONT DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 22%

REAR DRAINAGE AREA = 201.3 m^2
REAR DRAINAGE ROOF AREA = 88.4 m^2
REAR DRAINAGE PERCENT IMPERVIOUS = 44%
REAR DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 0%

TOTAL DRAINAGE AREA = 366.0 m^2
TOTAL ROOF AREA = 167.8 m^2
TOTAL DRIVEWAY AREA = 36.0 m^2
TOTAL AREA PERCENT IMPERVIOUS = 56%
TOTAL AREA DIRECTLY CONNECTED IMPERVIOUS = 10%

TYPICAL 13.4m x 30.0m SINGLE DETACHED 2



FRONT DRAINAGE AREA = 180.9 m^2
FRONT DRAINAGE ROOF AREA = 90.0 m^2
DRIVEWAY AREA = 36.0 m^2
FRONT DRAINAGE PERCENT IMPERVIOUS = 70%
FRONT DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 20%

REAR DRAINAGE AREA = 221.1 m^2
REAR DRAINAGE ROOF AREA = 99.0 m^2
REAR DRAINAGE PERCENT IMPERVIOUS = 45%
REAR DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 0%

TOTAL DRAINAGE AREA = 402.0 m^2
TOTAL ROOF AREA = 189.0 m^2
TOTAL DRIVEWAY AREA = 36.0 m^2
TOTAL AREA PERCENT IMPERVIOUS = 56%
TOTAL AREA DIRECTLY CONNECTED IMPERVIOUS = 9%

*NOTE: ALL ROOF LEADERS TO BE DIRECTED TO PERVIOUS SURFACES.
*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

7370 CENTRE ROAD UXBRIDGE

TYPICAL LAYOUT FOR SINGLE DETACHED DWELLING

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:500
DATE: DECEMBER 2022
PROJECT No: 2099
FIGURE No: C-1

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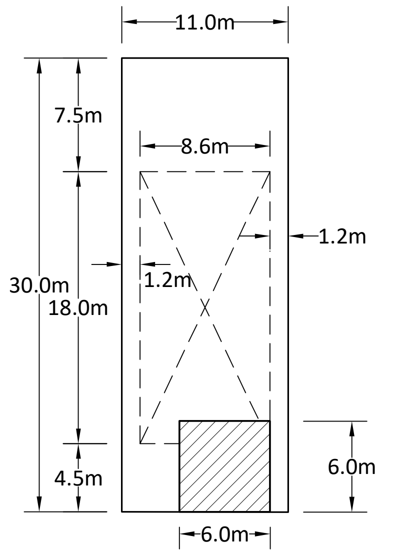
TYPICAL 11.0m x 30.0m LINKS

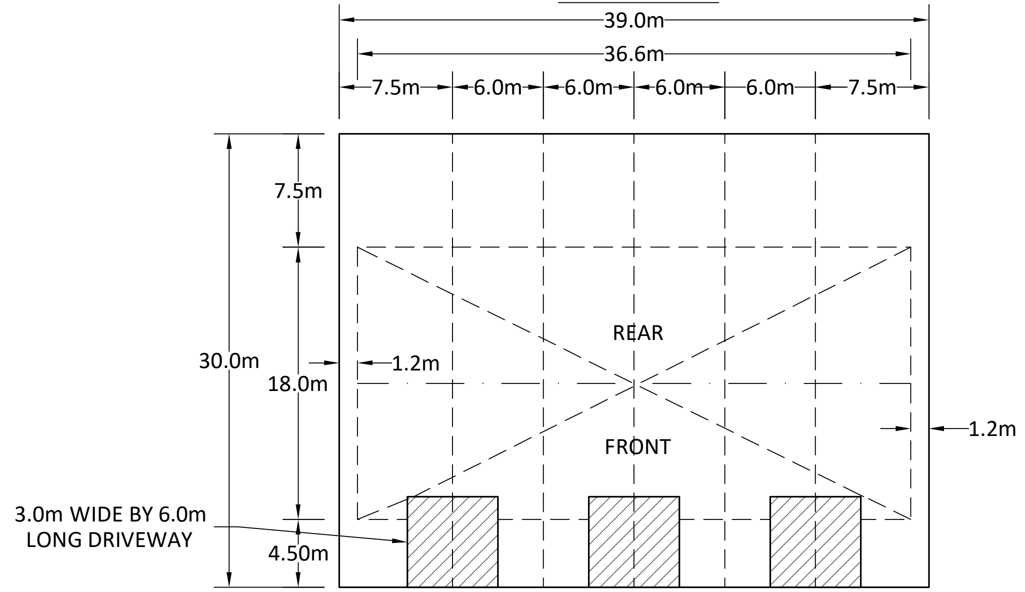


FRONT DRAINAGE AREA = 148.9 m^2
FRONT DRAINAGE ROOF AREA = 68.6 m^2
DRIVEWAY AREA = 36.0 m^2
FRONT DRAINAGE PERCENT IMPERVIOUS = 70%
FRONT DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 24%

REAR DRAINAGE AREA = 181.3 m^2
REAR DRAINAGE ROOF AREA = 77.2 m^2
REAR DRAINAGE PERCENT IMPERVIOUS = 43%
REAR DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 0%

TOTAL DRAINAGE AREA = 330.2 m^2
TOTAL ROOF AREA = 145.8 m^2
TOTAL DRIVEWAY AREA = 36.0 m^2
TOTAL AREA PERCENT IMPERVIOUS = 55%
TOTAL AREA DIRECTLY CONNECTED IMPERVIOUS = 11%

TYPICAL TOWNHOUSE FRONTING STANDARD R.O.W. (6.0m UNITS)



FRONT DRAINAGE AREA = 526.5 m^2
FRONT DRAINAGE ROOF AREA = 302.4 m^2
FRONT DIRECTLY CONNECTED ROOF AREA = 243.0 m^2
DRIVEWAY AREA = 108.0 m^2
FRONT DRAINAGE PERCENT IMPERVIOUS = 78%
FRONT DRAINAGE DIRECTLY CONNECTED IMPERVIOUS= 67%

REAR DRAINAGE AREA = 643.5 m^2
REAR DRAINAGE ROOF AREA = 329.4 m^2
REAR DRAINAGE PERCENT IMPERVIOUS = 51%
REAR DRAINAGE DIRECTLY CONNECTED IMPERVIOUS = 0%

TOTAL DRAINAGE AREA = 1170.0 m^2
TOTAL ROOF AREA = 631.8 m^2
DIRECTLY CONNECTED TOTAL ROOF AREA = 243.0 m^2
DRIVEWAY AREA = 108.0 m^2
TOTAL AREA PERCENT IMPERVIOUS = 63%
TOTAL AREA DIRECTLY CONNECTED IMPERVIOUS = 30%

*NOTE: ALL SINGLE DETACHED ROOF LEADERS TO BE DIRECTED TO PERVIOUS SURFACES.
*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

7370 CENTRE ROAD UXBRIDGE

TYPICAL LAYOUT FOR SINGLE DETACHED DWELLING AND TOWNHOUSE DWELLING

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY: G.M.
CHECKED BY: N.D.M.
SCALE: 1:500
DATE: DECEMBER 2022
PROJECT No: 2099
FIGURE No: C-2

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APPENDIX D

HYDRAULICS AND SWM FACILITY SIZING CALCULATIONS

Wet SWM Pond
Permanent Pool Sizing

Weighted Impervious Calculation

Catchment ID	Total Area	Imperviousness	Impervious Area
	(ha)	(%)	(ha)
201	25.20	60	15.12
203	1.57	50	0.79
209	0.13	60	0.08
Total	**26.90**	**59**	**15.98**

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Wet SWM Pond
Permanent Pool and Extended Detention Sizing

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

PERMANENT POOL

Level of Protection = Enhanced (Level 1)

Weighted Impervious = 59 %

Drainage Area = 26.90 ha

SWMP Type = 4. Wet Pond

Required Permanent Pool (including 40m^3/ha for extended detention)= 200.3 m^3/ha
Required Permanent Pool (minus 40m^3/ha for extended detention)= 160 m^3/ha

Required Permanent Pool = 4312 m^3

TABLE 3.2 - WATER QUALITY STORAGE REQUIREMENTS
(FROM MOE SWM PLANNING AND DESIGN MANUAL - 2003)

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced (Level 1)	1. Infiltration	25	30	35	40
	2. Wetlands	80	105	120	140
	3. Hybrid Wet Pond/Wetland	110	150	175	195
	4. Wet Pond	140	190	225	250
Normal (Level 2)	1. Infiltration	20	20	25	30
	2. Wetlands	60	70	80	90
	3. Hybrid Wet Pond/Wetland	75	90	105	120
	4. Wet Pond	90	110	130	150
Basic (Level 3)	1. Infiltration	20	20	20	20
	2. Wetlands	60	60	60	60
	3. Hybrid Wet Pond/Wetland	60	70	75	80
	4. Wet Pond	60	75	85	95
	5. Dry Pond (Continuous Flow)	90	150	200	240

EXTENDED DETENTION

Using the 40mm - 4 hour Chicago Storm

Erosion Control Volume (V) = Runoff Depth (mm) x Drainage Area (ha) x 10 (m^3) / (mm)(ha)

Erosion Control Volume (V) = 22.03 mm x 26.90 ha x 10 m^3 / mm·ha

Erosion Control Volume (V) = 5926 m^3

Using 40m^3/ha

Extended Detention Volume (V) = 40m^3/ha x Drainage Area (ha)

Extended Detention Volume (V) = 40 m^3/ha 26.90 ha

Extended Detention Volume (V) = 1076 m^3

Governing Volume (V) = 5926 m^3

Wet SWM Pond
Permanent Pool Sizing

Elevation (m)	Area (m^2)	Area (m^2)	H (m)	Vol (m^3)	Volume (m^3)	Storage (m^3)	Depth (m)	
292.00	2751				0		0	
		3610	1	3609.5				
293.00	4468				3610		1	
		5101	0.5	2550.25				
293.50	5733				6160		1.5	**N.W.L.**

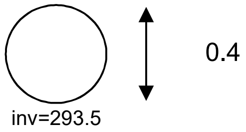
Permanent Pool Volume Required = 4312 m^3
Permanent Pool Volume Provided = 6160 m^3

CONTROL STRUCTURE SUMMARY
WET SWM POND

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Orifice 1

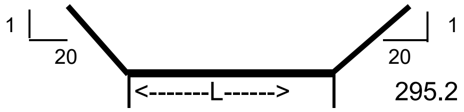
Invert =	293.50	m
Size =	0.400	m
Orifice Coefficient, C =	0.62	
Obvert =	293.9	m



Broad Crested Weir (Emergency Spillway)

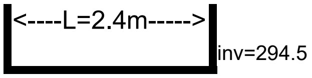
Length =	30.0	m
Elevation =	295.20	m
Crest Breadth =	5.2	m
Side Slope =	20	

(0 = vertical, 1 = 1H to 1V, 3 = 3H to 1 v)



Broad Crested Weir (Weir 1)

Length =	2.4	m
Elevation =	294.50	m
Crest Breadth =	0.2	m



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OUTFLOW SUMMARY
WET SWM POND

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Starting Water Level (m) = 293.50
Elevation Increment (m) = 0.02

▨ Shading represents Storage-Discharge pairings used in VO modelling

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Emergency Spillway Outflow (cms)	Weir 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	4 Hour Chicago Storm	12 Hour SCS Storm
293.50	0.000	0.000	0.000	293.50	0.000	0	0.0	Orifice 1	
293.52	0.001	0.000	0.000	293.52	0.001	115	0.0		
293.54	0.002	0.000	0.000	293.54	0.002	231	0.0		
293.56	0.005	0.000	0.000	293.56	0.005	349	9.4		
293.58	0.008	0.000	0.000	293.58	0.008	467	14.4		
293.60	0.013	0.000	0.000	293.60	0.013	586	17.5		
293.62	0.018	0.000	0.000	293.62	0.018	706	19.7		
293.64	0.024	0.000	0.000	293.64	0.024	828	21.3		
293.66	0.031	0.000	0.000	293.66	0.031	950	22.5		
293.68	0.038	0.000	0.000	293.68	0.038	1073	23.5		
293.70	0.038	0.000	0.000	293.70	0.038	1198	24.4		
293.72	0.049	0.000	0.000	293.72	0.049	1323	25.2		
293.74	0.069	0.000	0.000	293.74	0.069	1450	25.8		
293.76	0.085	0.000	0.000	293.76	0.085	1577	26.3		
293.78	0.098	0.000	0.000	293.78	0.098	1706	26.6		
293.80	0.109	0.000	0.000	293.80	0.109	1835	27.0		
293.82	0.120	0.000	0.000	293.82	0.120	1966	27.3		
293.84	0.129	0.000	0.000	293.84	0.129	2097	27.6		
293.86	0.138	0.000	0.000	293.86	0.138	2230	27.9		
293.88	0.146	0.000	0.000	293.88	0.146	2363	28.1		
293.90	0.154	0.000	0.000	293.90	0.154	2498	28.4		
293.92	0.162	0.000	0.000	293.92	0.162	2634	28.6		
293.94	0.169	0.000	0.000	293.94	0.169	2770	28.9		
293.96	0.176	0.000	0.000	293.96	0.176	2908	29.1		
293.98	0.183	0.000	0.000	293.98	0.183	3047	29.3		
294.00	0.189	0.000	0.000	294.00	0.189	3186	29.5	2 Year	
294.02	0.195	0.000	0.000	294.02	0.195	3327	29.7		
294.04	0.201	0.000	0.000	294.04	0.201	3469	29.9		
294.06	0.207	0.000	0.000	294.06	0.207	3611	30.1		
294.08	0.213	0.000	0.000	294.08	0.213	3754	30.3		
294.10	0.218	0.000	0.000	294.10	0.218	3898	30.5		2 Year
294.12	0.224	0.000	0.000	294.12	0.224	4043	30.7		
294.14	0.229	0.000	0.000	294.14	0.229	4188	30.8		
294.16	0.234	0.000	0.000	294.16	0.234	4335	31.0		
294.18	0.239	0.000	0.000	294.18	0.239	4482	31.2		
294.20	0.244	0.000	0.000	294.20	0.244	4630	31.4		
294.22	0.249	0.000	0.000	294.22	0.249	4778	31.5		
294.24	0.254	0.000	0.000	294.24	0.254	4928	31.7		
294.26	0.258	0.000	0.000	294.26	0.258	5078	31.8		
294.28	0.263	0.000	0.000	294.28	0.263	5230	32.0	5 Year	
294.30	0.267	0.000	0.000	294.30	0.267	5382	32.2		
294.32	0.272	0.000	0.000	294.32	0.272	5534	32.3		
294.34	0.276	0.000	0.000	294.34	0.276	5688	32.5		
294.36	0.280	0.000	0.000	294.36	0.280	5842	32.6		
294.38	0.285	0.000	0.000	294.38	0.285	5998	32.8	Extended Detention	
294.40	0.289	0.000	0.000	294.40	0.289	6154	32.9		
294.42	0.293	0.000	0.000	294.42	0.293	6311	33.1		5 Year
294.44	0.297	0.000	0.000	294.44	0.297	6468	33.2		
294.46	0.301	0.000	0.000	294.46	0.301	6627	33.4	10 Year	
294.48	0.305	0.000	0.000	294.48	0.305	6786	33.5		
294.50	0.309	0.000	0.000	294.50	0.309	6946	33.7	Weir 1	
294.52	0.313	0.000	0.011	294.52	0.323	7107	33.8		
294.54	0.316	0.000	0.030	294.54	0.346	7269	34.0		
294.56	0.320	0.000	0.055	294.56	0.375	7431	34.1		
294.58	0.324	0.000	0.084	294.58	0.408	7594	34.2		
294.60	0.327	0.000	0.118	294.60	0.445	7757	34.3		10 Year
294.62	0.331	0.000	0.155	294.62	0.486	7921	34.4	25 Year	
294.64	0.335	0.000	0.195	294.64	0.529	8086	34.5		
294.66	0.338	0.000	0.238	294.66	0.576	8251	34.6		
294.68	0.342	0.000	0.284	294.68	0.626	8417	34.6		
294.70	0.345	0.000	0.333	294.70	0.678	8584	34.7		
294.72	0.349	0.000	0.396	294.72	0.745	8751	34.8		
294.74	0.352	0.000	0.451	294.74	0.803	8919	34.8		25 Year
294.76	0.355	0.000	0.509	294.76	0.864	9088	34.9		
294.78	0.359	0.000	0.569	294.78	0.928	9257	35.0		
294.80	0.362	0.000	0.682	294.80	1.044	9427	35.0		
294.82	0.365	0.000	0.752	294.82	1.117	9598	35.0		

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OUTFLOW SUMMARY
WET SWM POND

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Starting Water Level (m) = 293.50
Elevation Increment (m) = 0.02

▨ Shading represents Storage-Discharge pairings used in VO modelling

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Emergency Spillway Outflow (cms)	Weir 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	4 Hour Chicago Storm	12 Hour SCS Storm
294.84	0.368	0.000	0.823	294.84	1.192	9769	35.1	100 Year	
294.86	0.372	0.000	0.897	294.86	1.269	9941	35.1		
294.88	0.375	0.000	0.973	294.88	1.347	10114	35.2		
294.90	0.378	0.000	1.050	294.90	1.428	10287	35.2		
294.92	0.381	0.000	1.176	294.92	1.557	10461	35.2		
294.94	0.384	0.000	1.261	294.94	1.645	10635	35.3		
294.96	0.387	0.000	1.348	294.96	1.735	10811	35.3		100 Year
294.98	0.390	0.000	1.437	294.98	1.827	10986	35.3		
295.00	0.393	0.000	1.544	295.00	1.938	11163	35.3		
295.02	0.396	0.000	1.638	295.02	2.034	11340	35.4		
295.04	0.399	0.000	1.733	295.04	2.133	11518	35.4		
295.06	0.402	0.000	1.830	295.06	2.233	11696	35.4		
295.08	0.405	0.000	1.929	295.08	2.335	11875	35.4		
295.10	0.408	0.000	2.041	295.10	2.450	12055	35.5		
295.12	0.411	0.000	2.144	295.12	2.555	12236	35.5		
295.14	0.414	0.000	2.249	295.14	2.663	12417	35.5		
295.16	0.417	0.000	2.355	295.16	2.772	12598	35.5		
295.18	0.420	0.000	2.463	295.18	2.883	12781	35.5		
295.20	0.423	0.000	2.572	295.20	2.995	12964	35.5	Emergency Spillway Invert (295.20)	
295.22	0.425	0.128	2.683	295.22	3.237	13147	35.6		
295.24	0.428	0.367	2.796	295.24	3.591	13332	35.6		
295.26	0.431	0.683	2.910	295.26	4.024	13517	35.6		
295.28	0.434	1.065	3.026	295.28	4.525	13702	35.6		
295.30	0.437	1.508	3.143	295.30	5.087	13889	35.6		
295.32	0.439	2.007	3.261	295.32	5.707	14076	35.6		
295.34	0.442	2.560	3.381	295.34	6.383	14263	35.6		
295.36	0.445	3.166	3.503	295.36	7.113	14451	35.6		
295.38	0.447	3.823	3.626	295.38	7.896	14640	35.6		
295.40	0.450	4.531	3.750	295.40	8.731	14830	35.7		
295.42	0.453	5.289	3.876	295.42	9.617	15020	35.7		
295.44	0.455	6.097	4.003	295.44	10.554	15211	35.7		
295.46	0.458	6.953	4.131	295.46	11.542	15402	35.7		
295.48	0.460	7.859	4.261	295.48	12.580	15594	35.7	100 Year Uncontrolled (295.48)	
295.50	0.463	8.577	4.392	295.50	13.432	15787	35.7		

FOREBAY SIZING CALCULATIONS

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Forebay

Elevation (m)	Area (m^2)	Average Area (m^2)	Height (m)	Volume (m^3)	Cumulative Volume (m^3)	Depth (m)
292.00	439				0	0
		742	1	742		
293.00	1044				742	1
		1268	0.5	634		
293.50	1491				1,375	1.5

Total Permanent Pool

Elevation (m)	Area (m^2)	Average Area (m^2)	Height (m)	Volume (m^3)	Cumulative Volume (m^3)	Depth (m)
292.00	2751				0	0
		3610	1	3,610		
293.00	4468				3,610	1
		5101	0.5	2,550		
293.50	5733				6,160	1.5

Minimum Criteria (per MECP guidelines)

Forebay area is	**26**	% of total Permanent Pool area
Maximum Forebay area is	**33**	% of total Permanent Pool area

Therefore the minimum criteria per MECP guidelines is satisfied.

2. Forebay Settling Length

Dist = (r x Q_p / V_s)$^{0.5}$

Dist = (2.45 * 0.28 / 0.0003)^0.5

Dist = 48.1

where:
Dist = forebay length (m)
r = length to width ratio
= 2.45
Q_p = peak flow rate from pond during design quality storm (m^3/s)
(total flow from SWM Pond at extended detention elevation)
= 0.283
V_s = settling velocity (m/s)*
= 0.0003

Minimum forebay length is (m) **48.1**
Actual forebay length is (m) **60.0**
CRITERIA SATISFIED

3. Forebay Dispersion Length

Dist = (8 x Q) / (d x V_f)

Dist = (8 * 4.996) / (1.5 * 0.5)

Dist = 53.3

where:
Dist = forebay length (m)
Q = inlet flow rate (m^3/s) (full flow capacity of a 1500mm dia. pipe)
= 4.996
d = depth of permanent pool in forebay (m)
= 1.5
V_f = desired velocity in forebay (m/s)*
0.5

Minimum forebay length is (m) **53.3**
Actual forebay length is (m) **60.0**
CRITERIA SATISFIED

4. Minimum Forebay Bottom Width

Width = Dist / 8

Width = 53.3 / 8

Width = 6.7

where:
Width = minimum forebay bottom width (m)
Dist = minimum forebay length (m)
= 53.3

Minimum bottom width is (m) **6.7**
Actual bottom width is (m) **10.0**
CRITERIA SATISFIED

5. Maximum Velocity Check

V = Q/A

V = 4.996 / 38

V = 0.10

where:
V = velocity (m/s)
Q = inlet flow rate (m^3/s) (full flow capacity of a 1500mm dia. pipe)
= 4.996
A = average cross-sectional area of entire forebay (m^2)
(see **Page 3**)
= 48.0

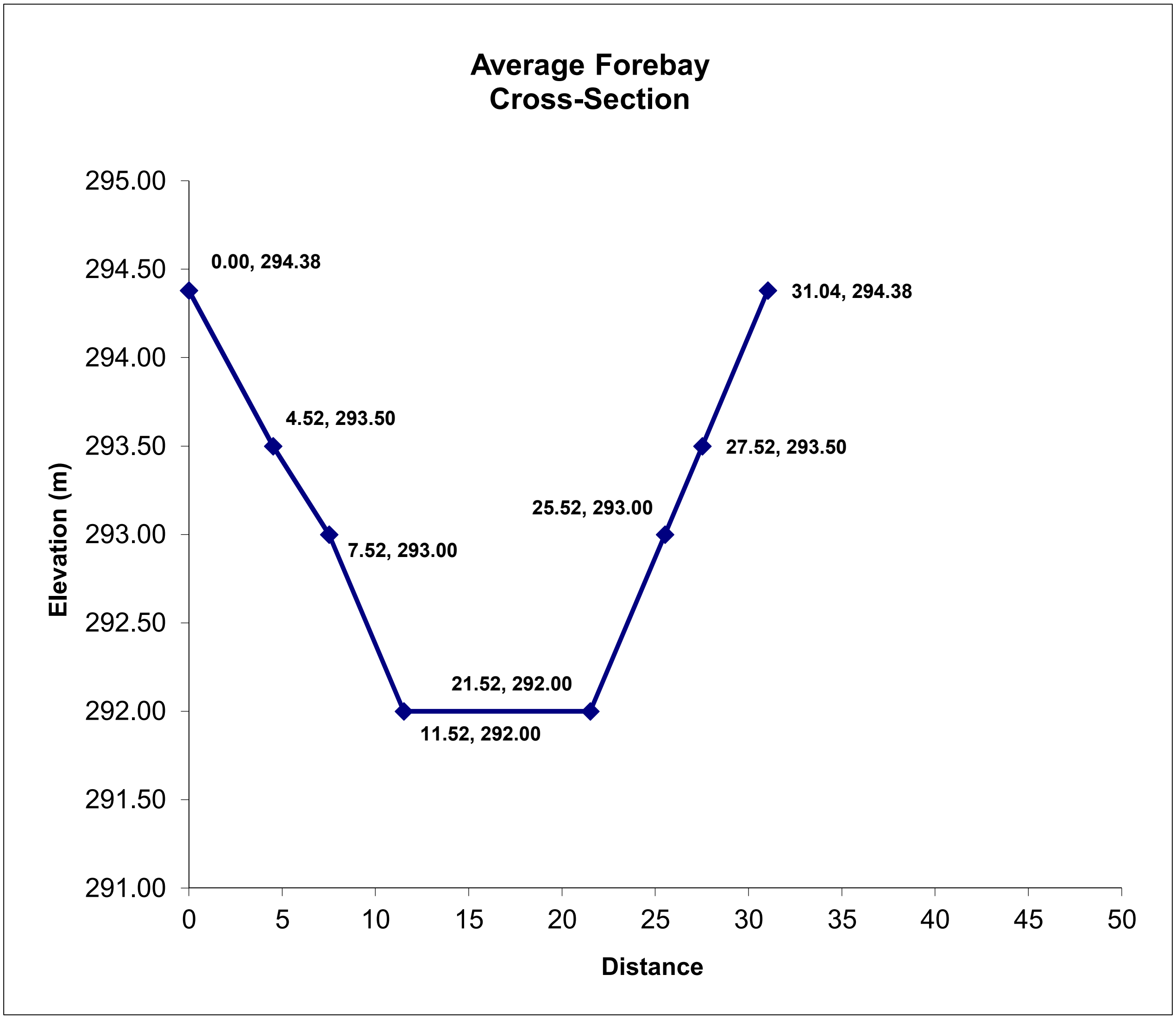
Maximum velocity permitted is (m/s) **0.15**
Actual velocity is (m/s) **0.10**
CRITERIA SATISFIED

*Value recommended by the MECP Stormwater Management Planning & Design Manual

FOREBAY SIZING CALCULATIONS

Distance (m)	Elevation (m)	Depth (m)	Incremental Area (m^2)
0.00	294.38	0.00	--
4.52	293.50	0.88	1.99
7.52	293.00	1.38	3.39
11.52	292.00	2.38	7.52
21.52	292.00	2.38	23.80
25.52	293.00	1.38	7.52
27.52	293.50	0.88	2.26
31.04	294.38	0.00	1.55

Area (m^2) = 48.03



CATCHMENT 204
REQUIRED QUALITY CONTROL VOLUME

Level of Protection = Enhanced (Level 1)

Weighted Impervious = 60 %

Drainage Area (Catchment 204 Only) = 5.63 ha

SWMP Type = 1. Infiltration

Required Infiltration/Filtration Volume = 31.7 m^3/ha

Required Infiltration/Filtration Volume = 178.3 m^3

TABLE 3.2 - WATER QUALITY STORAGE REQUIREMENTS
(FROM MOE SWM PLANNING AND DESIGN MANUAL - 2003)

Protection Level	SWMP Type	Storage Volume (m^3/ha) for Impervious Level			
		35%	55%	70%	85%
Enhanced (Level 1)	1. Infiltration	25	30	35	40
	2. Wetlands	80	105	120	140
	3. Hybrid Wet Pond/Wetland	110	150	175	195
	4. Wet Pond	140	190	225	250
Normal (Level 2)	1. Infiltration	20	20	25	30
	2. Wetlands	60	70	80	90
	3. Hybrid Wet Pond/Wetland	75	90	105	120
	4. Wet Pond	90	110	130	150
Basic (Level 3)	1. Infiltration	20	20	20	20
	2. Wetlands	60	60	60	60
	3. Hybrid Wet Pond/Wetland	60	70	75	80
	4. Wet Pond	60	75	85	95
	5. Dry Pond (Continuous Flow)	90	150	200	240

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Dry SWM Pond
Extended Detention Volume

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Weighted Impervious Calculation

Catchment ID	Total Area	Imperviousness	Impervious Area
	(ha)	(%)	(ha)
204	5.63	60	3.38
205	0.65	20	0.13
Total	**6.28**	**56**	**3.51**

Dry SWM Pond
Extended Detention Volume

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

EXTENDED DETENTION

Using the 40mm - 4 hour Chicago Storm

Erosion Control Volume (V) = Runoff Depth (mm) x Drainage Area (ha) x 10 (m^3) / (mm)(ha)

Erosion Control Volume (V) = 20.35 mm x 6.28 ha x 10 m^3 / mm·ha

Erosion Control Volume (V) = 1278 m^3

Using 40m^3/ha

Extended Detention Volume (V) = 40m^3/ha x Drainage Area (ha)

Extended Detention Volume (V) = 40 m^3/ha 6.28 ha

Extended Detention Volume (V) = 251.2 m^3

Governing Volume (V) = 1278 m^3

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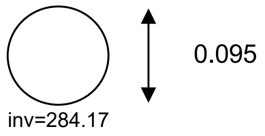
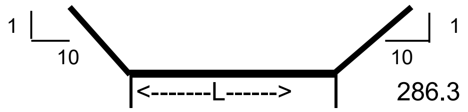
CONTROL STRUCTURE SUMMARY
DRY SWM POND 1

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

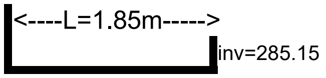
Orifice 1
Invert = 284.17 m
Size = 0.095 m
Orifice Coefficient, C = 0.62
Obvert = 284.265 m



Broad Crested Weir (Emergency Spillway)
Length = 15.0 m
Elevation = 286.30 m
Crest Breadth = 2 m
Side Slope = 10
(0 = vertical, 1 = 1H to 1V, 3 = 3H to 1 v)



Broad Crested Weir (Weir 1)
Length = 1.85 m
Elevation = 285.15 m
Crest Breadth = 0.2 m



OUTFLOW SUMMARY
DRY SWM POND 1

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Starting Water Level (m) = 284.17
Elevation Increment (m) = 0.02

▨ Shading represents Storage-Discharge pairings used in VO modelling

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Emergency Spillway Outflow (cms)	Weir 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	4 Hour Chicago Storm	12 Hour SCS Storm
284.17	0.000	0.000	0.000	284.17	0.000	0	0.0	Orifice 1	
284.19	0.000	0.000	0.000	284.19	0.000	0	0.0		
284.21	0.001	0.000	0.000	284.21	0.001	0	0.0		
284.23	0.002	0.000	0.000	284.23	0.002	0	0.0		
284.25	0.004	0.000	0.000	284.25	0.004	0	0.0		
284.27	0.004	0.000	0.000	284.27	0.004	0	0.0		
284.29	0.005	0.000	0.000	284.29	0.005	2	0.1		
284.31	0.006	0.000	0.000	284.31	0.006	4	0.2		
284.33	0.007	0.000	0.000	284.33	0.007	9	0.5		
284.35	0.007	0.000	0.000	284.35	0.007	17	0.8		
284.37	0.008	0.000	0.000	284.37	0.008	28	1.2		
284.39	0.008	0.000	0.000	284.39	0.008	42	1.7		
284.41	0.009	0.000	0.000	284.41	0.009	59	2.2		
284.43	0.009	0.000	0.000	284.43	0.009	78	2.9		
284.45	0.009	0.000	0.000	284.45	0.009	101	3.6		
284.47	0.010	0.000	0.000	284.47	0.010	128	4.3		
284.49	0.010	0.000	0.000	284.49	0.010	157	5.1		
284.51	0.011	0.000	0.000	284.51	0.011	189	6.0		
284.53	0.011	0.000	0.000	284.53	0.011	221	6.8		
284.55	0.011	0.000	0.000	284.55	0.011	254	7.7		
284.57	0.012	0.000	0.000	284.57	0.012	288	8.5		
284.59	0.012	0.000	0.000	284.59	0.012	321	9.3		
284.61	0.012	0.000	0.000	284.61	0.012	355	10.1		
284.63	0.013	0.000	0.000	284.63	0.013	389	10.8		
284.65	0.013	0.000	0.000	284.65	0.013	424	11.6		
284.67	0.013	0.000	0.000	284.67	0.013	459	12.3		
284.69	0.013	0.000	0.000	284.69	0.013	494	13.1		
284.71	0.014	0.000	0.000	284.71	0.014	529	13.8		
284.73	0.014	0.000	0.000	284.73	0.014	565	14.5		
284.75	0.014	0.000	0.000	284.75	0.014	601	15.2		
284.77	0.014	0.000	0.000	284.77	0.014	637	15.9		
284.79	0.015	0.000	0.000	284.79	0.015	674	16.6		
284.81	0.015	0.000	0.000	284.81	0.015	711	17.3		
284.83	0.015	0.000	0.000	284.83	0.015	748	18.0		
284.85	0.015	0.000	0.000	284.85	0.015	786	18.7		
284.87	0.016	0.000	0.000	284.87	0.016	823	19.4		
284.89	0.016	0.000	0.000	284.89	0.016	862	20.0	2 Year	
284.91	0.016	0.000	0.000	284.91	0.016	900	20.7		
284.93	0.016	0.000	0.000	284.93	0.016	939	21.3		
284.95	0.017	0.000	0.000	284.95	0.017	978	22.0		
284.97	0.017	0.000	0.000	284.97	0.017	1017	22.7		2 Year
284.99	0.017	0.000	0.000	284.99	0.017	1057	23.3		
285.01	0.017	0.000	0.000	285.01	0.017	1097	23.9		
285.03	0.018	0.000	0.000	285.03	0.018	1137	24.6		
285.05	0.018	0.000	0.000	285.05	0.018	1178	25.2		
285.07	0.018	0.000	0.000	285.07	0.018	1219	25.9		
285.09	0.018	0.000	0.000	285.09	0.018	1260	26.5	Extended Detention	
285.11	0.018	0.000	0.000	285.11	0.018	1301	27.1		
285.13	0.019	0.000	0.000	285.13	0.019	1343	27.8		
285.15	0.019	0.000	0.000	285.15	0.019	1385	28.4	5 Year	Weir 1
285.17	0.019	0.000	0.008	285.17	0.027	1428	28.9		
285.19	0.019	0.000	0.023	285.19	0.042	1470	29.2		5 Year
285.21	0.019	0.000	0.042	285.21	0.062	1513	29.5	10 Year	
285.23	0.020	0.000	0.065	285.23	0.084	1557	29.6		
285.25	0.020	0.000	0.091	285.25	0.110	1600	29.8		
285.27	0.020	0.000	0.119	285.27	0.139	1644	29.9	25 Year	10 Year
285.29	0.020	0.000	0.150	285.29	0.170	1688	29.9		
285.31	0.020	0.000	0.184	285.31	0.204	1733	30.0		
285.33	0.021	0.000	0.219	285.33	0.240	1778	30.1		
285.35	0.021	0.000	0.265	285.35	0.285	1823	30.1		25 Year
285.37	0.021	0.000	0.305	285.37	0.326	1868	30.1		
285.39	0.021	0.000	0.348	285.39	0.369	1914	30.2		
285.41	0.021	0.000	0.392	285.41	0.414	1960	30.2	100 Year	
285.43	0.021	0.000	0.439	285.43	0.460	2006	30.2		
285.45	0.022	0.000	0.526	285.45	0.548	2053	30.3		
285.47	0.022	0.000	0.579	285.47	0.601	2100	30.3		
285.49	0.022	0.000	0.635	285.49	0.656	2147	30.3		
285.51	0.022	0.000	0.691	285.51	0.713	2195	30.3		100 Year
285.53	0.022	0.000	0.750	285.53	0.772	2242	30.3		

OUTFLOW SUMMARY
DRY SWM POND 1

Starting Water Level (m) = 284.17
Elevation Increment (m) = 0.02

▨ Shading represents Storage-Discharge pairings used in VO modelling

Upstream Elevation (m)	Orifice 1 Outflow (cms)	Emergency Spillway Outflow (cms)	Weir 1 Outflow (cms)	Stage (m)	Total Flow (cms)	Storage (m^3)	Detention Time (hrs)	4 Hour Chicago Storm	12 Hour SCS Storm
285.55	0.022	0.000	0.842	285.55	0.865	2291	30.4		
285.57	0.023	0.000	0.906	285.57	0.929	2339	30.4		
285.59	0.023	0.000	0.972	285.59	0.995	2388	30.4		
285.61	0.023	0.000	1.039	285.61	1.062	2437	30.4		
285.63	0.023	0.000	1.107	285.63	1.131	2486	30.4		
285.65	0.023	0.000	1.190	285.65	1.214	2536	30.4		
285.67	0.023	0.000	1.263	285.67	1.286	2586	30.4		
285.69	0.024	0.000	1.336	285.69	1.360	2636	30.5		
285.71	0.024	0.000	1.411	285.71	1.435	2687	30.5		
285.73	0.024	0.000	1.487	285.73	1.511	2738	30.5		
285.75	0.024	0.000	1.573	285.75	1.598	2789	30.5		
285.77	0.024	0.000	1.653	285.77	1.677	2840	30.5		
285.79	0.024	0.000	1.733	285.79	1.758	2892	30.5		
285.81	0.025	0.000	1.815	285.81	1.840	2944	30.5		
285.83	0.025	0.000	1.898	285.83	1.923	2997	30.5		
285.85	0.025	0.000	1.983	285.85	2.008	3049	30.5		
285.87	0.025	0.000	2.068	285.87	2.093	3102	30.5		
285.89	0.025	0.000	2.155	285.89	2.180	3155	30.5		
285.91	0.025	0.000	2.243	285.91	2.268	3209	30.5		
285.93	0.025	0.000	2.332	285.93	2.358	3263	30.5		
285.95	0.026	0.000	2.422	285.95	2.448	3317	30.6		
285.97	0.026	0.000	2.514	285.97	2.540	3372	30.6		
285.99	0.026	0.000	2.606	285.99	2.632	3427	30.6		
286.01	0.026	0.000	2.700	286.01	2.726	3482	30.6		
286.03	0.026	0.000	2.795	286.03	2.821	3537	30.6		
286.05	0.026	0.000	2.891	286.05	2.917	3593	30.6		
286.07	0.026	0.000	2.987	286.07	3.014	3649	30.6		
286.09	0.027	0.000	3.085	286.09	3.112	3705	30.6		
286.11	0.027	0.000	3.184	286.11	3.211	3762	30.6		
286.13	0.027	0.000	3.284	286.13	3.311	3819	30.6		
286.15	0.027	0.000	3.386	286.15	3.413	3876	30.6		
286.17	0.027	0.000	3.488	286.17	3.515	3933	30.6		
286.19	0.027	0.000	3.591	286.19	3.618	3991	30.6		
286.21	0.027	0.000	3.695	286.21	3.722	4049	30.6		
286.23	0.028	0.000	3.800	286.23	3.827	4108	30.6		
286.25	0.028	0.000	3.906	286.25	3.934	4167	30.6		
286.27	0.028	0.000	4.013	286.27	4.041	4226	30.6		
286.29	0.028	0.000	4.121	286.29	4.149	4285	30.6		
286.31	0.028	0.021	4.230	286.31	4.279	4345	30.6	Emergency Spillway Invert (286.30)	
286.33	0.028	0.110	4.340	286.33	4.478	4405	30.6		
286.35	0.028	0.239	4.450	286.35	4.718	4466	30.7		
286.37	0.029	0.401	4.562	286.37	4.992	4526	30.7		
286.39	0.029	0.592	4.675	286.39	5.296	4588	30.7		
286.41	0.029	0.811	4.788	286.41	5.628	4649	30.7		
286.43	0.029	1.054	4.903	286.43	5.986	4711	30.7		
286.45	0.029	1.323	5.018	286.45	6.370	4773	30.7		
286.47	0.029	1.615	5.134	286.47	6.779	4836	30.7	100 Year Uncontrolled (286.47)	
286.49	0.029	1.932	5.251	286.49	7.212	4899	30.7		
286.51	0.029	2.452	5.369	286.51	7.851	4962	30.7		
286.53	0.030	2.843	5.488	286.53	8.361	5026	30.7		
286.55	0.030	3.259	5.608	286.55	8.897	5090	30.7		
286.57	0.030	3.700	5.729	286.57	9.459	5154	30.7		
286.59	0.030	4.165	5.850	286.59	10.045	5219	30.7		
286.61	0.030	4.624	5.972	286.61	10.626	5284	30.7		
286.63	0.030	5.134	6.096	286.63	11.260	5349	30.7		
286.65	0.030	5.669	6.220	286.65	11.919	5415	30.7		
286.67	0.030	6.229	6.344	286.67	12.604	5481	30.7		
286.69	0.031	6.813	6.470	286.69	13.313	5547	30.7		
286.71	0.031	7.321	6.596	286.71	13.948	5614	30.7		
286.73	0.031	7.945	6.724	286.73	14.700	5681	30.7		
286.75	0.031	8.594	6.852	286.75	15.477	5749	30.7		

5-Year Storm Design
7370 Centre Road, Uxbridge
Phase 1 & 2
Uxbridge

Project: 7370 Centre Road, Uxbridge
Project No. 2099
Date: 12-Dec-22
Designed By: G.M.
Reviewed By: N.D.M.

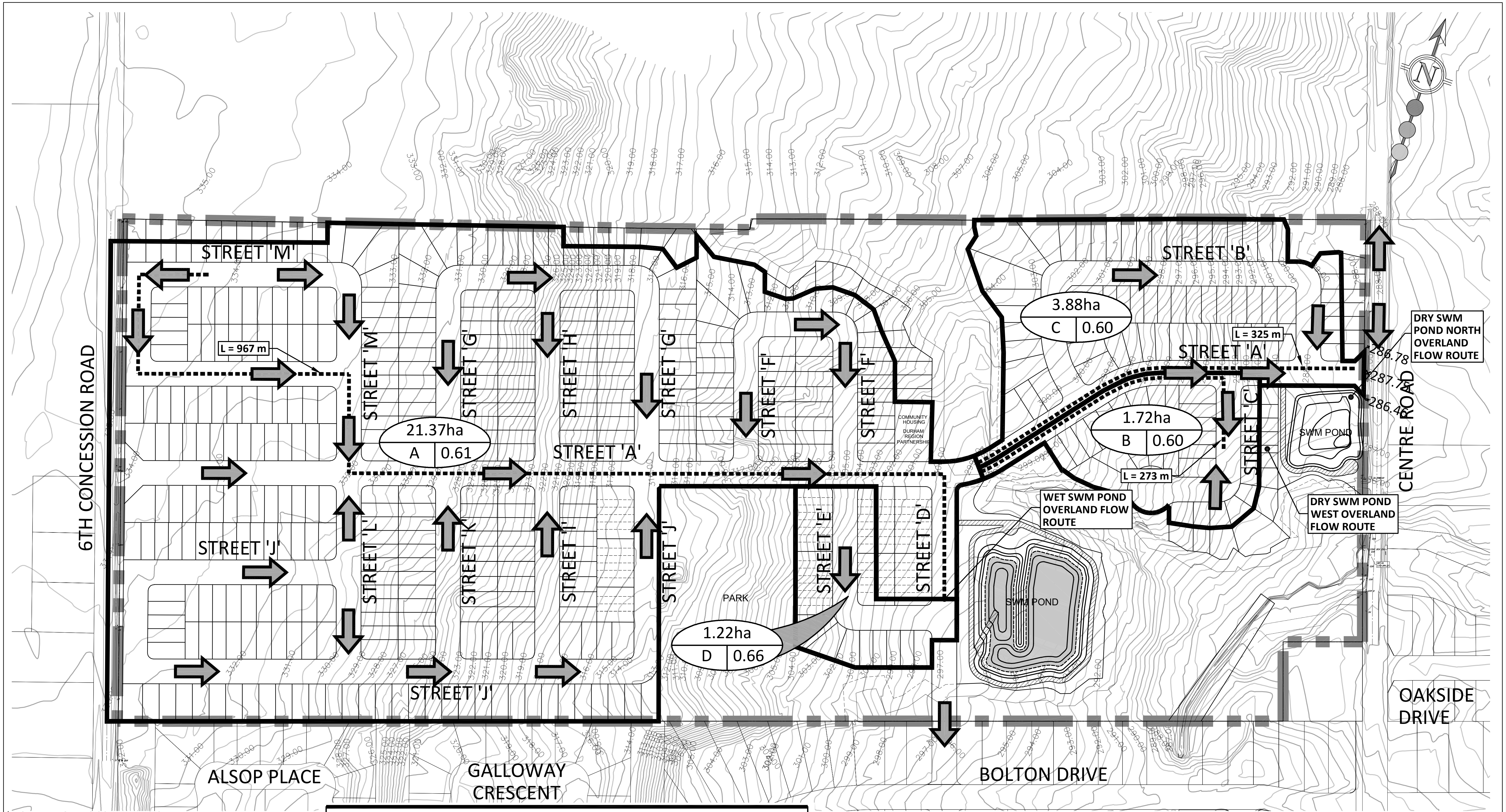
Rainfall Intensity (i) = $\frac{A}{(T_c+B)^c}$

A= 904
B= 5
c= 0.788

Starting T_c (min)= 10

P:\2099 7370 Centre Road Uxbridge\Design\Pipe Design\Storm\[2099 - Storm Design Sheet.xlsm]Design

LOCATION			5 YEAR						EXTERNAL FLOWS				TOTAL FLOW	PIPE DATA						
STREET	MAINTENANCE HOLE FROM	MAINTENANCE HOLE TO	5-YEAR AREA (ha)	RUNOFF COEFF. (R)	"AR"	ACCUM. "AR"	RAINFALL INTENSITY (mm/hr)	ACCUM. FLOW (m3/s)	AREA (ha)	FLOW RATE (l/s/ha)	EXT. FLOW (m3/s)	ACCUM. EXT. FLOW (m3/s)	TOTAL (Qdes) (m3/s)	LENGTH (m)	SLOPE (%)	PIPE DIAMETER (mm)	FULL FLOW CAPACITY (m3/s)	FULL FLOW VELOCITY (m/s)	TIME OF CONC. (min)	ACCUM. TIME OF CONC. (min)
To Wet SWM Pond	1	2	25.20	0.60	15.12	15.12	77.56	3.258	0.000	0.000	0.000	0.000	3.258	908.0	0.50	1500	4.996	2.829	5.35	22.92
To Dry SWM Pond	3	4	5.63	0.60	3.38	3.38	94.41	0.886	0.000	0.000	0.000	0.000	0.886	310.0	0.50	825	1.014	1.899	2.72	15.30



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

LEGEND:

LIMIT OF PROPERTY

318.00 EXISTING CONTOUR AND ELEVATION

PROPOSED OVERLAND FLOW DRAINAGE BOUNDARY

OVERLAND FLOW DIRECTION

21.37ha — DRAINAGE AREA (HECTARES)

A — CATCHMENT ID

0.61 — RUNOFF COEFFICIENT

FSSR

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

7370 CENTRE ROAD UXBRIDGE

PROPOSED OVERLAND FLOW PLAN

DESIGNED BY:	G.M.	CHECKED BY:	N.D.M.
SCALE:	1:3000	DATE:	DECEMBER 2022

PROJECT No: 2099

FIGURE No: D.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-STRM-ROWC-D.1.dwg – Revised by <GMURRIA> : Wed, Dec 14 2022 – 4:47pm

Right-Of-Way Capacity Calculations
- Catchment A

Township of Uxbridge 5 Year (Rational Method)	
Area (ha) =	21.37
5 Year Runoff Coeff. =	0.61
T_c (min) =	18.06
a=	**904**
b=	**5**
c=	**0.788**
Intensity (mm/hr) =	76.25
Runoff (m^3/s)=	**2.744**

(Assumes initial Tc of 10 minutes and 967m flowing at 2 m/s)

Catchment A			
Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
Single Detached Lots	20.49	0.60	0.58
Townhouse Lots	0.74	0.75	0.03
Community Housing	0.14	0.75	0.00
	21.37		0.61

(Refer to **Figure D.1**)

Township of Uxbridge 100 Year (Rational Method)	
Area (ha) =	21.37
100 Year Return Period Factor =	1.25
100 Year Runoff Coeff. =	0.76
T_c (min) =	18.06
a=	**1799**
b=	**5**
c=	**0.810**
Intensity (mm/hr) =	141.63
Runoff (m^3/s)=	**6.370**

Major System Peak Flow (Catchment A):

Q_{100yr} - Q_{5yr} = 3.626 m^3/s

Major system capacity in 20.0 m R.O.W. at 0.5% road slope with 4.0% boulevards = 4.790 m^3/s.
Therefore, the major system flows will be conveyed within the 20.0 m R.O.W.

Wet Pond Overland Flow Route Calculations - Catchment A+D

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Township of Uxbridge 5 Year
(Rational Method)

Area (ha) = 22.59
5 Year Runoff Coeff. = 0.61
T_c (min) = 18.06 (Assumes initial Tc of 10 minutes and 967m flowing at 2 m/s)

a= 904
b= 5
c= 0.788

Intensity (mm/hr) = 76.25
Runoff (m^3/s)= **2.914**

Township of Uxbridge 100 Year
(Rational Method)

Area (ha) = 22.59
100 Year Return Period Factor = 1.25
100 Year Runoff Coeff. = 0.76
T_c (min) = 18.06

a= 1799
b= 5
c= 0.810

Intensity (mm/hr) = 141.63
Runoff (m^3/s)= **6.766**

Catchment D

Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
Single Detached Lots	0.74	0.60	0.36
Townhouse Lots	0.48	0.75	0.30
	1.22		0.66

Catchment A + Catchment D

Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
Catchment A	21.37	0.61	0.57
Catchment B	1.22	0.66	0.04
	22.59		0.61

(Refer to **Figure D.1**)

Wet Pond Overland Flow Route Peak Flow:

$Q_{100yr} - Q_{5yr} =$ **3.851** m^3/s

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Right-Of-Way Capacity and Dry Pond West Overland Flow Route Calculations - Catchment B

Township of Uxbridge 5 Year (Rational Method)	
Area (ha) =	1.72
5 Year Runoff Coeff. =	0.60
T_c (min) =	12.28
a=	**904**
b=	**5**
c=	**0.788**
Intensity (mm/hr) =	95.74
Runoff (m^3/s)=	**0.274**

(Assumes initial Tc of 10 minutes and 273m flowing at 2 m/s)

Catchment B			
Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
Single Detached Lots	1.72	0.60	0.60
	1.72		0.60

(Refer to **Figure D.1**)

Township of Uxbridge 100 Year (Rational Method)	
Area (ha) =	1.72
100 Year Return Period Factor =	1.25
100 Year Runoff Coeff. =	0.75
T_c (min) =	12.28
a=	**1799**
b=	**5**
c=	**0.810**
Intensity (mm/hr) =	178.95
Runoff (m^3/s)=	**0.641**

Major System Peak Flow (Catchment B):

$Q_{100yr} - Q_{5yr} =$ **0.367 m^3/s**

Major system capacity in 20.0 m R.O.W. at 0.5% road slope = 2.013 m^3/s.
Therefore, the major system flows will be conveyed within the 20.0 m R.O.W.
The west overland flow route into Dry SWM Pond 1 will convey the major system peak flow of 0.367 m^3/s.

Right-Of-Way Capacity and Dry Pond North Overland Flow Route Calculations - Catchment C

Township of Uxbridge 5 Year (Rational Method)	
Area (ha) =	3.88
5 Year Runoff Coeff. =	0.60
T_c (min) =	12.71
a=	**904**
b=	**5**
c=	**0.788**
Intensity (mm/hr) =	93.89
Runoff (m^3/s)=	**0.607**

(Assumes initial Tc of 10 minutes and 325m flowing at 2 m/s)

Catchment C			
Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
Single Detached Lots	3.88	0.60	0.60
	3.88		0.60

(Refer to **Figure D.1**)

Township of Uxbridge 100 Year (Rational Method)	
Area (ha) =	3.88
100 Year Return Period Factor =	1.25
100 Year Runoff Coeff. =	0.75
T_c (min) =	12.71
a=	**1799**
b=	**5**
c=	**0.810**
Intensity (mm/hr) =	175.39
Runoff (m^3/s)=	**1.418**

Major System Peak Flow (Catchment C):

$Q_{100yr} - Q_{5yr}$ = 0.811 m^3/s

Major system capacity in 20.0 m R.O.W. at 0.5% road slope = 2.013 m^3/s.
Therefore, the major system flows will be conveyed within the 20.0 m R.O.W.
The north overland flow route into Dry SWM Pond 1 will convey the major system peak flow of 0.811 m^3/s.

20.0m R.O.W. 4% Boulevard @ 0.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50 %
Discharge	3.626 m³/s

Section Definitions

Station (m)	Elevation (m)
0+00.00	0.268
0+05.55	0.046
0+05.85	0.046
0+05.90	-0.104
0+06.05	-0.079
0+10.00	0.000
0+13.95	-0.079
0+14.25	-0.104
0+14.30	0.046
0+14.45	0.046
0+17.59	0.172
0+19.09	0.232
0+20.00	0.268

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.268)	(0+05.55, 0.046)	0.025
(0+05.55, 0.046)	(0+14.45, 0.046)	0.013
(0+14.45, 0.046)	(0+17.59, 0.172)	0.025
(0+17.59, 0.172)	(0+19.09, 0.232)	0.013
(0+19.09, 0.232)	(0+20.00, 0.268)	0.025

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.329 m
Roughness Coefficient	0.019
Elevation	0.225 m
Elevation Range	-0.104 to 0.268 m

20.0m R.O.W. 4% Boulevard @ 0.5%

Results

Flow Area	3.13 m²
Wetted Perimeter	18.056 m
Hydraulic Radius	0.174 m
Top Width	17.83 m
Normal Depth	0.329 m
Critical Depth	0.311 m
Critical Slope	0.65 %
Velocity	1.16 m/s
Velocity Head	0.068 m
Specific Energy	0.40 m
Froude Number	0.881
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.000 m
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.329 m
Critical Depth	0.311 m
Channel Slope	0.50 %
Critical Slope	0.65 %

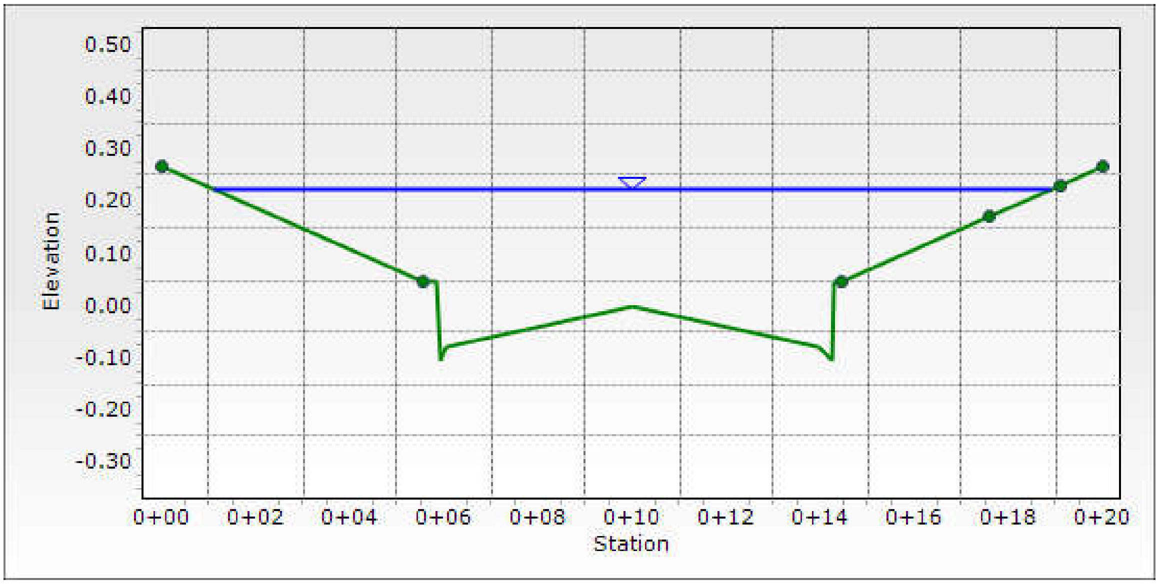
20.0m R.O.W. 4% Boulevard @ 0.5%

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.50 %
Normal Depth	0.329 m
Discharge	3.626 m³/s



20.0m R.O.W. 2% Boulevard @ 0.5% (Max Depth)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50 %
Normal Depth	0.261 m

Section Definitions

Station (m)	Elevation (m)
0+00.00	0.157
0+05.55	0.046
0+05.85	0.046
0+05.90	-0.104
0+06.05	-0.079
0+10.00	0.000
0+13.95	-0.079
0+14.25	-0.104
0+14.30	0.046
0+14.45	0.046
0+17.59	0.109
0+19.09	0.139
0+20.00	0.157

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.157)	(0+05.55, 0.046)	0.025
(0+05.55, 0.046)	(0+14.45, 0.046)	0.013
(0+14.45, 0.046)	(0+17.59, 0.109)	0.025
(0+17.59, 0.109)	(0+19.09, 0.139)	0.013
(0+19.09, 0.139)	(0+20.00, 0.157)	0.025

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Discharge	2.013 m³/s
Roughness Coefficient	0.020
Elevation Range	-0.104 to 0.157 m
Flow Area	2.35 m²

20.0m R.O.W. 2% Boulevard @ 0.5% (Max Depth)

Results

Wetted Perimeter	20.223 m
Hydraulic Radius	0.116 m
Top Width	20.00 m
Normal Depth	0.261 m
Critical Depth	0.240 m
Critical Slope	0.80 %
Velocity	0.86 m/s
Velocity Head	0.037 m
Specific Energy	0.30 m
Froude Number	0.799
Flow Type	Subcritical

GVF Input Data

Downstream Depth	0.000 m
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.261 m
Critical Depth	0.240 m
Channel Slope	0.50 %
Critical Slope	0.80 %

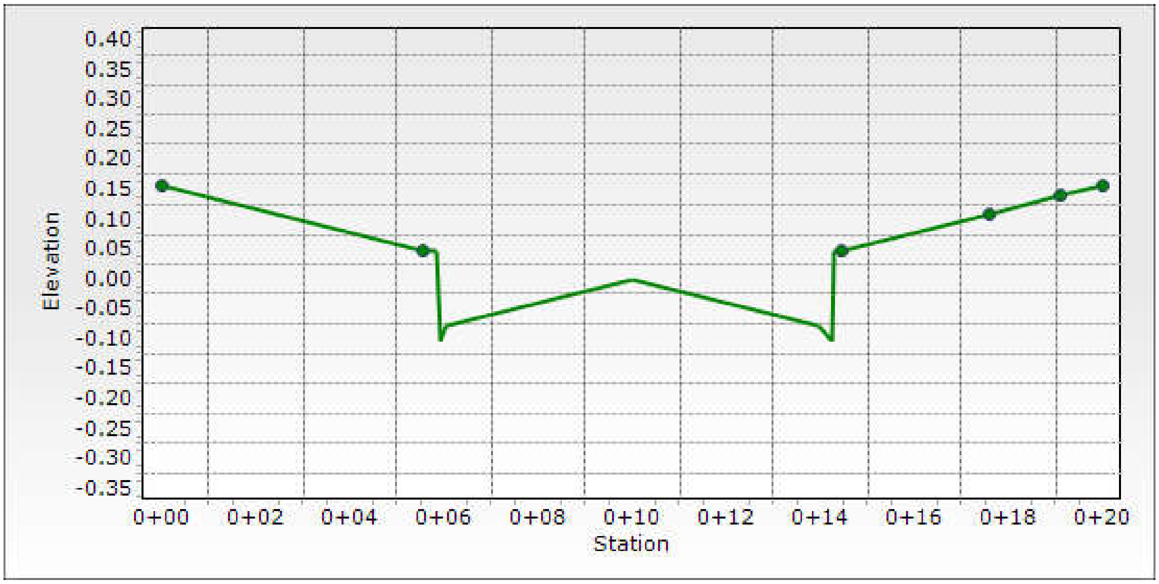
20.0m R.O.W. 2% Boulevard @ 0.5% (Max Depth)

Project Description

Friction Method	Manning Formula
Solve For	Discharge

Input Data

Channel Slope	0.50 %
Normal Depth	0.261 m
Discharge	2.013 m³/s



20.0m R.O.W. 2% Boulevard @ 5.2% (Max Velocity)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.20 %
Discharge	3.626 m³/s

Normal depth * Velocity = 0.207m * 2.57m/s = 0.53m^2/s < 0.65 m^2/s (Uxbridge criteria)

Section Definitions

Station (m)	Elevation (m)
0+00.00	0.157
0+05.55	0.046
0+05.85	0.046
0+05.90	-0.104
0+06.05	-0.079
0+10.00	0.000
0+13.95	-0.079
0+14.25	-0.104
0+14.30	0.046
0+14.45	0.046
0+17.59	0.109
0+19.09	0.139
0+20.00	0.157

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 0.157)	(0+05.55, 0.046)	0.025
(0+05.55, 0.046)	(0+14.45, 0.046)	0.013
(0+14.45, 0.046)	(0+17.59, 0.109)	0.025
(0+17.59, 0.109)	(0+19.09, 0.139)	0.013
(0+19.09, 0.139)	(0+20.00, 0.157)	0.025

Options

Current Roughness Weighted Method	Pavlovskii's Method
Open Channel Weighting Method	Pavlovskii's Method
Closed Channel Weighting Method	Pavlovskii's Method

Results

Normal Depth	0.207 m
Roughness Coefficient	0.019
Elevation	0.103 m
Elevation Range	-0.104 to 0.157 m

20.0m R.O.W. 2% Boulevard @ 5.2% (Max Velocity)

Results

Flow Area	1.41 m²
Wetted Perimeter	14.798 m
Hydraulic Radius	0.095 m
Top Width	14.58 m
Normal Depth	0.207 m
Critical Depth	0.293 m
Critical Slope	0.65 %
Velocity	2.57 m/s
Velocity Head	0.336 m
Specific Energy	0.54 m
Froude Number	2.634
Flow Type	Supercritical

GVF Input Data

Downstream Depth	0.000 m
Length	0.000 m
Number Of Steps	0

GVF Output Data

Upstream Depth	0.000 m
Profile Description	
Profile Headloss	0.00 ft
Downstream Velocity	Infinity m/s
Upstream Velocity	Infinity m/s
Normal Depth	0.207 m
Critical Depth	0.293 m
Channel Slope	5.20 %
Critical Slope	0.65 %

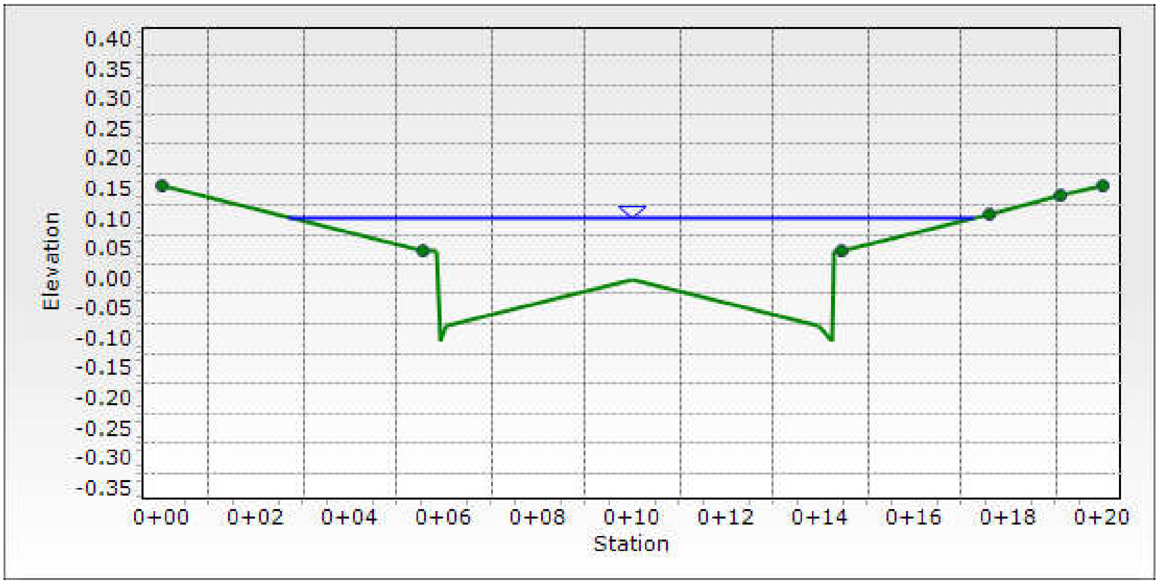
20.0m R.O.W. 2% Boulevard @ 5.2% (Max Velocity)

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	5.20 %
Normal Depth	0.207 m
Discharge	3.626 m³/s



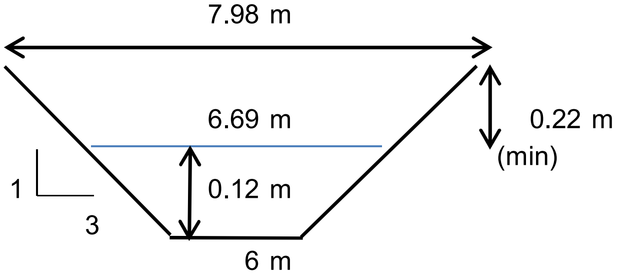
7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

West Overland Flow Route
Sizing Calculations
WET SWM POND 1

Required Capacity = 3.851 m^3/s per calculations in this Appendix

Mannings' Equation for a Trapezoidal Channel

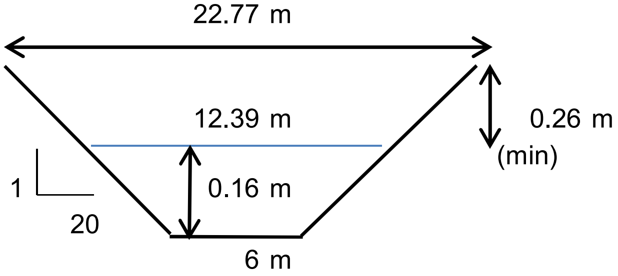
Grassed Swale in Pond Block



Area =	0.732 m^2
Wetted Perimeter =	6.729 m
Channel Capacity =	**3.852 m^3/s**
Velocity =	5.26 m/s
Velocity X Depth =	0.61 m^2/s

Slope = 33.33 %
Manning's n = 0.025

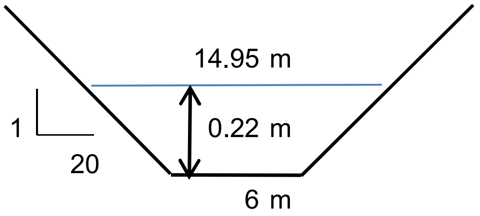
Access Road



Area =	1.468 m^2
Wetted Perimeter =	12.395 m
Channel Capacity =	**3.851 m^3/s**
Velocity =	2.62 m/s
Velocity X Depth =	0.42 m^2/s

Slope = 2 %
Manning's n = 0.013

Boulevard

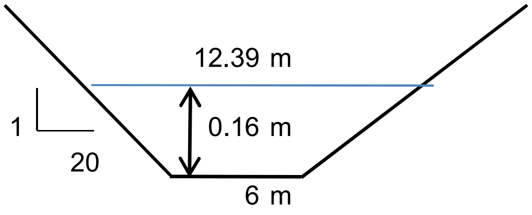


Area =	2.343 m^2
Wetted Perimeter =	14.959 m
Channel Capacity =	**3.851 m^3/s**
Velocity =	1.64 m/s
Velocity X Depth =	0.37 m^2/s

Slope = 2 %
Manning's n = 0.025

West Overland Flow Route
Sizing Calculations
WET SWM POND 1

Sidewalk Spillway



Area =	1.468	m^2
Wetted Perimeter =	12.395	m
Channel Capacity =	**3.851**	**m^3/s**
Velocity =	2.62	m/s
Velocity X Depth =	0.42	m^2/s

Slope = 2 %
Manning's n = 0.013

Note: Velocity of flows in the overland flow route into the pond is greater than the maximum allowable flow over grass (1.5 m/s). Therefore, NAG Ero-Net P300 turf reinforcement matting is required.

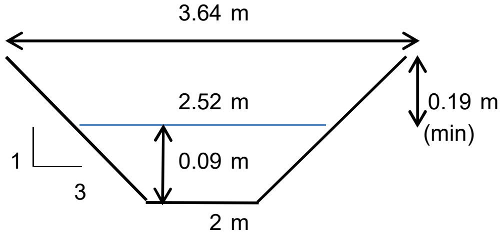
North Overland Flow Route
Sizing Calculations
DRY SWM POND 1

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: C.M.D.

Required Capacity = 0.811 m^3/s per calculations in this Appendix

Mannings' Equation for a Trapezoidal Channel

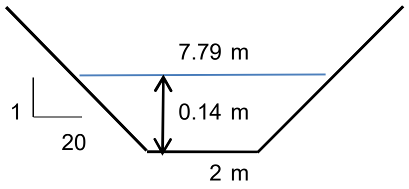
Grassed Swale



Area =	0.195 m^2
Wetted Perimeter =	2.546 m
Channel Capacity =	**0.811 m^3/s**
Velocity =	4.16 m/s
Velocity X Depth =	0.36 m^2/s

Slope = 33.33 %
Manning's n = 0.025

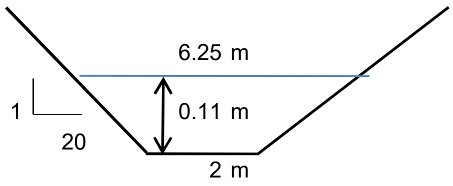
Boulevard



Area =	0.709 m^2
Wetted Perimeter =	7.800 m
Channel Capacity =	**0.811 m^3/s**
Velocity =	1.14 m/s
Velocity X Depth =	0.17 m^2/s

Slope = 2 %
Manning's n = 0.025

Sidewalk Spillway



Area =	0.438 m^2
Wetted Perimeter =	6.255 m
Channel Capacity =	**0.810 m^3/s**
Velocity =	1.85 m/s
Velocity X Depth =	0.20 m^2/s

Slope = 2 %
Manning's n = 0.013

Note: Velocity of flows in the overland flow route into the East Pond is greater than the maximum allowable flow over grass (1.5 m/s). Therefore, NAG Ero-Net P300 turf reinforcement matting is required.

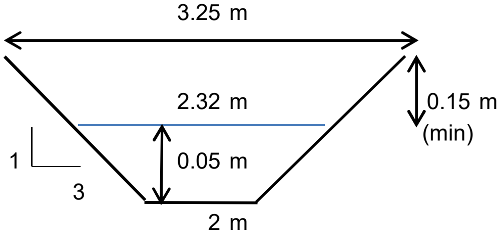
West Overland Flow Route
Sizing Calculations
DRY SWM POND 1

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Required Capacity = 0.367 m^3/s per calculations in this Appendix

Mannings' Equation for a Trapezoidal Channel

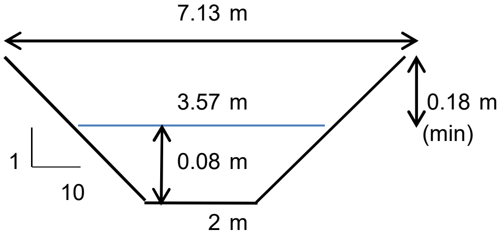
Grassed Swale in Pond Block



Area =	0.117 m^2
Wetted Perimeter =	2.343 m
Channel Capacity =	**0.367 m^3/s**
Velocity =	3.13 m/s
Velocity X Depth =	0.17 m^2/s

Slope = 33.33 %
Manning's n = 0.025

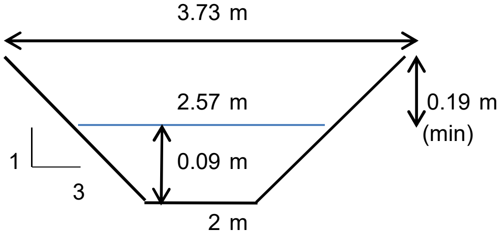
Access Road



Area =	0.218 m^2
Wetted Perimeter =	3.573 m
Channel Capacity =	**0.367 m^3/s**
Velocity =	1.68 m/s
Velocity X Depth =	0.13 m^2/s

Slope = 2 %
Manning's n = 0.013

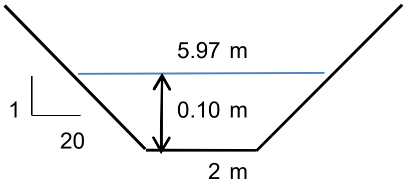
Grassed Swale in Servicing Block



Area =	0.216 m^2
Wetted Perimeter =	2.597 m
Channel Capacity =	**0.367 m^3/s**
Velocity =	1.70 m/s
Velocity X Depth =	0.16 m^2/s

Slope = 5 %
Manning's n = 0.025

Boulevard



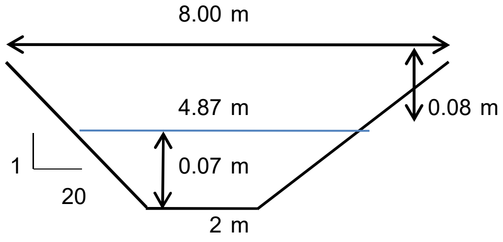
Area =	0.396 m^2
Wetted Perimeter =	5.980 m
Channel Capacity =	**0.367 m^3/s**
Velocity =	0.93 m/s
Velocity X Depth =	0.09 m^2/s

Slope = 2 %
Manning's n = 0.025

West Overland Flow Route
Sizing Calculations
DRY SWM POND 1

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

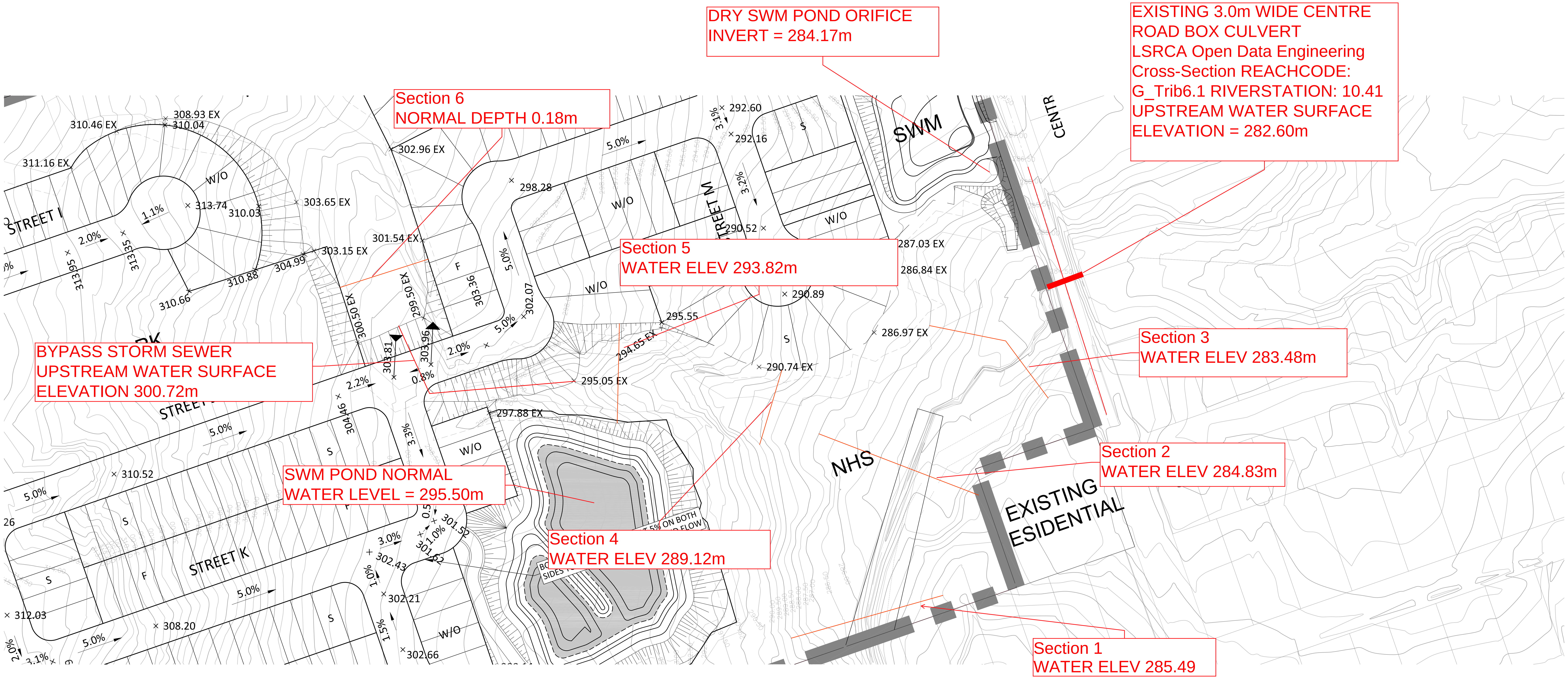
Sidewalk Spillway



Area =	0.247 m^2
Wetted Perimeter =	4.875 m
Channel Capacity =	**0.367 m^3/s**
Velocity =	1.49 m/s
Velocity X Depth =	0.11 m^2/s

Slope = 2 %
Manning's n = 0.013

Note: Velocity of flows in the overland flow route into the East Pond is greater than the maximum allowable flow over grass (1.5 m/s). Therefore, NAG Ero-Net P300 turf reinforcement matting is required.



DRY SWM POND ORIFICE
INVERT = 284.17m

EXISTING 3.0m WIDE CENTRE
ROAD BOX CULVERT
LSRCA Open Data Engineering
Cross-Section REACHCODE:
G_Trib6.1 RIVERSTATION: 10.41
UPSTREAM WATER SURFACE
ELEVATION = 282.60m

Section 6
NORMAL DEPTH 0.18m

Section 5
WATER ELEV 293.82m

Section 3
WATER ELEV 283.48m

BYPASS STORM SEWER
UPSTREAM WATER SURFACE
ELEVATION 300.72m

Section 2
WATER ELEV 284.83m

SWM POND NORMAL
WATER LEVEL = 295.50m

Section 4
WATER ELEV 289.12m

Section 1
WATER ELEV 285.49

Centre Road Tributary Conveyance Cross-Sections

1:1000

September, 2022

2099 - Uxbridge Tributary Section 1

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	1.28	%
Discharge	4.85	m³/s
Section Definitions		

From LSRCA Open Data portal "Cross Sections - Engineering" REACHCODE: G_Trib6.1 RIVERSTATION: 10.41 100 year peak flow. Made available under Lake Simcoe Region Conservation Authority Open Data Licence v1.0

Station (m)	Elevation (m)
0+00.00	289.00
0+11.12	287.50
0+33.64	286.03
0+39.87	284.47
0+47.67	286.00
0+68.75	287.50
0+80.50	288.48

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 289.00)	(0+80.50, 288.48)	0.070

Results

Normal Depth	1.02	m
Elevation Range	284.47 to 289.00 m	
Flow Area	4.76	m²
Wetted Perimeter	9.53	m
Top Width	9.31	m
Normal Depth	1.02	m
Critical Depth	0.75	m
Critical Slope	0.06890	m/m
Velocity	1.02	m/s
Velocity Head	0.05	m
Specific Energy	1.08	m

2099 - Uxbridge Tributary Section 1

Results

Froude Number		0.45	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.02	m
Critical Depth	0.75	m
Channel Slope	0.01280	m/m
Critical Slope	0.06890	m/m

2099 - Uxbridge Tributary Section 2

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	0.76	%
Discharge	4.85	m³/s
Section Definitions		

From LSRCA Open Data portal "Cross Sections - Engineering" REACHCODE: G_Trib6.1 RIVERSTATION: 10.41 100 year peak flow. Made available under Lake Simcoe Region Conservation Authority Open Data Licence v1.0

Station (m)	Elevation (m)
0+00.00	287.01
0+48.52	284.26
0+50.99	283.46
0+54.51	284.47
0+77.51	284.99
0+81.74	285.99
0+87.36	286.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 287.01)	(0+87.36, 286.50)	0.070

Results

Normal Depth	1.27	m
Elevation Range	283.46 to 287.01 m	
Flow Area	8.35	m²
Wetted Perimeter	26.22	m
Top Width	25.94	m
Normal Depth	1.27	m
Critical Depth	0.87	m
Critical Slope	0.07000	m/m
Velocity	0.58	m/s
Velocity Head	0.02	m
Specific Energy	1.29	m

2099 - Uxbridge Tributary Section 2

Results

Froude Number		0.33	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	1.27	m
Critical Depth	0.87	m
Channel Slope	0.00760	m/m
Critical Slope	0.07000	m/m

2099 - Uxbridge Tributary Section 3

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.41	%
Discharge	4.85	m³/s
Section Definitions		

From LSRCA Open Data portal "Cross Sections - Engineering" REACHCODE: G_Trib6.1 RIVERSTATION: 10.41 100 year peak flow. Made available under Lake Simcoe Region Conservation Authority Open Data Licence v1.0

Station (m)	Elevation (m)
0+00.00	285.99
0+27.49	283.57
0+39.65	283.24
0+49.80	283.22
0+50.66	282.83
0+51.95	283.21
0+57.22	283.50
0+75.97	286.00

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 285.99)	(0+75.97, 286.00)	0.070

Results

Normal Depth	0.65	m
Elevation Range	282.83 to 286.00 m	
Flow Area	5.34	m²
Wetted Perimeter	26.39	m
Top Width	26.24	m
Normal Depth	0.65	m
Critical Depth	0.59	m
Critical Slope	0.08809	m/m
Velocity	0.91	m/s
Velocity Head	0.04	m

2099 - Uxbridge Tributary Section 3

Results

Specific Energy		0.70	m
Froude Number		0.64	
Flow Type	Subcritical		

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.65	m
Critical Depth	0.59	m
Channel Slope	0.03410	m/m
Critical Slope	0.08809	m/m

Culvert Calculator Report
2099 - 3.05m x 1.8m Centre Road Box Culvert

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	284.240	m	Headwater Depth/Height	0.61	
Computed Headwater Eleva	282.599	m	Discharge	4.85	m3/s
Inlet Control HW Elev.	282.532	m	Tailwater Elevation	0.000	m
Outlet Control HW Elev.	282.599	m	Control Type	Outlet Control	

From LSRCA Open Data portal "Cross Sections - Engineering" REACHCODE: G_Trib6.1 RIVERSTATION: 10.41 100 year peak flow. Made available under Lake Simcoe Region Conservation Authority Open Data Licence v1.0

Grades

Upstream Invert	281.489	m	Downstream Invert	281.235	m
Length	19.35	m	Constructed Slope	1.31	%

Hydraulic Profile

Profile	M2		Depth, Downstream	0.637	m
Slope Type	Mild		Normal Depth	0.980	m
Flow Regime	Subcritical		Critical Depth	0.637	m
Velocity Downstream	2.50	m/s	Critical Slope	4.54	%

Section

Section Shape	Box		Mannings Coefficient	0.050	
Section Material	Concrete		Span	3.05	m
Section Size	3050 x 1830 mm		Rise	1.83	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	282.599	m	Upstream Velocity Head	0.149	m
Ke	0.20		Entrance Loss	0.030	m

Inlet Control Properties

Inlet Control HW Elev.	282.532	m	Flow Control	N/A	
Inlet Type	90° headwall w 3/4 inch chamfers		Area Full	5.6	m2
K	0.51500		HDS 5 Chart	10	
M	0.66700		HDS 5 Scale	1	
C	0.03750		Equation Form	2	
Y	0.79000				

2099 - Uxbridge Tributary Section 4

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	4.94	%
Discharge	3.58	m³/s
Section Definitions		

12hr 100-year peak flow from VO model Node 16

Station (m)	Elevation (m)
0+00.00	290.00
0+08.11	289.50
0+11.75	289.00
0+19.80	288.91
0+36.10	289.02
0+39.59	289.48

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 290.00)	(0+39.59, 289.48)	0.070

Results

Normal Depth	0.21	m
Elevation Range	288.91 to 290.00 m	
Flow Area	3.95	m²
Wetted Perimeter	26.00	m
Top Width	25.98	m
Normal Depth	0.21	m
Critical Depth	0.18	m
Critical Slope	0.09593	m/m
Velocity	0.90	m/s
Velocity Head	0.04	m
Specific Energy	0.25	m
Froude Number	0.74	

2099 - Uxbridge Tributary Section 4

Results

Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.21	m
Critical Depth	0.18	m
Channel Slope	0.04940	m/m
Critical Slope	0.09593	m/m

2099 - Uxbridge Tributary Section 5

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	7.75	%
Discharge	3.58	m³/s

12hr 100-year peak flow from VO model Node 16

Section Definitions

Station (m)	Elevation (m)
0+00.00	296.12
0+08.42	295.40
0+16.03	295.01
0+25.35	294.01
0+33.03	293.36
0+40.50	294.02
0+50.76	295.03

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 296.12)	(0+50.76, 295.03)	0.070

Results

Normal Depth	0.46	m
Elevation Range	293.36 to 296.12 m	
Flow Area	2.41	m²
Wetted Perimeter	10.60	m
Top Width	10.56	m
Normal Depth	0.46	m
Critical Depth	0.46	m
Critical Slope	0.07911	m/m
Velocity	1.48	m/s
Velocity Head	0.11	m
Specific Energy	0.57	m

2099 - Uxbridge Tributary Section 5

Results

Froude Number	0.99	
Flow Type	Subcritical	

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.46	m
Critical Depth	0.46	m
Channel Slope	0.07750	m/m
Critical Slope	0.07911	m/m

2099 - Uxbridge Tributary Section 6

Project Description

Friction Method	Manning Formula
Solve For	Normal Depth

Input Data

Channel Slope	3.61	%
Discharge	0.92	m³/s
Section Definitions		

12hr 100-year peak flow from VO Model Node 16

Station (m)	Elevation (m)
0+00.00	301.30
0+11.35	300.50
0+23.68	300.31
0+30.19	300.52
0+47.35	301.50

Roughness Segment Definitions

Start Station	Ending Station	Roughness Coefficient
(0+00.00, 301.30)	(0+47.35, 301.50)	0.070

Results

Normal Depth	0.18	m
Elevation Range	300.31 to 301.50 m	
Flow Area	1.66	m²
Wetted Perimeter	18.05	m
Top Width	18.04	m
Normal Depth	0.18	m
Critical Depth	0.15	m
Critical Slope	0.11430	m/m
Velocity	0.55	m/s
Velocity Head	0.02	m
Specific Energy	0.20	m
Froude Number	0.58	
Flow Type	Subcritical	

2099 - Uxbridge Tributary Section 6

GVF Input Data

Downstream Depth	0.00	m
Length	0.00	m
Number Of Steps	0	

GVF Output Data

Upstream Depth	0.00	m
Profile Description		
Profile Headloss	0.00	m
Downstream Velocity	Infinity	m/s
Upstream Velocity	Infinity	m/s
Normal Depth	0.18	m
Critical Depth	0.15	m
Channel Slope	0.03610	m/m
Critical Slope	0.11430	m/m

Culvert Calculator Report
By-Pass Sewer Sizing

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	301.54	m	Headwater Depth/Height	2.38	
Computed Headwater Eleva	300.72	m	Discharge	0.9230	m3/s
Inlet Control HW Elev.	300.72	m	Tailwater Elevation	0.00	m
Outlet Control HW Elev.	300.48	m	Control Type	Inlet Control	

12hr 100-year
peak flow from VO
Model Node 202

Grades

Upstream Invert	299.27	m	Downstream Invert	295.05	m
Length	109.00	m	Constructed Slope	0.038716	m/m

Hydraulic Profile

Profile	S2		Depth, Downstream	0.37	m
Slope Type	Steep		Normal Depth	0.37	m
Flow Regime	Supercritical		Critical Depth	0.58	m
Velocity Downstream	5.02	m/s	Critical Slope	0.015314	m/m

Section

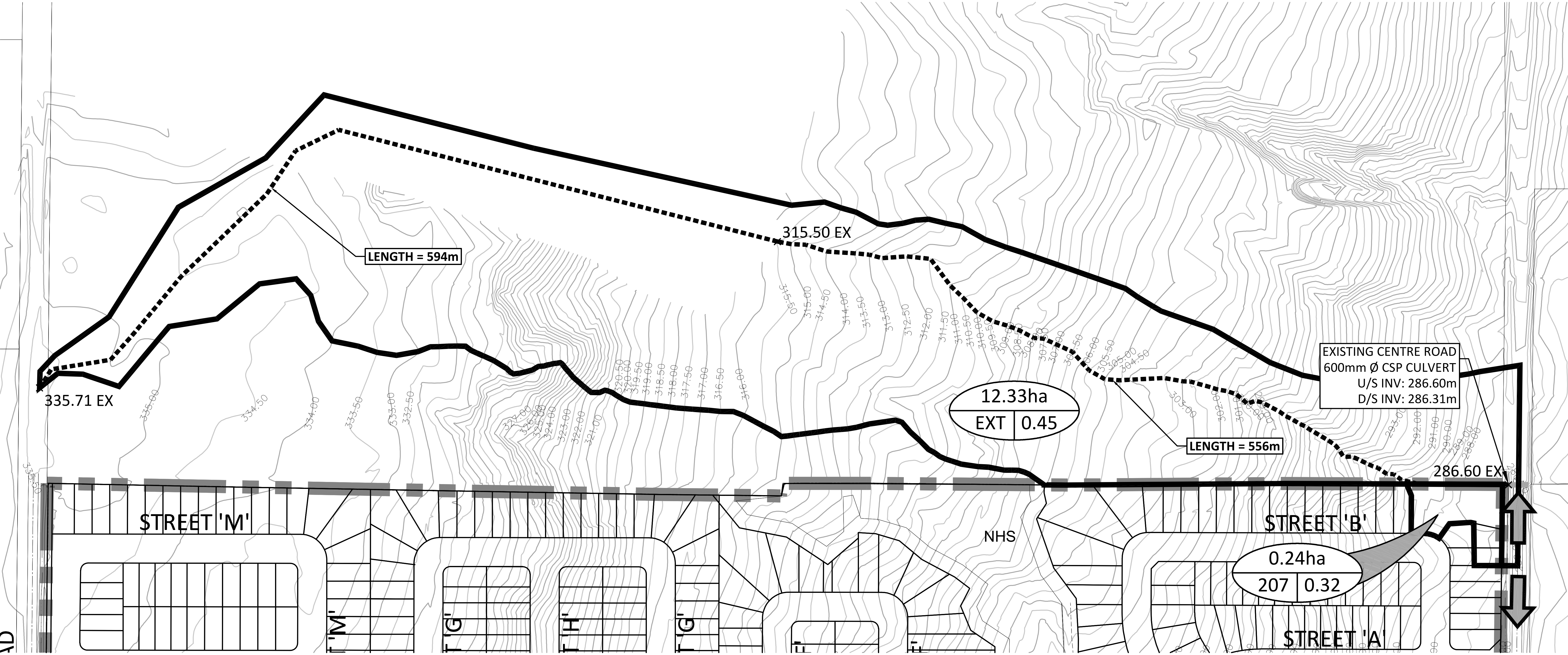
Section Shape	Circular		Mannings Coefficient	0.012	
Section Material	Corrugated HDPE (Smooth Interior)		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	300.48	m	Upstream Velocity Head	0.53	m
Ke	0.20		Entrance Loss	0.11	m

Inlet Control Properties

Inlet Control HW Elev.	300.72	m	Flow Control	Submerged	
Inlet Type	Groove end projecting		Area Full	0.3	m2
K	0.00450		HDS 5 Chart	1	
M	2.00000		HDS 5 Scale	3	
C	0.03170		Equation Form	1	
Y	0.69000				



SCALE: 1:2500
EXISTING CENTRE ROAD CULVERT DRAINAGE PLAN
DECEMBER 2022

Proposed Conditions
CN Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Uplands Method:

Catchment ID	High Elevation	Low Elevation	Length (m)	Slope (%)	Land Cover Type	Velocity (m/s)	Time of Concentration (s)	Time of Concentration (hr)	Time to Peak (hr)
EXTa	335.71	315.50	594	3.40	Cultivated Straight Row	0.51	1155.7	0.32	0.22
EXTb	315.50	286.60	556	5.20	Cultivated Straight Row	0.63	876.3	0.24	0.16
EXT									**0.38**

Centre Road Culvert
Capacity Calculations

Township of Uxbridge 100 Year (Rational Method)	
Area (ha) =	12.57
100 Year Return Period Factor =	1.25
100 Year Runoff Coeff. =	0.56
T_c (min) =	22.80
a=	**1799**
b=	**5**
c=	**0.810**
Intensity (mm/hr) =	121.72
Runoff (m^3/s)=	**2.387**

(Time of concentration per Uplands calculation in this Appendix)

Catchment EXT

Land Use	**Area (ha)**	**Runoff Coefficient***	**Weighted Runoff Coefficient**
Agricultural Field	12.28	0.45	0.45
Centre Road Imperviousness	0.05	0.90	0.00
	12.33		0.45

*Runoff coefficient per MTO Design Chart 1.07

Catchment 207

Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
Grass	0.19	0.25	0.20
Rear Yard Residential	0.05	0.60	0.13
	0.24		0.32

Catchments EXT & 207

Land Use	**Area (ha)**	**Runoff Coefficient**	**Weighted Runoff Coefficient**
EXT	12.33	0.45	0.44
207	0.24	0.32	0.01
	12.57		0.45

Therefore, the proposed Centre Road North culvert and road deck convey 2.387 m3/s

Ex Centre Road Weir Calculation

Project Description

Solve For	Headwater Elevation

Input Data

Discharge	1.712 m³/s
Crest Elevation	287.84 m
Tailwater Elevation	0.00 m
Crest Surface Type	Paved
Crest Breadth	6.75 m
Crest Length	50.00 m

Results

Headwater Elevation	287.92 m
Headwater Height Above Crest	0.08 m
Tailwater Height Above Crest	-287.84 m
Weir Coefficient	1.64 m^(1/2)/s
Submergence Factor	1.000
Adjusted Weir Coefficient	1.64 m^(1/2)/s
Flow Area	3.8 m²
Velocity	0.45 m/s
Wetted Perimeter	50.15 m
Top Width	50.00 m

Culvert Calculator Report
2099 - Centre Road Culvert Calculation

Solve For: Headwater Elevation

Culvert Summary

Allowable HW Elevation	288.00	m	Headwater Depth/Height	2.17	
Computed Headwater Elevation	287.92	m	Discharge	0.675	m³/s
Inlet Control HW Elev.	287.89	m	Tailwater Elevation	0.00	m
Outlet Control HW Elev.	287.92	m	Control Type	Outlet Control	

Grades

Upstream Invert	286.60	m	Downstream Invert	286.31	m
Length	13.89	m	Constructed Slope	2.09	%

Hydraulic Profile

Profile	CompositeM2PressureProfile		Depth, Downstream	0.53	m
Slope Type	Mild		Normal Depth	N/A	m
Flow Regime	Subcritical		Critical Depth	0.53	m
Velocity Downstream	2.51	m/s	Critical Slope	3.48	%

Section

Section Shape	Circular		Mannings Coefficient	0.024	
Section Material	CMP		Span	0.61	m
Section Size	600 mm		Rise	0.61	m
Number Sections	1				

Outlet Control Properties

Outlet Control HW Elev.	287.92	m	Upstream Velocity Head	0.27	m
Ke	0.90		Entrance Loss	0.25	m

Inlet Control Properties

Inlet Control HW Elev.	287.89	m	Flow Control	Submerged	
Inlet Type	Projecting		Area Full	0.3	m²
K	0.03400		HDS 5 Chart	2	
M	1.50000		HDS 5 Scale	3	
C	0.05530		Equation Form	1	
Y	0.54000				

APPENDIX E

BMP SIZING AND PHOSPHORUS BUDGET CALCULATIONS

SCS consulting group ltd

LID Sizing and Volume Control Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

48 Hour Drawdown Calculation		
Hydraulic Conductivity (Per Terrapex Hydrogeological Assessment)	$9.5x10^{-5}$	cm/s
I - Infiltration Rate (Per Table C1 of the TRCA and CVC LID SWM Planning and Design Guide, 2010)	49.0	mm/h
Design Infiltration Rate*	12.0	mm/h
n - Porosity	0.4	
t - Design Detention Time	48	h
SF - Safety Factor	2.5	
D - Maximum Depth of Infiltration Trench for 48 Hour Drawdown	0.6	m

* Conservative estimate based on Silty Clay soils until in-situ testing performed at detailed design

$$D = \frac{I * t}{SF * n * 1000}$$

Catchment 201

Catchbasin Filtration Trench Parameters		
Porosity Coefficient	0.4	
Depth	1.00	m
Width	1.00	m
Length of Filtration Trench	1618.0	m
Provided Stone Volume	1618.0	m^3
Provided Runoff Storage Volume	**647.2**	m^3

Catchbasin Infiltration Trench Parameters		
Porosity Coefficient	0.4	
Depth	0.60	m
Width	1.00	m
Length of Infiltration Trench	113.0	m
Provided Stone Volume	67.8	m^3
Provided Runoff Storage Volume	**27.1**	m^3
A - Infiltration Trench Bottom area	113.00	m^2

Rear Yard At-Surface Infiltration Trenches		
Drainage Area	3.11	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	1.37	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**342.1**	m^3
Number of Lots with Rear Yard Infiltration Trenches	170	
Total Length of Infiltration Trenches	1907	m
Depth	0.6	m
Average Width	0.8	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**366.1**	m^3

Total Runoff Infiltration/Filtration Volume =	**1016.4**	**m^3**
Catchmnent Area	25.20	ha
Imperviousness	60	%
Catchment Impervious Area	15.12	ha
Equivalent Depth of Rainfall Over Impervious Area (15.12 ha)	6.7	mm

Therefore, the proposed LIDs within Catchment 201 will provide an equivalent level of volume control for a rainfall depth of approximately 6.7 mm across the proposed impervious surfaces within Catchment 201.

Catchment 202

Rear Yard At-Surface Infiltration Trenches		
Lot Drainage Area	0.88	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	0.39	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**96.8**	m^3
Number of Lots with Rear Yard Infiltration Trenches	31	
Total Length of Infiltration Trenches	476	m
Depth	0.6	m
Average Width	1.00	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**114.2**	m^3

Therefore, the proposed LIDs within Catchment 202 will provide an equivalent level of volume control for a rainfall depth of 25 mm across the proposed impervious surfaces within Catchment 202.

LID Sizing and Volume Control Calculations

7370 Centre Road
Project Number: 2099
Date: December 2022
Designer Initials: G.M.

Catchment 204

Catchbasin Filtration Trench Parameters		
Porosity Coefficient	0.4	
Depth	1.00	m
Width	1.00	m
Length of Filtration Trench	463.0	m
Provided Stone Volume	463.0	m^3
Proposed Runoff Storage Volume	185.2	m^3
Required Runoff Storage Volume	178.3	m^3

Therefore, the proposed LIDs within Catchment 204 will provide a quality control volume of 185.2 cu.m.

Rear Yard At-Surface Infiltration Trenches		
Drainage Area	0.46	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	0.20	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**50.6**	m^3
Number of Lots with Rear Yard Infiltration Trenches	25	
Total Length of Infiltration Trenches	273	m
Depth	0.6	m
Average Width	1.0	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**65.5**	m^3

Total Runoff Infiltration/Filtration Volume =	**228.9**	**m^3**
Catchmnent Area	5.63	ha
Imperviousness	60	%
Catchment Impervious Area	3.38	ha
Equivalent Depth of Rainfall Over Impervious Area (3.38 ha)	6.8	mm

Therefore, the proposed LIDs within Catchment 204 will provide an equivalent level of volume control for a rainfall depth of approximately 6.8 mm across the proposed impervious surfaces within Catchment 204.

Catchment 205

Rear Yard At-Surface Infiltration Trenches		
Lot Drainage Area	0.12	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	0.05	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**13.2**	m^3
Number of Lots with Rear Yard Infiltration Trenches	6	
Total Length of Infiltration Trenches	74	m
Depth	0.6	m
Average Width	1.0	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**17.8**	m^3

Therefore, the proposed LIDs within Rear Yard At-Surface Infiltration Trenches will provide an equivalent level of volume control for a rainfall depth of 25 mm across the proposed impervious surfaces within Rear Yard At-Surface Infiltration Trenches.

Catchment 206

Rear Yard At-Surface Infiltration Trenches		
Drainage Area	0.10	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	0.04	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**11.0**	m^3
Number of Lots with Rear Yard Infiltration Trenches	4	
Total Length of Infiltration Trenches	47	m
Depth	0.6	m
Average Width	1.00	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**11.3**	m^3

Therefore, the proposed LIDs within Rear Yard At-Surface Infiltration Trenches will provide an equivalent level of volume control for a rainfall depth of 25 mm across the proposed impervious surfaces within Rear Yard At-Surface Infiltration Trenches.

Catchment 207

Rear Yard At-Surface Infiltration Trenches		
Drainage Area	0.05	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	0.02	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**5.5**	m^3
Number of Lots with Rear Yard Infiltration Trenches	2	
Total Length of Infiltration Trenches	24	m
Depth	0.6	m
Average Width	1.00	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**5.8**	m^3

Therefore, the proposed LIDs within Rear Yard At-Surface Infiltration Trenches will provide an equivalent level of volume control for a rainfall depth of 25 mm across the proposed impervious surfaces within Rear Yard At-Surface Infiltration Trenches.

Catchment 208

Rear Yard At-Surface Infiltration Trenches		
Drainage Area	0.22	ha
Imperviousness (Per Figure C-1 in Appendix C)	44	%
Total Roof Area to Rear Yard Infiltration Trench	0.10	ha
Runoff Depth	25	mm
Required Runoff Storage Volume to Infiltrate Runoff Depth	**24.2**	m^3
Number of Lots with Rear Yard Infiltration Trenches	6	
Total Length of Infiltration Trenches	111	m
Depth	0.6	m
Average Width	1.0	m
Porosity	0.4	
Preliminary Runoff Storage Volume Provided	**26.6**	m^3

Therefore, the proposed LIDs within Rear Yard At-Surface Infiltration Trenches will provide an equivalent level of volume control for a rainfall depth of 25 mm across the proposed impervious surfaces within Rear Yard At-Surface Infiltration Trenches.

Sitewide Summary

Volume Control Total		
Phase 1 Site Total Area (Catchments 204-208)	6.88	ha
Phase 1 Total Impervious Area	3.69	ha
Total Phase 1 Infiltration/Filtration Volume Required (25mm storm event)	922.4	m^3
Total Phase 1 Infiltration/Filtration Volume Provided	290.3	m^3
Phase 2 Site Total Area (Catchments 201-203, 209)	34.61	ha
Phase 2 Total Impervious Area	16.45	ha
Total Phase 2 Infiltration/Filtration Volume Required (25mm storm event)	4111.4	m^3
Total Phase 2 Infiltration/Filtration Volume Provided	1130.7	m^3
Total Impervious Area	20.14	ha
Total Infiltration/Filtration Volume Provided (During 25mm Storm Event)	1421.0	m^3
Equivalent Depth of Rainfall over Impervious Area	7.1	mm

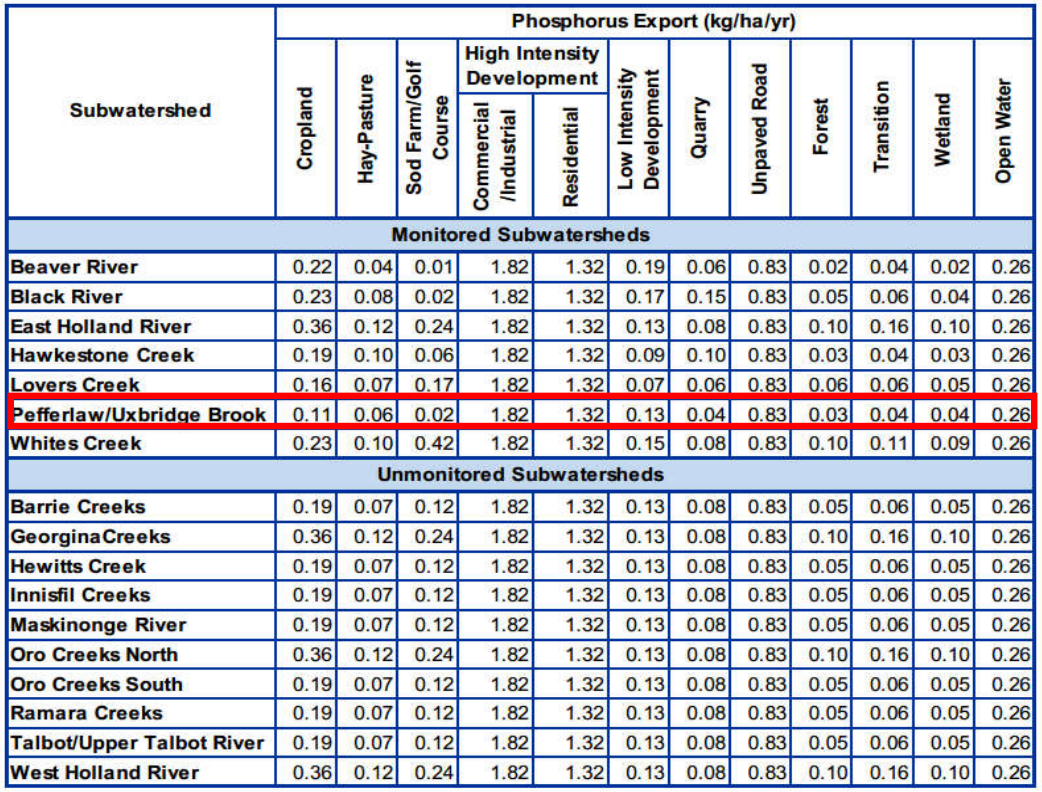
Therefore, the proposed LIDs within the site will provide an equivalent level of volume control for a rainfall depth of 7.1 mm across the proposed impervious surfaces within the site.

Existing Phosphorous Budget

Areas from **Figure 2.6**, Existing Drainage Plan shown on **Figure 2.1**.

	Area (ha)	Land Use Type	Loading Rate (kg/ha/yr)	P_{load} (kg/year)
Wetland (Part of Catchment 101 & 102)	0.24	Wetland	0.04	0.01
Forest (Part of Catchment 101)	0.04	Forest	0.03	0.00
Cropland (Part of Catchment 101 & 102)	33.96	Cropland	0.11	3.74
Total	**34.24**		**Total**	3.75

Table 2. Land-Use Specific Phosphorus Export Coefficients (kg/ha/yr) for Lake Simcoe Subwatersheds



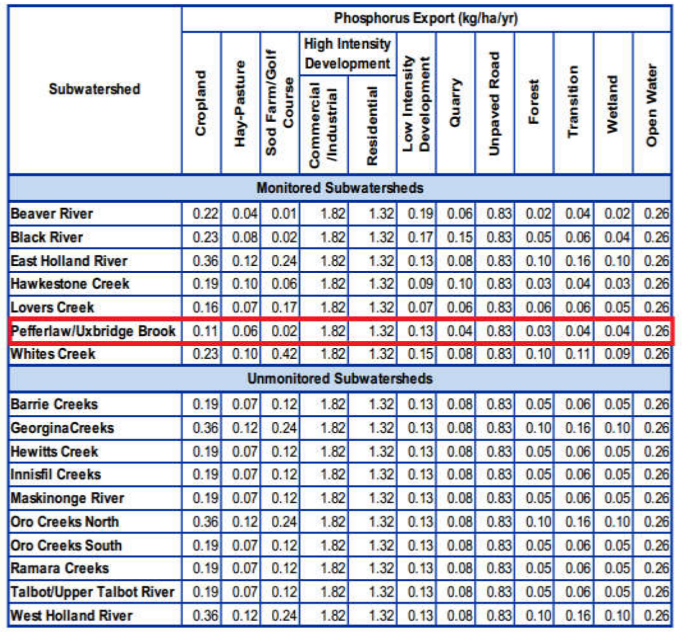
Subwatershed	**Phosphorus Export (kg/ha/yr)**											
	Cropland	**Hay-Pasture**	**Sod Farm/Golf Course**	**High Intensity Development**		**Low Intensity Development**	**Quarry**	**Unpaved Road**	**Forest**	**Transition**	**Wetland**	**Open Water**
				Commercial /Industrial	**Residential**							
Monitored Subwatersheds												
Beaver River	0.22	0.04	0.01	1.82	1.32	0.19	0.06	0.83	0.02	0.04	0.02	0.26
Black River	0.23	0.08	0.02	1.82	1.32	0.17	0.15	0.83	0.05	0.06	0.04	0.26
East Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hawkestone Creek	0.19	0.10	0.06	1.82	1.32	0.09	0.10	0.83	0.03	0.04	0.03	0.26
Lovers Creek	0.16	0.07	0.17	1.82	1.32	0.07	0.06	0.83	0.06	0.06	0.05	0.26
Pefferlaw/Uxbridge Brook	0.11	0.06	0.02	1.82	1.32	0.13	0.04	0.83	0.03	0.04	0.04	0.26
Whites Creek	0.23	0.10	0.42	1.82	1.32	0.15	0.08	0.83	0.10	0.11	0.09	0.26
Unmonitored Subwatersheds												
Barrie Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
GeorginaCreeks	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hewitts Creek	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Innisfil Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Maskinonge River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Oro Creeks North	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Oro Creeks South	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Ramara Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Talbot/Upper Talbot River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
West Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26

Proposed Phosphorous Budget

Areas from **Figure 2.7**, Proposed Drainage Plan shown on **Figure 2.2**.

	Area (ha)	Land Use Type	Loading Rate (kg/ha/yr)	BMP 1	Removal Efficiency	BMP 2	Removal Efficiency	BMP 3	Removal Efficiency	BMP 4	Removal Efficiency	Combined Removal Efficiency	Unmitigated P_{load} (kg/year)	Mitigated P_{load} (kg/year)
Park (Part of Catchment 201)	2.38	Low Intensity Residential	0.13	Wet Detention Pond	63%	Stream Buffer	65%					87%	0.31	0.04
Wetland (Part of Catchment 201)	0.22	Wetland	0.04	Wet Detention Pond	63%	Stream Buffer	65%					87%	0.01	0.00
Residential (Part of Catchment 201)	2.62	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Catchbasin Filtration Trench	45%	Wet Detention Pond	63%	Stream Buffer	65%	97%	3.46	0.10
Residential (Part of Catchment 201)	0.50	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Wet Detention Pond	63%	Stream Buffer	65%			95%	0.66	0.03
Residential (Part of Catchment 201)	17.72	High Intensity Residential	1.32	Catchbasin Filtration Trench	45%	Wet Detention Pond	63%	Stream Buffer	65%			93%	23.39	1.67
Residential (Part of Catchment 201)	0.85	High Intensity Residential	1.32	Catchbasin Infiltration Trench	87%	Wet Detention Pond	63%	Stream Buffer	65%			98%	1.12	0.02
Residential (Part of Catchment 201)	0.67	High Intensity Residential	1.32	Wet Detention Pond	63%	Stream Buffer	65%					87%	0.88	0.11
Uncontrolled Rear Yard Pervious & Roof (Part of Catchment 202)	0.85	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Stream Buffer	65%					86%	1.12	0.16
SWM Facility (Catchment 203)	1.57	Low Intensity Residential	0.13	Wet Detention Pond	63%	Stream Buffer	65%					87%	0.20	0.03
Residential (Catchment 204)	0.23	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Catchbasin Filtration Trench	45%	Dry SWM Pond	10%	Grassed Filter Strip	65%	93%	0.30	0.02
Residential (Catchment 204)	5.13	High Intensity Residential	1.32	Catchbasin Filtration Trench	45%	Dry SWM Pond	10%	Grassed Filter Strip	65%			83%	6.77	1.17
Residential (Catchment 204)	0.20	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Stream Buffer	65%					86%	0.26	0.04
Residential (Catchment 204)	0.02	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Enhanced Grass Swale	25%					70%	0.03	0.01
Residential (Part of Catchment 205)	0.11	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Dry SWM Pond	10%	Stream Buffer	65%			87%	0.15	0.02
SWM Facility (Part of Catchment 205)	0.54	Low Intensity Residential	0.13	Stream Buffer/Grassed Filter Strip	65%	Dry SWM Pond	10%	Stream Buffer	65%			89%	0.07	0.01
Uncontrolled Rear Yard Pervious & Roof (Catchment 206)	0.10	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Enhanced Grass Swale	25%					70%	0.13	0.04
Uncontrolled Wetland (Catchment 207)	0.01	Wetland	0.04	Enhanced Grass Swale	25%							25%	0.00	0.00
Uncontrolled Wetland (Catchment 207)	0.18	Low Intensity Residential	0.13	Enhanced Grass Swale	25%							25%	0.02	0.02
Uncontrolled Rear Yard Pervious & Roof (Catchment 207)	0.05	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Enhanced Grass Swale	25%					70%	0.07	0.02
Uncontrolled Rear Yard Pervious & Roof (Catchment 208)	0.26	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Stream Buffer	65%					86%	0.34	0.05
Roadway (Catchment 209)	0.13	High Intensity Residential	1.32	Wet Detention Pond	63%	Stream Buffer	65%					87%	0.17	0.02
Total	**34.34**											**Total**	39.48	3.57
													Removal Rate	**91.0%**

Table 2. Land-Use Specific Phosphorus Export Coefficients (kg/ha/yr) for Lake Simcoe Subwatersheds



Subwatershed	Phosphorus Export (kg/ha/yr)											
	Cropland	Hay-Pasture	Sod Farm/Golf Course	High Intensity Development		Low Intensity Development	Quarry	Unpaved Road	Forest	Transition	Wetland	Open Water
				Commercial /Industrial	Residential							
Monitored Subwatersheds												
Beaver River	0.22	0.04	0.01	1.82	1.32	0.19	0.06	0.83	0.02	0.04	0.02	0.26
Black River	0.23	0.08	0.02	1.82	1.32	0.17	0.15	0.83	0.05	0.06	0.04	0.26
East Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hawkestone Creek	0.19	0.10	0.06	1.82	1.32	0.09	0.10	0.83	0.03	0.04	0.03	0.26
Lovers Creek	0.16	0.07	0.17	1.82	1.32	0.07	0.06	0.83	0.06	0.06	0.05	0.26
Pefferlaw/Uxbridge Brook	0.11	0.06	0.02	1.82	1.32	0.13	0.04	0.83	0.03	0.04	0.04	0.26
Whites Creek	0.23	0.10	0.42	1.82	1.32	0.15	0.08	0.83	0.10	0.11	0.09	0.26
Unmonitored Subwatersheds												
Barrie Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
GeorginaCreeks	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hewitts Creek	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Innisfil Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Maskinonge River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Oro Creeks North	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Oro Creeks South	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Ramara Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Talbot/Upper Talbot River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
West Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26

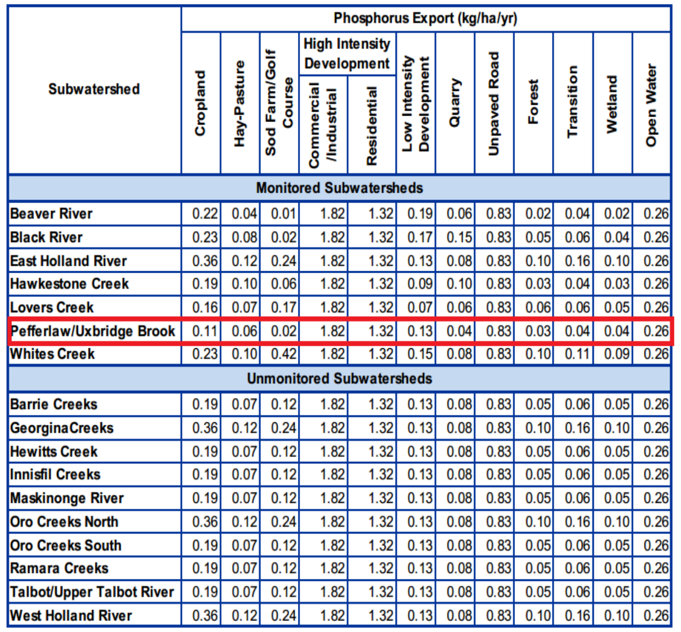
Phosphorous Budget - Phase 1

Areas from **Figure 2.7**, Proposed Drainage Plan shown on **Figure 2.2**.

	Area (ha)	Land Use Type	Loading Rate (kg/ha/yr)	P_{load} (kg/year)
Wetland (Part of Catchment 102)	0.02	Wetland	0.04	0.00
Cropland (Part of Catchment 101 & 102)	6.81	Cropland	0.11	0.75
			Total	0.75

	Area (ha)	Land Use Type	Loading Rate (kg/ha/yr)	BMP 1	Removal Efficiency	BMP 2	Removal Efficiency	BMP 3	Removal Efficiency	BMP 4	Removal Efficiency	Combined Removal Efficiency	Unmitigated P_{load} (kg/year)	Mitigated P_{load} (kg/year)
Residential (Catchment 204)	0.23	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Catchbasin Filtration Trench	45%	Dry SWM Pond	10%	Grassed Filter Strip	65%	93%	0.30	0.02
Residential (Catchment 204)	5.13	High Intensity Residential	1.32	Catchbasin Filtration Trench	45%	Dry SWM Pond	10%	Grassed Filter Strip	65%			83%	6.77	1.17
Residential (Catchment 204)	0.20	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Stream Buffer	65%					86%	0.26	0.04
Residential (Catchment 204)	0.02	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Enhanced Grass Swale	25%					70%	0.03	0.01
Residential (Part of Catchment 205)	0.11	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Dry SWM Pond	10%	Stream Buffer	65%			87%	0.15	0.02
SWM Facility (Part of Catchment 205)	0.54	Low Intensity Residential	0.13	Stream Buffer/Grassed Filter Strip	65%	Dry SWM Pond	10%	Stream Buffer	65%			89%	0.07	0.01
Uncontrolled Rear Yard Pervious & Roof (Catchment 206)	0.10	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Enhanced Grass Swale	25%					70%	0.13	0.04
Uncontrolled Wetland (Catchment 207)	0.01	Wetland	0.04	Enhanced Grass Swale	25%							25%	0.00	0.00
Uncontrolled Wetland (Catchment 207)	0.18	Low Intensity Residential	0.13	Enhanced Grass Swale	25%							25%	0.02	0.02
Uncontrolled Rear Yard Pervious & Roof (Catchment 207)	0.05	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Enhanced Grass Swale	25%					70%	0.07	0.02
Uncontrolled Rear Yard Pervious & Roof (Catchment 208)	0.26	High Intensity Residential	1.32	Rear Yard At-Surface Infiltration Trench	60%	Stream Buffer	65%					86%	0.34	0.05
Total	**6.83**											**Total**	8.15	1.39
													Removal Rate	**82.9%**

Table 2. Land-Use Specific Phosphorus Export Coefficients (kg/ha/yr) for Lake Simcoe Subwatersheds



Subwatershed	Phosphorus Export (kg/ha/yr)											
	Cropland	Hay-Pasture	Sod Farm/Golf Course	High Intensity Development		Low Intensity Development	Quarry	Unpaved Road	Forest	Transition	Wetland	Open Water
				Commercial /Industrial	Residential							
Monitored Subwatersheds												
Beaver River	0.22	0.04	0.01	1.82	1.32	0.19	0.06	0.83	0.02	0.04	0.02	0.26
Black River	0.23	0.08	0.02	1.82	1.32	0.17	0.15	0.83	0.05	0.06	0.04	0.26
East Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hawkestone Creek	0.19	0.10	0.06	1.82	1.32	0.09	0.10	0.83	0.03	0.04	0.03	0.26
Lovers Creek	0.16	0.07	0.17	1.82	1.32	0.07	0.06	0.83	0.06	0.06	0.05	0.26
Pefferlaw/Uxbridge Brook	0.11	0.06	0.02	1.82	1.32	0.13	0.04	0.83	0.03	0.04	0.04	0.26
Whites Creek	0.23	0.10	0.42	1.82	1.32	0.15	0.08	0.83	0.10	0.11	0.09	0.26
Unmonitored Subwatersheds												
Barrie Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
GeorginaCreeks	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Hewitts Creek	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Innisfil Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Maskinonge River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Oro Creeks North	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26
Oro Creeks South	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Ramara Creeks	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
Talbot/Upper Talbot River	0.19	0.07	0.12	1.82	1.32	0.13	0.08	0.83	0.05	0.06	0.05	0.26
West Holland River	0.36	0.12	0.24	1.82	1.32	0.13	0.08	0.83	0.10	0.16	0.10	0.26

APPENDIX F

PRELIMINARY VORTECH SIZING CALCULATIONS

VORTECHS SYSTEM® ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON AN AVERAGE PARTICLE SIZE OF 80 MICRONS

CONTECH
ENGINEERED SOLUTIONS

7370 CENTRE RD
UXBRIDGE, ON
MODEL PC1421 OFF-LINE
SITE DESIGNATION OGS1

Design Ratio[1] = **(25.2 hectares) x (0.6) x (2.775) / (14.3 m2) = 2.92**

Bypass occurs at an elevation of 0.94m (at approximately 21 l/s/m2)

Rainfall Intensity mm/hr	Operating Rate[2] % of capacity	Flow Treated (l/s)	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.5	2.1	21.2	9.9%	98.0%	9.7%
1.0	4.3	42.5	10.7%	98.0%	10.5%
1.5	6.4	63.7	9.8%	98.0%	9.6%
2.0	8.6	85.0	8.9%	96.9%	8.6%
2.5	10.7	106.2	7.2%	96.0%	6.9%
3.0	12.9	127.5	6.1%	94.7%	5.7%
3.5	15.0	148.7	3.4%	91.8%	3.1%
4.0	17.1	170.0	5.0%	89.9%	4.5%
4.5	19.3	191.2	4.2%	88.0%	3.7%
5.0	21.4	212.5	3.2%	86.8%	2.8%
6.0	25.7	255.0	5.4%	84.9%	4.6%
7.0	30.0	297.5	4.2%	82.0%	3.4%
8.0	34.3	340.0	4.0%	80.0%	3.2%
9.0	38.6	382.5	2.3%	77.2%	1.7%
10.0	42.9	425.0	2.5%	74.0%	1.8%
15.0	64.3	637.5	4.6%	54.9%	2.5%
20.0	85.7	849.9	1.8%	26.2%	0.5%
25.0	107.2	1062.4	1.1%	8.0%	0.1%
30.0	128.6	1274.9	0.6%	8.0%	0.0%
35.0	150.1	1487.4	0.2%	8.0%	0.0%
40.0	171.5	1699.9	0.3%	8.0%	0.0%
					83.1%

Predicted Annual Runoff Volume Treated =	95.2%
Assumed removal efficiency for bypassed flows =	0.0%
Estimated reduction in efficiency[5] =	0.0%
Predicted Net Annual Load Removal Efficiency =	**83%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (Rational Method Conversion) / Grit Chamber Area
- The Total Drainage Area and Runoff Coefficient are specified by the site engineer.
- The rational method conversion based on the units in the above equation is 2.775.

2 - Operating Rate (% of capacity) = percentage of peak operating rate of 68 l/s/m^2.

3 - Based on 65 years of hourly rainfall data from Canadian Station 6158350, Toronto ON (Bloor)

4 - Based on Contech Construction Products laboratory verified removal of an average particle size of TYPICAL microns (see Technical Bulletin #1).

5- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

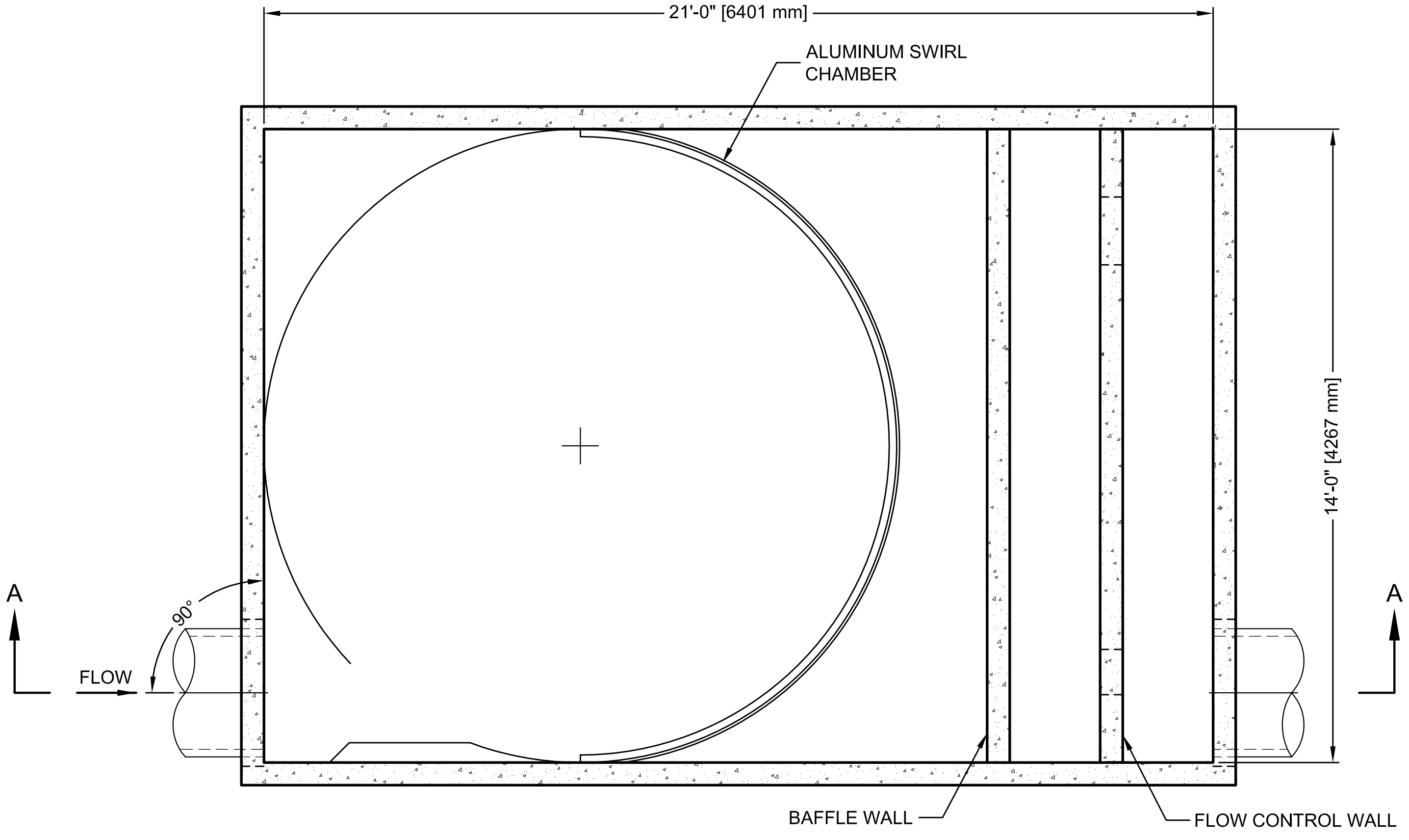
Calculated by: JAK 12/16

Checked by:

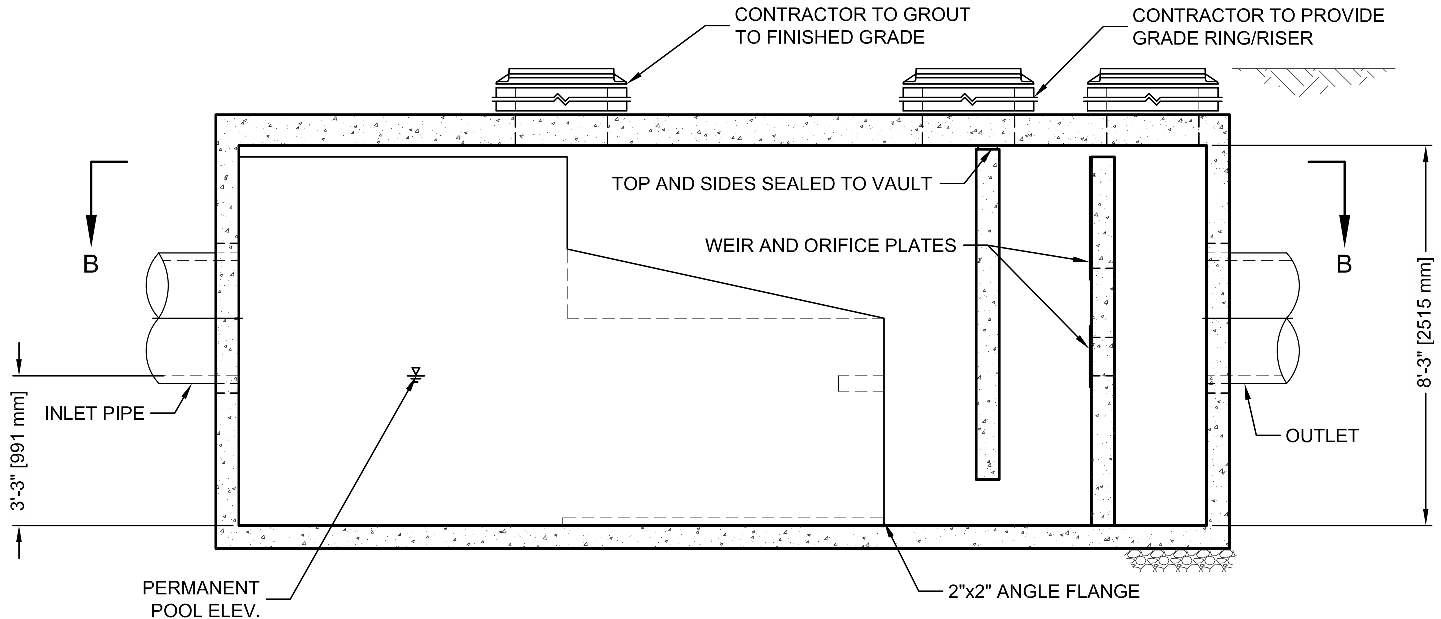
VORTECHS PC1421 DESIGN NOTES

VORTECHS PC1421 RATED TREATMENT CAPACITY IS 34 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

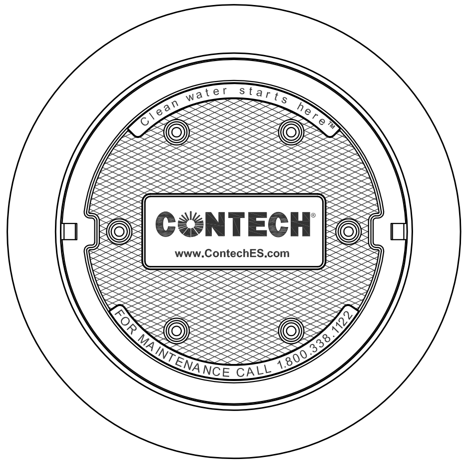
THE STANDARD INLET/OUTLET CONFIGURATION IS SHOWN. FOR OTHER CONFIGURATION OPTIONS , PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS, LLC REPRESENTATIVE. www.ContechES.com



SECTION B-B



SECTION A-A



FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			*
WATER QUALITY FLOW RATE (CFS)			*
PEAK FLOW RATE (CFS)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION			*
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES
1. CONTECH TO PROVIDE ALL MATERIALS UNLESS NOTED OTHERWISE.
2. DIMENSIONS MARKED WITH ( ) ARE REFERENCE DIMENSIONS. ACTUAL DIMENSIONS MAY VARY.
3. FOR FABRICATION DRAWINGS WITH DETAILED STRUCTURE DIMENSIONS AND WEIGHT, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS, LLC REPRESENTATIVE. www.ContechES.com
4. VORTECHS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 AND CASTINGS SHALL MEET AASHTO M306 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION.
6. INLET PIPE(S) MUST BE PERPEDICULAR TO THE VAULT AND AT THE CORNER TO INTRODUCE THE FLOW TANGENTIALLY TO THE SWIRL CHAMBER. DUAL INLETS NOT TO HAVE OPPOSING TANGENTIAL FLOW DIRECTIONS.
7. OUTLET PIPE(S) MUST BE DOWN STREAM OF THE FLOW CONTROL BAFFLE AND MAY BE LOCATED ON THE SIDE OR END OF THE VAULT. THE FLOW CONTROL WALL MAY BE TURNED TO ACCOMODATE OUTLET PIPE KNOCKOUTS ON THE SIDE OF THE VAULT.

INSTALLATION NOTES
A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE VORTECHS STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO INSTALL JOINT SEALANT BETWEEN ALL STRUCTURE SECTIONS AND ASSEMBLE STRUCTURE.
D. CONTRACTOR TO PROVIDE, INSTALL, AND GROUT PIPES. MATCH PIPE INVERTS WITH ELEVATIONS SHOWN.
E. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO ASSURE UNIT IS WATER TIGHT, HOLDING WATER TO FLOWLINE INVERT MINIMUM. IT IS SUGGESTED THAT ALL JOINTS BELOW PIPE INVERTS ARE GROUTED.

Vortechs®

THIS PRODUCT MAY BE PROTECTED BY THE FOLLOWING U.S. PATENT: 5,759,415; RELATED FOREIGN PATENTS.

CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
9025 Centre Pointe Dr., Suite 400, West Chester, OH 45069
800-338-1122 513-645-7000 513-645-7993 FAX

VORTECHS PC1421
STANDARD DETAIL

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VORTECHS SYSTEM® ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON AN AVERAGE PARTICLE SIZE OF 80 MICRONS
7370 CENTRE RD
UXBRIDGE, ON
MODEL 7000 OFF-LINE
SITE DESIGNATION OGS2

Design Ratio[1] = **(5.63 hectares) x (0.6) x (2.775)** / **(4.7 m2)** **= 2**

Bypass occurs at an elevation of 1.01m (at approximately 50 l/s/m2)

Rainfall Intensity mm/hr	Operating Rate[2] % of capacity	Flow Treated (l/s)	% Total Rainfall Volume[3]	Rmvl. Effcy[4] (%)	Rel. Effcy (%)
0.5	1.5	4.6	9.9%	98.0%	9.7%
1.0	2.9	9.1	10.7%	98.0%	10.5%
1.5	4.4	13.7	9.8%	98.0%	9.6%
2.0	5.9	18.3	8.9%	98.0%	8.7%
2.5	7.3	22.8	7.2%	97.6%	7.0%
3.0	8.8	27.4	6.1%	96.9%	5.9%
3.5	10.3	32.0	3.4%	96.0%	3.3%
4.0	11.7	36.5	5.0%	95.3%	4.8%
4.5	13.2	41.1	4.2%	93.8%	3.9%
5.0	14.7	45.7	3.2%	92.8%	3.0%
6.0	17.6	54.8	5.4%	89.9%	4.9%
7.0	20.5	64.0	4.2%	87.3%	3.6%
8.0	23.5	73.1	4.0%	85.7%	3.4%
9.0	26.4	82.2	2.4%	84.3%	2.0%
10.0	29.3	91.4	2.7%	82.6%	2.2%
15.0	44.0	137.1	6.1%	72.8%	4.4%
20.0	58.7	182.7	2.8%	59.3%	1.7%
25.0	73.3	228.4	1.8%	45.6%	0.8%
30.0	88.0	274.1	1.0%	22.7%	0.2%
35.0	102.7	319.8	0.3%	8.0%	0.0%
40.0	117.3	365.5	0.5%	8.0%	0.0%
					89.7%

Predicted Annual Runoff Volume Treated = 92.9%
Assumed removal efficiency for bypassed flows = 0.0%
Estimated reduction in efficiency[5] = 6.5%
Predicted Net Annual Load Removal Efficiency = **83%**

1 - Design Ratio = (Total Drainage Area) x (Runoff Coefficient) x (Rational Method Conversion) / Grit Chamber Area
- The Total Drainage Area and Runoff Coefficient are specified by the site engineer.
- The rational method conversion based on the units in the above equation is 2.775.

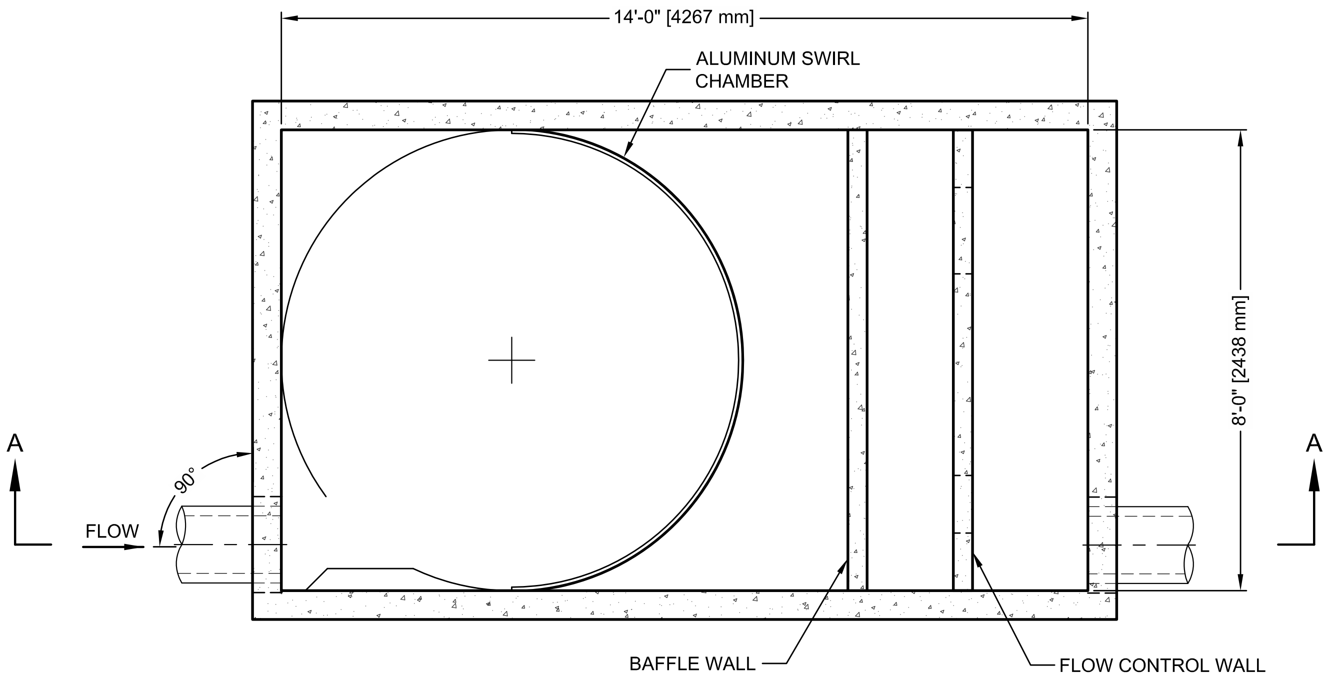
2 - Operating Rate (% of capacity) = percentage of peak operating rate of 68 l/s/m^2.
3 - Based on 65 years of hourly rainfall data from Canadian Station 6158350, Toronto ON (Bloor)
4 - Based on Contech Construction Products laboratory verified removal of an average particle size of TYPICAL microns (see Technical Bulletin #1).
5- Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.

Calculated by: JAK 12/16
Checked by:

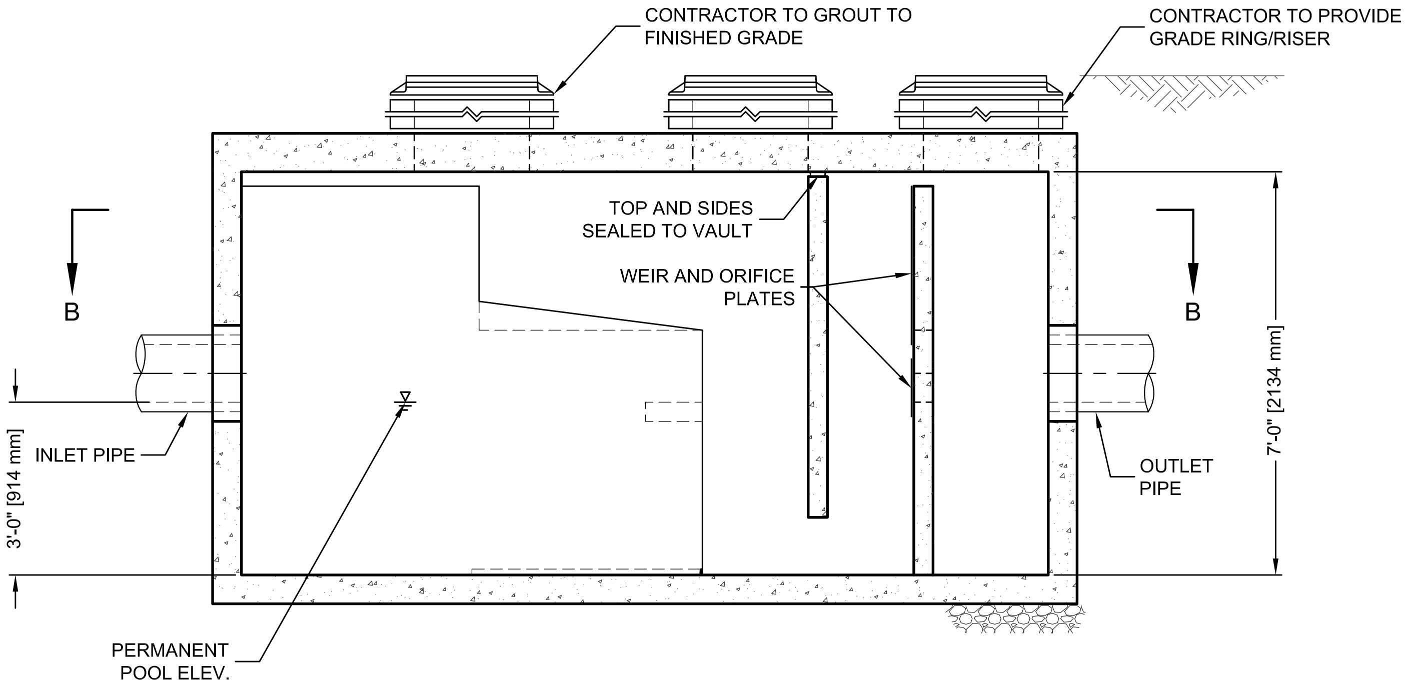
VORTECHS 7000 DESIGN NOTES

VORTECHS 7000 RATED TREATMENT CAPACITY IS 11 CFS, OR PER LOCAL REGULATIONS. IF THE SITE CONDITIONS EXCEED RATED TREATMENT CAPACITY, AN UPSTREAM BYPASS STRUCTURE IS REQUIRED.

THE STANDARD INLET/OUTLET CONFIGURATION IS SHOWN. FOR OTHER CONFIGURATION OPTIONS , PLEASE CONTACT YOUR CONTECH REPRESENTATIVE. www.ContechES.com



SECTION B-B



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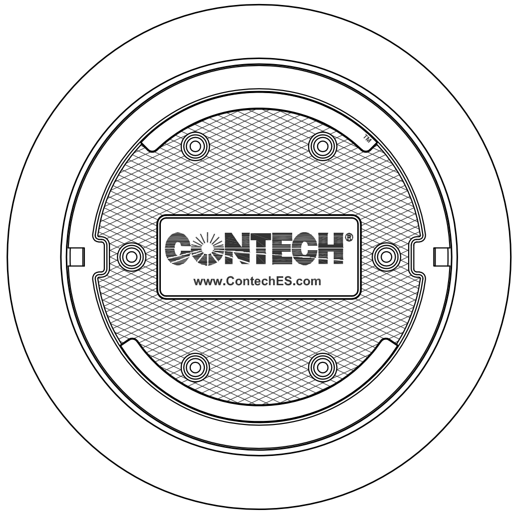

FRAME AND COVER

(DIAMETER VARIES)
N.T.S.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID	*		
WATER QUALITY FLOW RATE (CFS)	*		
PEAK FLOW RATE (CFS)	*		
RETURN PERIOD OF PEAK FLOW (YRS)	*		
PIPE DATA:	I.E.	MATERIAL	DIAMETER
INLET PIPE 1	*	*	*
INLET PIPE 2	*	*	*
OUTLET PIPE	*	*	*
RIM ELEVATION	*		
ANTI-FLOTATION BALLAST		WIDTH	HEIGHT
		*	*
NOTES/SPECIAL REQUIREMENTS:			

* PER ENGINEER OF RECORD

GENERAL NOTES

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Vortechs®

THIS PRODUCT MAY BE PROTECTED BY THE FOLLOWING U.S. PATENT: 5,759,415; RELATED FOREIGN PATENTS.

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VORTECHS 7000
STANDARD DETAIL

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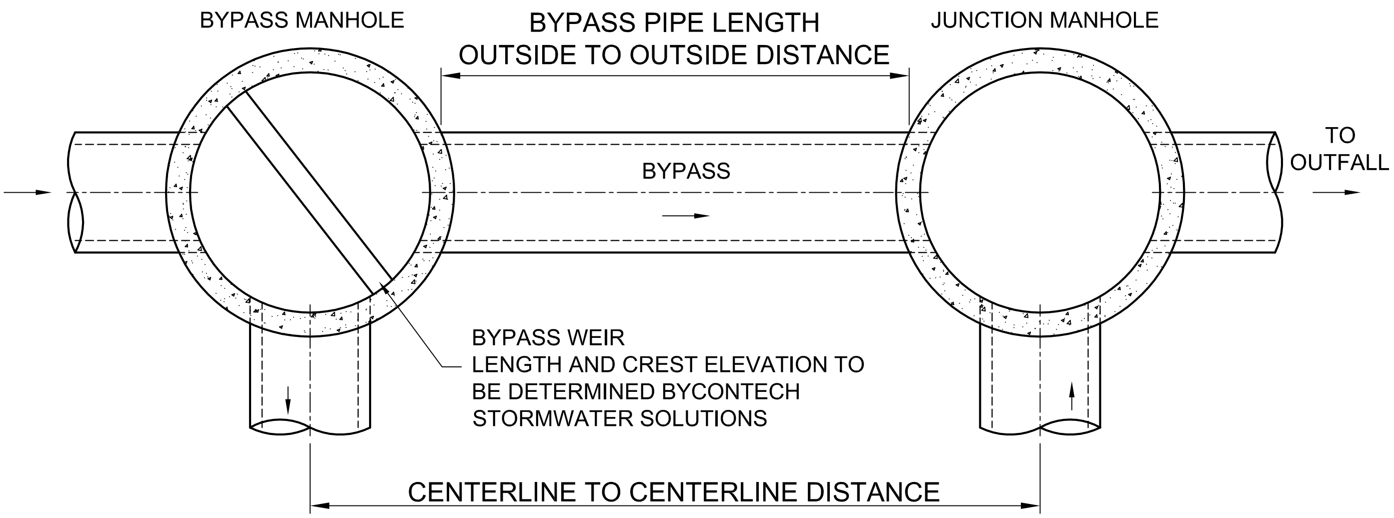
-BYPASS AND JUNCTION STRUCTURES NOT SUPPLIED BY CONTECH STORMWATER SOLUTIONS-



<u>NOTE</u>: BYPASS AND JUNCTION MANHOLE DIAMETERS ARE ASSUMED BASED ON THE TREATMENT CAPACITY OF THE VORTECHS SYSTEM. THESE DIAMETERS MAY CHANGE DEPENDING ON SPECIFIC SITE CONDITIONS. CONTACT YOUR CONTECH STORMWATER SOLUTIONS DESIGN ENGINEER.

Vortechs Model Size	Vortechs Dims		Recommended Pipe Size Diameter in / mm	Typical Bypass Manhole Diameter	Typical Junction Manhole Diameter	Approximate Center to Center Distance ft / mm	Approximate Bypass Pipe Length Outside ft / mm
	Length ft / mm	Width ft / mm					
1000	9 / 2743	3 / 914	10 / 250	4 / 1200	4 / 1200	7.5 / 2286	3.5 / 1067
2000	10 / 3048	4 / 1219	12 / 300	4 / 1200	4 / 1200	8.5 / 2591	4.42 / 1347
3000	11 / 3353	5 / 1524	15 / 375	5 / 1500	4 / 1200	9.25 / 2819	4.75 / 1448
4000	12 / 3658	6 / 1829	15 / 375	5 / 1500	4 / 1200	10.25 / 3124	5.75 / 1753
5000	13 / 3962	7 / 2134	18 / 450	6 / 1800	5 / 1500	11.17 / 3405	5.67 / 1728
7000	14 / 4267	8 / 2438	18 / 450	6 / 1800	5 / 1500	12.17 / 3709	6.67 / 2033
9000	15 / 4572	9 / 2743	21 / 525	6 / 1800	6 / 1800	11.83 / 3606	5.83 / 1777
11000	16 / 4877	10 / 3048	24 / 600	6 / 1800	6 / 1800	12.67 / 3862	6.67 / 2033
16000	18 / 5486	12 / 3658	27 / 675	6 / 1800	6 / 1800	14.58 / 4444	8.58 / 2615

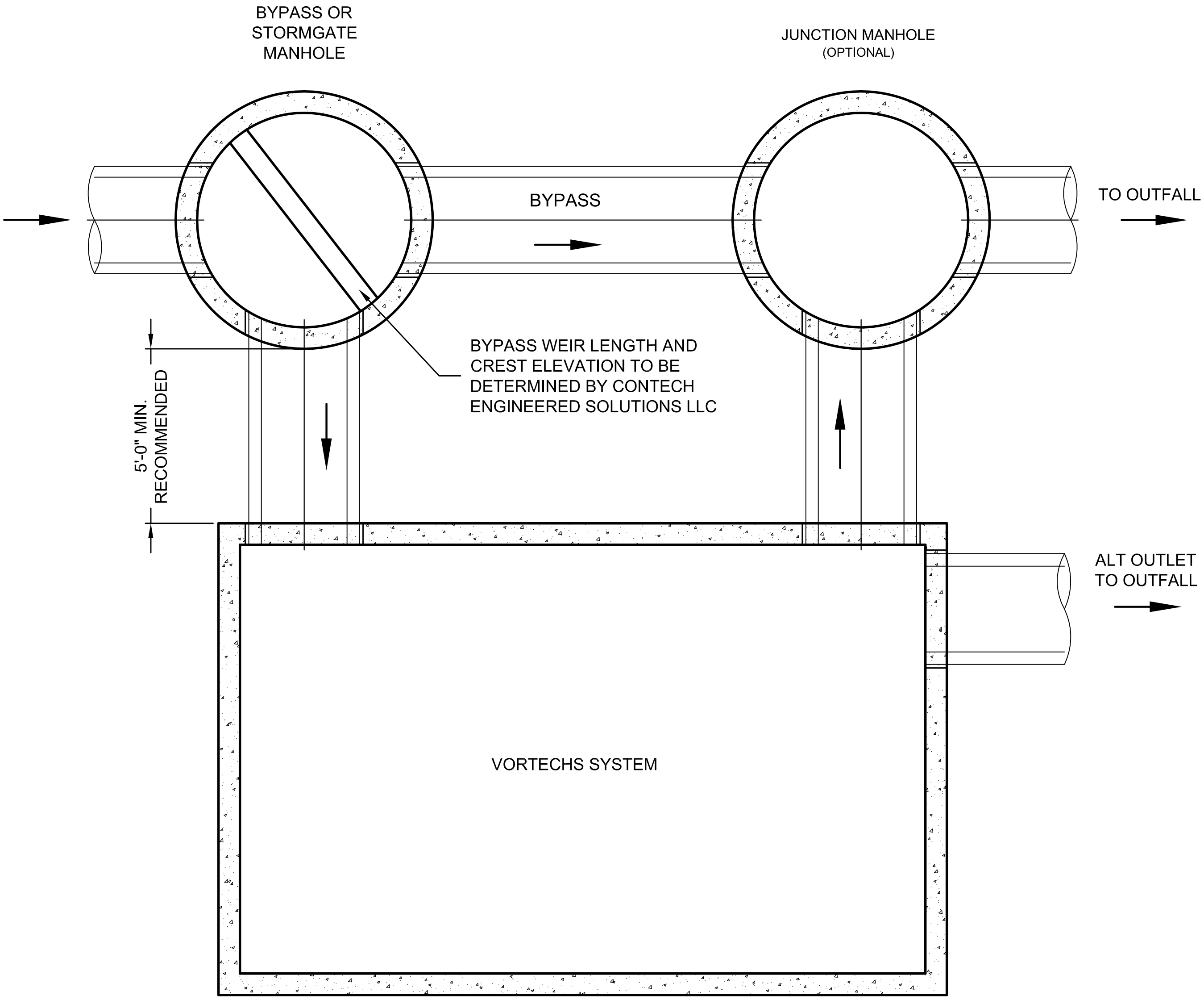
This CADD file is for the purpose of specifying stormwater treatment equipment to be furnished by CONTECH Stormwater Solutions and may only be transferred to other documents exactly as provided by CONTECH Stormwater Solutions. Title block information, **excluding** the CONTECH Stormwater Solutions logo and the Vortechs Stormwater Treatment System designation and patent number, may be deleted if necessary. Revisions to any part of this CADD file without prior coordination with CONTECH Stormwater Solutions shall be considered unauthorized use of proprietary information.

CONTECH®
STORMWATER
SOLUTIONS INC.
contechstormwater.com

TYPICAL BYPASS & JUNCTION MANHOLE LAYOUT
WITH SPECIFICATIONS TABLE FOR
VORTECHS® STORMWATER TREATMENT SYSTEM

DATE: 1/24/07
SCALE: NONE
FILE NAME: TYPTBLVXBPRmet
DRAWN: GMC
CHECKED: NDG

FOR INFORMATIONAL PURPOSES ONLY
NOT INTENDED AS A CONSTRUCTION DOCUMENT
- BYPASS AND JUNCTION STRUCTURES MAY OR MAY NOT BE SUPPLIED BY CONTECH -



ACTUAL ORIENTATION AND LAYOUT MAY VARY DUE TO
SITE SPECIFIC CONSIDERATIONS

Vortechs®

THIS PRODUCT MAY BE PROTECTED BY THE FOLLOWING
U.S. PATENT: 5,759,415; RELATED FOREIGN PATENTS.

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CONTECH®
ENGINEERED SOLUTIONS LLC
www.ContechES.com
200 Enterprise Drive, Scarborough, ME 04074
877-907-8676 207-885-9830 207-885-9825 FAX

TYPICAL BYPASS LAYOUT
VORTECHS® STORMWATER TREATMENT SYSTEM

DATE:3/8/13	SCALE: NONE	PROJECT No.:TYPVXBPLOR	SEQ. No.: N/A	DRAWN: SCF	CHECKED: NDG

APPENDIX G

SANITARY FLOW CALCULATIONS

scs consulting group ltd

SCS consulting group ltd

Sanitary Design Sheet
7370 Centre Road Uxbridge
FSR
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3.65
Minimum Pipe Slope (%) = 0.50

Avg. Domestic Flow (l/cap/day) = 364
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

Project: 7370 Centre Road Uxbridge
Project No. 2099
Date: 12-Dec-22
Designed By: G.M.
Reviewed By: N.D.M.

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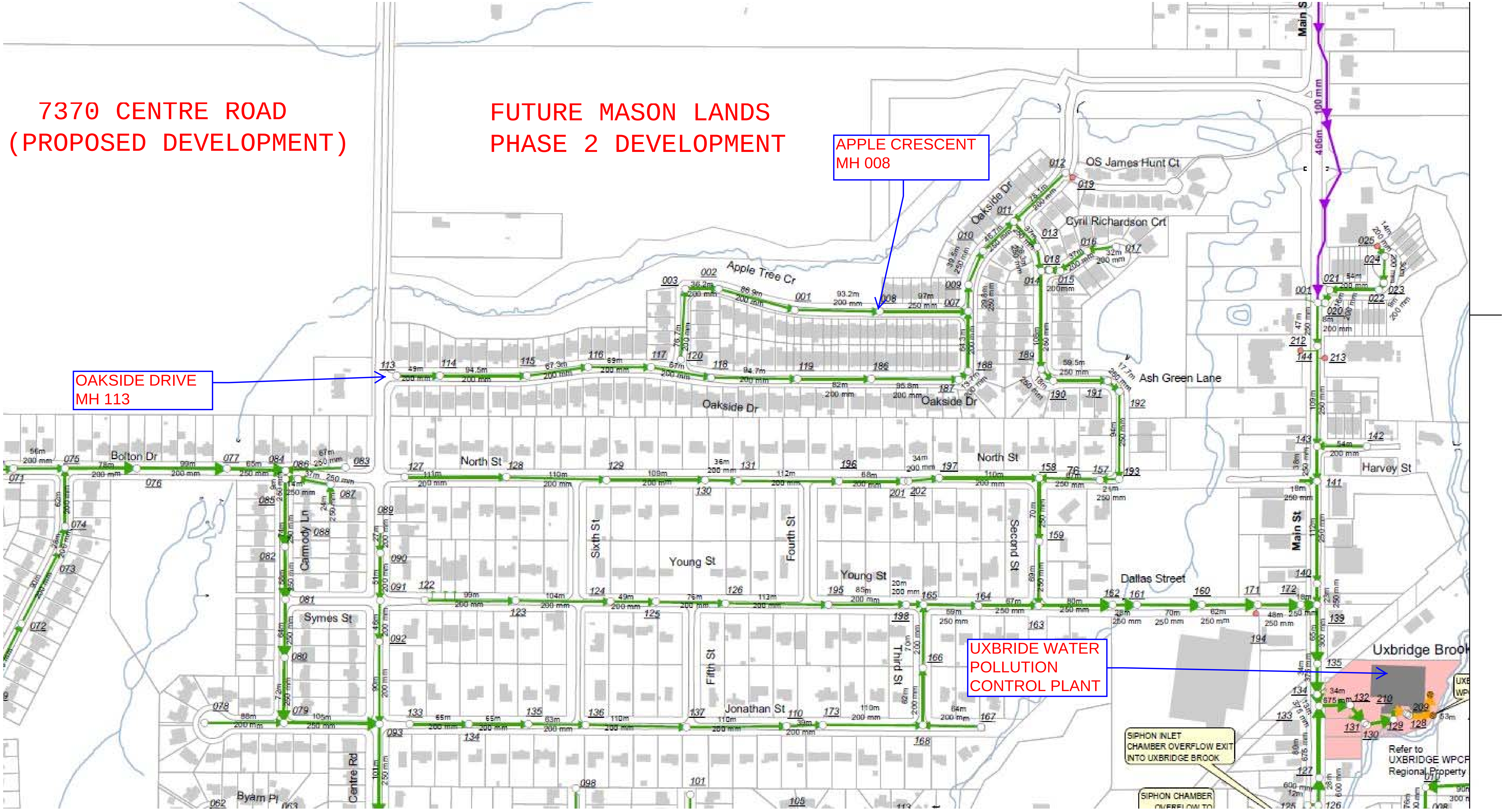
CONFIRM IF MUNICIPALITY REQUIRES
ACTUAL VELOCITY TO BE SHOWN.
HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO	(ha)	(ha)	(#)	PER UNIT (p/unit)	PER HA (p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
Phase 2 - Townhouse	1	3	0	0	60	3		180	180	0	0	0	0	0	0.0	180	0.8	0.8	3.80	2.9	0.0	2.9	297.8	200	0.50	23.2	0.74	0.49
Phase 2 - Single Detached	2	3	23.07	23.07	369	3.5		1291.5	1291.5	0	0	0	0	0	6.0	1291.5	5.4	5.4	3.73	20.3	0.0	26.3	858.2	200	1.00	32.8	1.04	1.16
Total Flow from Phase 2	3	4	0	23.07	0			0	1471.5	0	0	0	0	0	6.0	1471.5	0.0	6.2	3.69	22.8	0.0	28.8	44.8	200	1.50	40.1	1.28	1.39
Phase 1 - Single Detached	4	5	6.13	29.2	95	3.5		332.5	1804	0	0	0	0	0	7.6	1804	1.4	7.6	3.62	27.5	0.0	35.1	345.0	200	1.50	40.1	1.28	1.44



7370 CENTRE ROAD
(PROPOSED DEVELOPMENT)

FUTURE MASON LANDS
PHASE 2 DEVELOPMENT

APPLE CRESCENT
MH 008

OAKSIDE DRIVE
MH 113

UXBRIDE WATER
POLLUTION
CONTROL PLANT

EXCERPT FROM TOWNSHIP OF UXBRIDGE SANITARY SEWERAGE SYSTEM MAP (DATED MARCH 22, 2019)

Sanitary Design Sheet
7370 Centre Road
Option 1 - Phase 1 Proposed Development to Oakside Drive
Uxbridge, Ontario

Minimum Sewer Diameter (mm) =	200	Avg. Domestic Flow (l/cap/day) =	364
Mannings n =	0.013	Infiltration Rate (l/s/ha) =	0.26
Minimum Velocity (m/s) =	0.60	Max. Harmon Peaking Factor =	3.8
Maximum Velocity (m/s) =	3.65	Min. Harmon Peaking Factor =	1.5
Minimum Pipe Slope (%) =	0.50	NOMINAL PIPE SIZE USED	

Project: 7370 Centre Road
Project No. 2099
Date: 12-Dec-22
Designed By: N.D.M.
Reviewed By: 0

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CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO				PER UNIT	PER HA																					
			(ha)	(ha)	(#)	(p/unit)	(p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
7370 Centre Road (Single Detached)	2	MH21A	6.13	6.13	95	3.5		332.5	332.5	0	0	0	0	0	1.6	332.5	1.4	1.4	3.80	5.3	0.0	6.9	345.0	200	2.00	46.4	1.48	1.06
Oakside Drive	MH21A	MH20A	0.54	6.67	6	3.5	38.9	21	353.5	0	0	0	0	0	1.7	353.5	0.1	1.5	3.80	5.7	0.0	7.4	49.0	200	2.00	46.4	1.48	1.08
Oakside Drive	MH20A	MH19A	0.813	7.483	11	3.5454545	48.0	39	392.5	0	0	0	0	0	1.9	392.5	0.2	1.7	3.80	6.3	0.0	8.2	94.5	200	1.10	34.4	1.09	0.89
Oakside Drive	MH19A	MH18A	0.595	8.078	8	3.5	47.1	28	420.5	0	0	0	0	0	2.1	420.5	0.1	1.8	3.80	6.7	0.0	8.8	67.3	200	0.60	25.4	0.81	0.73
Oakside Drive	MH18A	MH17A	0.64	8.718	8	3.5	43.8	28	448.5	0	0	0	0	0	2.3	448.5	0.1	1.9	3.80	7.2	0.0	9.4	69.0	200	0.60	25.4	0.81	0.75
Oakside Drive	MH17A	MH16A	0.474	9.192	5	3.6	38.0	18	466.5	0	0	0	0	0	2.4	466.5	0.1	2.0	3.80	7.5	0.0	9.9	67.4	200	1.92	45.4	1.45	1.14
Oakside Drive	MH16A	MH15A	0.815	10.007	13	3.4615385	55.2	45	511.5	0	0	0	0	0	2.6	511.5	0.2	2.2	3.80	8.2	0.0	10.8	94.7	200	3.68	62.9	2.00	1.50
Oakside Drive	MH15A	MH14A	0.612	10.619	12	3.3333333	65.4	40	551.5	0	0	0	0	0	2.8	551.5	0.2	2.3	3.80	8.8	0.0	11.6	82.0	200	2.93	56.1	1.79	1.39
Oakside Drive	MH14A	MH13A	0.789	11.408	15	3.3333333	63.4	50	601.5	0	0	0	0	0	3.0	601.5	0.2	2.5	3.80	9.6	0.0	12.6	95.8	200	1.24	36.5	1.16	1.05
Oakside Drive	MH13A	MH12A	0.22	11.628	2	3.5	31.8	7	608.5	0	0	0	0	0	3.0	608.5	0.0	2.6	3.80	9.7	0.0	12.8	13.7	200	2.48	51.6	1.64	1.34
Oakside Drive	MH12A	MH11A	0.378	12.006	5	3.6	47.6	18	626.5	0	0	0	0	0	3.1	626.5	0.1	2.6	3.80	10.0	0.0	13.2	64.3	200	0.47	22.5	0.72	0.74
Apple Tree Crescent	MH11-5A	MH11-4A	0.564	0.564	9	3.5555556	56.7	32	32	0	0	0	0	0	0.1	32	0.1	0.1	3.80	0.5	0.0	0.7	76.7	200	3.02	57.0	1.81	0.58
Apple Tree Crescent	MH11-4A	MH11-3A	0	0.564	0			0	32	0	0	0	0	0	0.1	32	0.0	0.1	3.80	0.5	0.0	0.7	36.2	200	1.80	44.0	1.40	0.49
Apple Tree Crescent	MH11-3A	MH11-2A	0.43	0.994	6	3.5	48.8	21	53	0	0	0	0	0	0.3	53	0.1	0.2	3.80	0.8	0.0	1.1	86.9	200	3.40	60.4	1.92	0.72
Apple Tree Crescent	MH11-2A	MH11-1A	0.448	1.442	10	3.2	71.4	32	85	0	0	0	0	0	0.4	85	0.1	0.4	3.80	1.4	0.0	1.7	93.2	200	1.65	42.1	1.34	0.63
Apple Tree Crescent	MH11-1A	MH11A	0.622	2.064	16	3.25	83.6	52	137	0	0	0	0	0	0.5	137	0.2	0.6	3.80	2.2	0.0	2.7	96.8	250	0.43	39.0	0.79	0.44
Oakside Drive	MH11A	MH10A	0.088	14.158	1	4	45.5	4	767.5	0	0	0	0	0	3.7	767.5	0.0	3.2	3.80	12.3	0.0	16.0	29.8	250	0.47	40.7	0.83	0.78
Oakside Drive	MH10A	MHAH14-001	0.33	14.488	5	3.6	54.5	18	785.5	0	0	0	0	0	3.8	785.5	0.1	3.3	3.80	12.6	0.0	16.3	39.5	250	0.46	40.3	0.82	0.78
Oakside Drive	MHAH14-001	MHAH14-001	0.335	14.823	5	3.6	53.7	18	803.5	0	0	0	0	0	3.9	803.5	0.1	3.4	3.80	12.9	0.0	16.7	46.7	250	0.60	46.0	0.94	0.86
Oakside Drive	MHAH14-001	MHAH14-001	0.638	0.638	10	3.5	54.9	35	35	0	0	0	0	0	0.2	35	0.1	0.1	3.80	0.6	0.0	0.7	78.1	200	1.00	32.8	1.04	0.42
Ash Green Lane	MHAH14-001	MH7A	0.098	15.559	0			0	838.5	0	0	0	0	0	4.0	838.5	0.0	3.5	3.80	13.4	0.0	17.5	37.0	250	0.49	41.6	0.85	0.81
Ash Green Lane	MH7A	MH6A	0	15.559	0			0	838.5	0	0	0	0	0	4.0	838.5	0.0	3.5	3.80	13.4	0.0	17.5	26.3	250	0.65	47.9	0.98	0.89
Future Block 110	A5a	MH6A	1.151	1.151	14	4.2857143	52.1	60	60	0	0	0	0	0	0.3	60	0.3	0.3	3.80	1.0	0.0	1.3	12.7	250	0.55	44.1	0.90	0.38
Ash Green Lane	MH6A	MH5A	0.871	17.581	13	3.5384615	52.8	46	944.5	0	0	0	0	0	4.6	944.5	0.2	4.0	3.80	15.1	0.0	19.7	108.2	250	0.48	41.2	0.84	0.82
Ash Green Lane	MH5A	MH4A	0.28	17.861	3	3.6666667	39.3	11	955.5	0	0	0	0	0	4.6	955.5	0.0	4.0	3.80	15.3	0.0	19.9	18.2	250	0.50	42.0	0.86	0.84
Ash Green Lane	MH4A	MH3A	0.284	18.145	3	3.6666667	38.7	11	966.5	0	0	0	0	0	4.7	966.5	0.0	4.1	3.80	15.5	0.0	20.2	59.5	250	0.50	42.0	0.86	0.84
Ash Green Lane	MH3A	MH2A	0	18.145	0			0	966.5	0	0	0	0	0	4.7	966.5	0.0	4.1	3.80	15.5	0.0	20.2	17.7	250	0.62	46.8	0.95	0.91
Ash Green Lane	MH2A	MH1A	0.59	18.735	5	3.6	30.5	18	984.5	0	0	0	0	0	4.9	984.5	0.1	4.1	3.80	15.8	0.0	20.6	94.5	250	0.40	37.6	0.77	0.78
Ash Green Lane	MH1A	EXMH28-61	0	18.735	0			0	984.5	0	0	0	0	0	4.9	984.5	0.0	4.1	3.80	15.8	0.0	20.6	20.6	250	0.50	42.0	0.86	0.85
North Street	EXMH28-61	EXMH28-60	0.7899	19.5249	5	3.5	22.2	17.5	1002	0	0	0	0	0	5.1	1002	0.1	4.2	3.80	16.0	0.0	21.1	76.0	250	0.50	42.0	0.86	0.86
North Street	MHS22	MHS21	1.3566	1.3566	10	3.5	25.8	35	35	0	0	0	0	0	0.4	35	0.1	0.1	3.80	0.6	0.0	0.9	110.0	200	1.00	32.8	1.04	0.44
North Street	MHS21	MHS20	1.228	2.5846	8	3.5	22.8	28	63	0	0	0	0	0	0.7	63	0.1	0.3	3.80	1.0	0.0	1.7	110.0	200	0.50	23.2	0.74	0.43
North Street	MHS20	MHS19	1.1447	3.7293	7	3.5	21.4	24.5	87.5	0	0	0	0	0	1.0	87.5	0.1	0.4	3.80	1.4	0.0	2.4	110.0	200	0.90	31.1	0.99	0.57
North Street	MHS19	MHS18	0.3657	4.095	2	3.5	19.1	7	94.5	0	0	0	0	0	1.1	94.5	0.0	0.4	3.80	1.5	0.0	2.6	35.0	200	1.80	44.0	1.40	0.75
North Street	MHS18	MHS17	1.2374	5.3324	8	3.5	22.6	28	122.5	0	0	0	0	0	1.4	122.5	0.1	0.5	3.80	2.0	0.0	3.3	110.0	200	2.00	46.4	1.48	0.85
North Street	MHS17	MHS16	1.2162	6.5486	8	3.5	23.0	28	150.5	0	0	0	0	0	1.7	150.5	0.1	0.6	3.80	2.4	0.0	4.1	110.0	200	1.00	32.8	1.04	0.70
North Street	MHS16	EXMH28-60	1.2226	7.7712	8	3.5	22.9	28	178.5	0	0	0	0	0	2.0	178.5	0.1	0.8	3.80	2.9	0.0	4.9	110.0	200	1.00	32.8	1.04	0.75
Second Street	EXMH28-60	MH28-73	0.1753	27.4714	1	3.5	20.0	3.5	1184	0	0	0	0	0	7.1	1184	0.0	5.0	3.75	18.7	0.0	25.9	69.8	250	0.71	50.1	1.02	1.02
Second Street	MH28-73	MH28-64	0	27.4714	0	3.5		0	1184	0	0	0	0	0	7.1	1184	0.0	5.0	3.75	18.7	0.0	25.9	69.5	250	0.50	42.0	0.86	0.90
Dallas Street	MH28-64	MH28-65	18.8	46.2714	97	3.5	18.1	339.5	1523.5	0	0	0	0	0	12.0	1523.5	1.4	6.4	3.67	23.6	0.0	35.6	80.0	250	0.69	49.4	1.01	1.09

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Sanitary Design Sheet
7370 Centre Road
Option 1 - Phase 1 Proposed Development to Oakside Drive
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3.65
Minimum Pipe Slope (%) = 0.50

Avg. Domestic Flow (l/cap/day) = 364
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

Project: 7370 Centre Road
Project No. 2099
Date: 12-Dec-22
Designed By: N.D.M.
Reviewed By: 0

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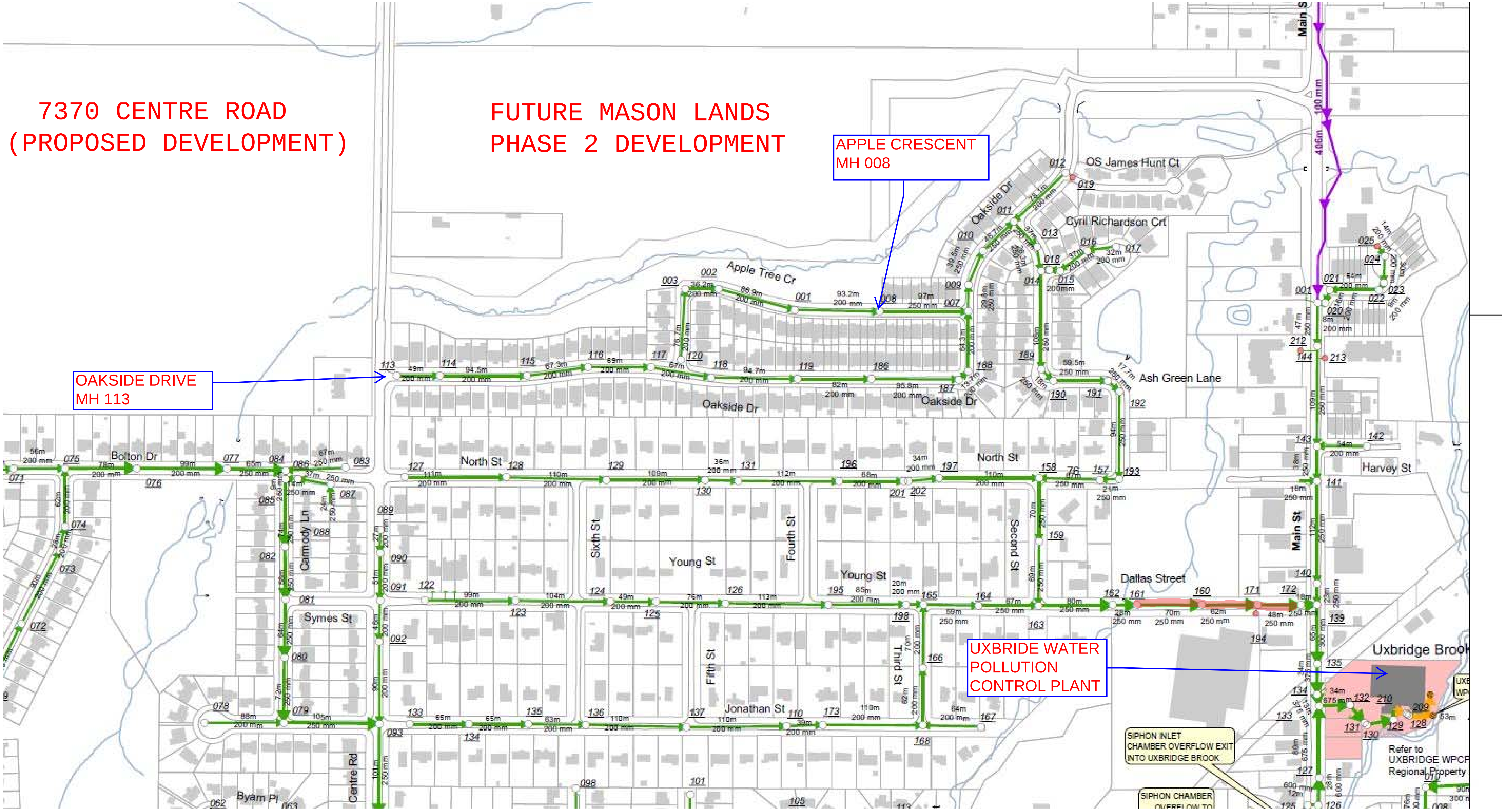
CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO	(ha)	(ha)	(#)	PER UNIT (p/unit)	PER HA (p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
Dallas Street	MH28-65	MH28-66	0	46.2714	0	3.5		0	1523.5	0	0	0	0	0	12.0	1523.5	0.0	6.4	3.67	23.6	0.0	35.6	27.8	250	1.30	67.8	1.38	1.39
Dallas Street	MH28-66	MH28-67	0	46.2714	0	3.5		0	1523.5	0	0	0	0	0	12.0	1523.5	0.0	6.4	3.67	23.6	0.0	35.6	69.8	250	0.32	33.6	0.68	0.78
Dallas Street	MH28-67	MH28-9	0	46.2714	0	3.5		0	1523.5	0	0	0	0	0	12.0	1523.5	0.0	6.4	3.67	23.6	0.0	35.6	61.7	250	0.35	35.2	0.72	0.82
Dallas Street	MH28-9	EXMH28-11	0	46.2714	0	3.5		0	1523.5	0	0	0	0	0	12.0	1523.5	0.0	6.4	3.67	23.6	0.0	35.6	48.3	250	0.22	27.9	UNDER	#VALUE!
Dallas Street	EXMH28-11	EXMH28-12	0	46.2714	0	3.5		0	1523.5	0	0	0	0	0	12.0	1523.5	0.0	6.4	3.67	23.6	0.0	35.6	18.0	250	0.80	53.2	1.08	1.15



OPTION 1 - PHASE 1 PROPOSED DEVELOPMENT TO OAKSIDE DRIVE CAPACITY ANALYSIS

SCS consulting group ltd

Sanitary Design Sheet
7370 Centre Road, Uxbridge, ON
Option 2 - Phase 1 Proposed Development to Mason Lands Phase 2
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3.65
Minimum Pipe Slope (%) = 0.50

Avg. Domestic Flow (l/cap/day) = 364
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

Project: 7370 Centre Road, Uxbridge, ON
Project No. 2099
Date: 20-Dec-22
Designed By: S.S.
Reviewed By: 0

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CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA (ha)	ACCUM. AREA (ha)	UNITS (#)	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA (ha)	ACCUM. AREA (ha)	POPULATION DENSITY (p/ha)	FLOW RATE (l/s/ha)	ACCUM. EQUIV. POPULATION	INFILTRATION (L/s)	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW (L/s)	ACCUM. AVG. DOMESTIC FLOW (L/s)	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW (L/s)	ICI FLOW (L/s)	TOTAL FLOW (L/s)	LENGTH (m)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)
	FROM	TO				PER UNIT (p/unit)	PER HA (p/ha)																					
7370 Centre Road (Single Detached)	2	3	6.13	6.13	95	3.5		332.5	332.5	0	0	0	0	0	1.6	332.5	1.4	1.4	3.80	5.3	0.0	6.9	330.5	200	2.00	46.4	1.48	1.06
Mason Phase 2	3	MH11-1A	12.8	18.93	200	4	62.5	800	1132.5	0	0	0	0	0	4.9	1132.5	3.4	4.8	3.76	18.0	0.0	22.9	9.3	200	2.00	46.4	1.48	1.46
Oakside Drive	MH21A	MH20A	0.54	0.54	6	3.5	38.9	21	21	0	0	0	0	0	0.1	21	0.1	0.1	3.80	0.3	0.0	0.5	49.0	200	2.00	46.4	1.48	0.47
Oakside Drive	MH20A	MH19A	0.813	1.353	11	3.5454545	48.0	39	60	0	0	0	0	0	0.4	60	0.2	0.3	3.80	1.0	0.0	1.3	94.5	200	1.10	34.4	1.09	0.52
Oakside Drive	MH19A	MH18A	0.595	1.948	8	3.5	47.1	28	88	0	0	0	0	0	0.5	88	0.1	0.4	3.80	1.4	0.0	1.9	67.3	200	0.60	25.4	0.81	0.47
Oakside Drive	MH18A	MH17A	0.64	2.588	8	3.5	43.8	28	116	0	0	0	0	0	0.7	116	0.1	0.5	3.80	1.9	0.0	2.5	69.0	200	0.60	25.4	0.81	0.51
Oakside Drive	MH17A	MH16A	0.474	3.062	5	3.6	38.0	18	134	0	0	0	0	0	0.8	134	0.1	0.6	3.80	2.1	0.0	2.9	67.4	200	1.92	45.4	1.45	0.81
Oakside Drive	MH16A	MH15A	0.815	3.877	13	3.4615385	55.2	45	179	0	0	0	0	0	1.0	179	0.2	0.8	3.80	2.9	0.0	3.9	94.7	200	3.68	62.9	2.00	1.08
Oakside Drive	MH15A	MH14A	0.612	4.489	12	3.3333333	65.4	40	219	0	0	0	0	0	1.2	219	0.2	0.9	3.80	3.5	0.0	4.7	82.0	200	2.93	56.1	1.79	1.07
Oakside Drive	MH14A	MH13A	0.789	5.278	15	3.3333333	63.4	50	269	0	0	0	0	0	1.4	269	0.2	1.1	3.80	4.3	0.0	5.7	95.8	200	1.24	36.5	1.16	0.83
Oakside Drive	MH13A	MH12A	0.22	5.498	2	3.5	31.8	7	276	0	0	0	0	0	1.4	276	0.0	1.2	3.80	4.4	0.0	5.8	13.7	200	2.48	51.6	1.64	1.07
Oakside Drive	MH12A	MH11A	0.378	5.876	5	3.6	47.6	18	294	0	0	0	0	0	1.5	294	0.1	1.2	3.80	4.7	0.0	6.2	64.3	200	0.47	22.5	0.72	0.61
Apple Tree Crescent	MH11-5A	MH11-4A	0.564	0.564	9	3.5555556	56.7	32	32	0	0	0	0	0	0.1	32	0.1	0.1	3.80	0.5	0.0	0.7	76.7	200	3.02	57.0	1.81	0.58
Apple Tree Crescent	MH11-4A	MH11-3A	0	0.564	0			0	32	0	0	0	0	0	0.1	32	0.0	0.1	3.80	0.5	0.0	0.7	36.2	200	1.80	44.0	1.40	0.49
Apple Tree Crescent	MH11-3A	MH11-2A	0.43	0.994	6	3.5	48.8	21	53	0	0	0	0	0	0.3	53	0.1	0.2	3.80	0.8	0.0	1.1	86.9	200	3.40	60.4	1.92	0.72
Apple Tree Crescent	MH11-2A	MH11-1A	0.448	1.442	10	3.2	71.4	32	85	0	0	0	0	0	0.4	85	0.1	0.4	3.80	1.4	0.0	1.7	93.2	200	1.65	42.1	1.34	0.63
Apple Tree Crescent	MH11-1A	MH11A	0.622	20.994	16	3.25	83.6	52	1269.5	0	0	0	0	0	5.5	1269.5	0.2	5.3	3.73	20.0	0.0	25.4	96.8	250	0.43	39.0	0.79	0.84
Oakside Drive	MH11A	MH10A	0.088	26.958	1	4	45.5	4	1567.5	0	0	0	0	0	7.0	1567.5	0.0	6.6	3.67	24.2	0.0	31.2	29.8	250	0.47	40.7	0.83	0.91
Oakside Drive	MH10A	MHAH14-001	0.33	27.288	5	3.6	54.5	18	1585.5	0	0	0	0	0	7.1	1585.5	0.1	6.7	3.66	24.5	0.0	31.6	39.5	250	0.46	40.3	0.82	0.91
Oakside Drive	MHAH14-001	MHAH14-001	0.335	27.623	5	3.6	53.7	18	1603.5	0	0	0	0	0	7.2	1603.5	0.1	6.8	3.66	24.7	0.0	31.9	46.7	250	0.60	46.0	0.94	1.01
Oakside Drive	MHAH14-001	MHAH14-001	0.638	0.638	10	3.5	54.9	35	35	0	0	0	0	0	0.2	35	0.1	0.1	3.80	0.6	0.0	0.7	78.1	200	1.00	32.8	1.04	0.42
Ash Green Lane	MHAH14-001	MH7A	0.098	28.359	0			0	1638.5	0	0	0	0	0	7.4	1638.5	0.0	6.9	3.65	25.2	0.0	32.6	37.0	250	0.49	41.6	0.85	0.94
Ash Green Lane	MH7A	MH6A	0	28.359	0			0	1638.5	0	0	0	0	0	7.4	1638.5	0.0	6.9	3.65	25.2	0.0	32.6	26.3	250	0.65	47.9	0.98	1.05
Future Block 110	A5a	MH6A	1.151	1.151	14	4.2857143	52.1	60	60	0	0	0	0	0	0.3	60	0.3	0.3	3.80	1.0	0.0	1.3	12.7	250	0.55	44.1	0.90	0.38
Ash Green Lane	MH6A	MH5A	0.871	30.381	13	3.5384615	52.8	46	1744.5	0	0	0	0	0	7.9	1744.5	0.2	7.3	3.63	26.7	0.0	34.6	108.2	250	0.48	41.2	0.84	0.94
Ash Green Lane	MH5A	MH4A	0.28	30.661	3	3.6666667	39.3	11	1755.5	0	0	0	0	0	8.0	1755.5	0.0	7.4	3.63	26.8	0.0	34.8	18.2	250	0.50	42.0	0.86	0.96
Ash Green Lane	MH4A	MH3A	0.284	30.945	3	3.6666667	38.7	11	1766.5	0	0	0	0	0	8.0	1766.5	0.0	7.4	3.63	27.0	0.0	35.0	59.5	250	0.50	42.0	0.86	0.96
Ash Green Lane	MH3A	MH2A	0	30.945	0			0	1766.5	0	0	0	0	0	8.0	1766.5	0.0	7.4	3.63	27.0	0.0	35.0	17.7	250	0.62	46.8	0.95	1.04
Ash Green Lane	MH2A	MH1A	0.59	31.535	5	3.6	30.5	18	1784.5	0	0	0	0	0	8.2	1784.5	0.1	7.5	3.62	27.2	0.0	35.4	94.5	250	0.40	37.6	0.77	0.87
Ash Green Lane	MH1A	EXMH28-61	0	31.535	0			0	1784.5	0	0	0	0	0	8.2	1784.5	0.0	7.5	3.62	27.2	0.0	35.4	20.6	250	0.50	42.0	0.86	0.96
North Street	EXMH28-61	EXMH28-60	0.7899	32.3249	5	3.5	22.2	17.5	1802	0	0	0	0	0	8.4	1802	0.1	7.6	3.62	27.5	0.0	35.9	76.0	250	0.50	42.0	0.86	0.96
North Street	MHS22	MHS21	1.3566	1.3566	10	3.5	25.8	35	35	0	0	0	0	0	0.4	35	0.1	0.1	3.80	0.6	0.0	0.9	110.0	200	1.00	32.8	1.04	0.44
North Street	MHS21	MHS20	1.228	2.5846	8	3.5	22.8	28	63	0	0	0	0	0	0.7	63	0.1	0.3	3.80	1.0	0.0	1.7	110.0	200	0.50	23.2	0.74	0.43
North Street	MHS20	MHS19	1.1447	3.7293	7	3.5	21.4	24.5	87.5	0	0	0	0	0	1.0	87.5	0.1	0.4	3.80	1.4	0.0	2.4	110.0	200	0.90	31.1	0.99	0.57
North Street	MHS19	MHS18	0.3657	4.095	2	3.5	19.1	7	94.5	0	0	0	0	0	1.1	94.5	0.0	0.4	3.80	1.5	0.0	2.6	35.0	200	1.80	44.0	1.40	0.75
North Street	MHS18	MHS17	1.2374	5.3324	8	3.5	22.6	28	122.5	0	0	0	0	0	1.4	122.5	0.1	0.5	3.80	2.0	0.0	3.3	110.0	200	2.00	46.4	1.48	0.85
North Street	MHS17	MHS16	1.2162	6.5486	8	3.5	23.0	28	150.5	0	0	0	0	0	1.7	150.5	0.1	0.6	3.80	2.4	0.0	4.1	110.0	200	1.00	32.8	1.04	0.70
North Street	MHS16	EXMH28-60	1.2226	7.7712	8	3.5	22.9	28	178.5	0	0	0	0	0	2.0	178.5	0.1	0.8	3.80	2.9	0.0	4.9	110.0	200	1.00	32.8	1.04	0.75
Second Street	EXMH28-60	MH28-73	0.1753	40.2714	1	3.5	20.0	3.5	1984	0	0	0	0	0	10.5	1984	0.0	8.4	3.59	30.0	0.0	40.5	69.8	250	0.71	50.1	1.02	1.13

Sanitary Design Sheet
7370 Centre Road, Uxbridge, ON
Option 2 - Phase 1 Proposed Development to Mason Lands Phase 2
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200 **Avg. Domestic Flow (l/cap/day) =** 364
Mannings n = 0.013 **Infiltration Rate (l/s/ha) =** 0.26
Minimum Velocity (m/s) = 0.60 **Max. Harmon Peaking Factor =** 3.8
Maximum Velocity (m/s) = 3.65 **Min. Harmon Peaking Factor =** 1.5
Minimum Pipe Slope (%) = 0.50 **NOMINAL PIPE SIZE USED**

Project: 7370 Centre Road, Uxbridge, ON
Project No. 2099
Date: 20-Dec-22
Designed By: S.S.
Reviewed By: 0

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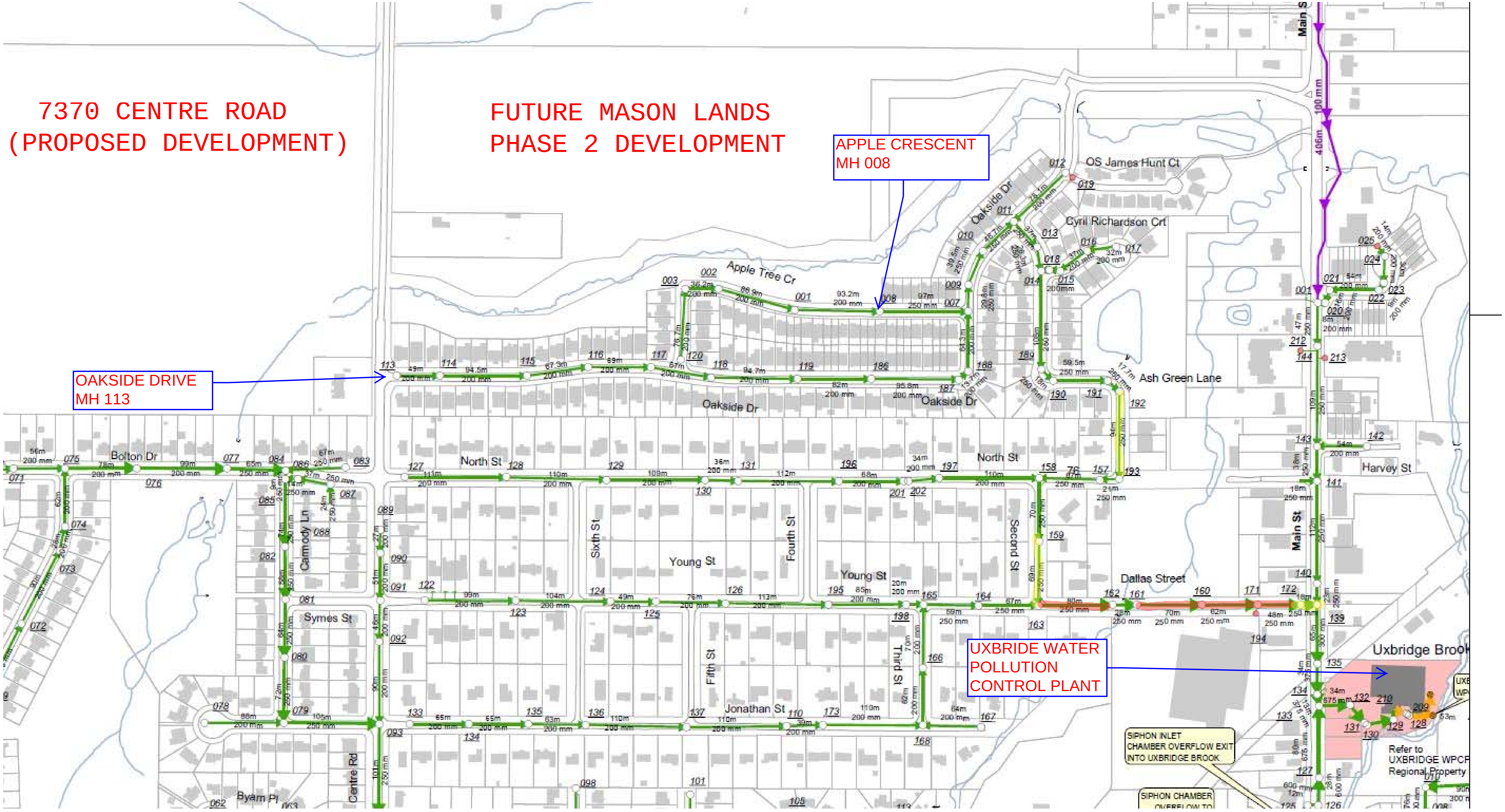
CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO	(ha)	(ha)	(#)	PER UNIT (p/unit)	PER HA (p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
Second Street	MH28-73	MH28-64	0	40.2714	0	3.5		0	1984	0	0	0	0	0	10.5	1984	0.0	8.4	3.59	30.0	0.0	40.5	69.5	250	0.50	42.0	0.86	0.97
Dallas Street	MH28-64	MH28-65	18.8	59.0714	97	3.5	18.1	339.5	2323.5	0	0	0	0	0	15.4	2323.5	1.4	9.8	3.53	34.6	0.0	50.0	80.0	250	0.69	49.4	1.01	1.15
Dallas Street	MH28-65	MH28-66	0	59.0714	0	3.5		0	2323.5	0	0	0	0	0	15.4	2323.5	0.0	9.8	3.53	34.6	0.0	50.0	27.8	250	1.30	67.8	1.38	1.50
Dallas Street	MH28-66	MH28-67	0	59.0714	0	3.5		0	2323.5	0	0	0	0	0	15.4	2323.5	0.0	9.8	3.53	34.6	0.0	50.0	69.8	250	0.32	33.6	0.68	0.78
Dallas Street	MH28-67	MH28-9	0	59.0714	0	3.5		0	2323.5	0	0	0	0	0	15.4	2323.5	0.0	9.8	3.53	34.6	0.0	50.0	61.7	250	0.35	35.2	0.72	0.82
Dallas Street	MH28-9	EXMH28-11	0	59.0714	0	3.5		0	2323.5	0	0	0	0	0	15.4	2323.5	0.0	9.8	3.53	34.6	0.0	50.0	48.3	250	0.22	27.9	UNDER	#VALUE!
Dallas Street	EXMH28-11	EXMH28-12	0	59.0714	0	3.5		0	2323.5	0	0	0	0	0	15.4	2323.5	0.0	9.8	3.53	34.6	0.0	50.0	18.0	250	0.80	53.2	1.08	1.23



OPTION 2 - PHASE 1 PROPOSED DEVELOPMENT TO MASON LANDS PHASE 2 CAPACITY ANALYSIS

Sanitary Design Sheet
7370 Centre Road, Uxbridge, ON
Option 3 - Ultimate Proposed Development to Oakside Drive
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200 **Avg. Domestic Flow (l/cap/day) =** 364
Mannings n = 0.013 **Infiltration Rate (l/s/ha) =** 0.26
Minimum Velocity (m/s) = 0.60 **Max. Harmon Peaking Factor =** 3.8
Maximum Velocity (m/s) = 3.65 **Min. Harmon Peaking Factor =** 1.5
Minimum Pipe Slope (%) = 0.50 **NOMINAL PIPE SIZE USED**

Project: 7370 Centre Road, Uxbridge, ON
Project No. 2099
Date: 20-Dec-22
Designed By: S.S.
Reviewed By: 0

P:\2099 7370 Centre Road Uxbridge\Design\Pipe Design\Sanitary\2022 12(Dec) 05 - FSR Sanitary Design Updated\[2099-Sanitary Design Sheet (Ultimate MDTR Through Oakside).xlsm]Design

CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO				PER UNIT	PER HA																					
			(ha)	(ha)	(#)	(p/unit)	(p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
7370 Centre Road (Townhouse)	1	2	0	0	60	3		180	180	0	0	0	0	0	0.0	180	0.8	0.8	3.80	2.9	0.0	2.9	297.0	200	0.50	23.2	0.74	0.49
7370 Centre Road (Single Detached)	2	MH21A	29.2	29.2	464	3.5		1624	1804	0	0	0	0	0	7.6	1804	6.8	7.6	3.62	27.5	0.0	35.1	858.0	250	0.50	42.0	0.86	0.96
Oakside Drive	MH21A	MH20A	0.54	29.74	6	3.5	38.9	21	1825	0	0	0	0	0	7.7	1825	0.1	7.7	3.62	27.8	0.0	35.5	49.0	200	2.00	46.4	1.48	1.62
Oakside Drive	MH20A	MH19A	0.813	30.553	11	3.5454545	48.0	39	1864	0	0	0	0	0	7.9	1864	0.2	7.9	3.61	28.3	0.0	36.3	94.5	200	1.10	34.4	1.09	1.25
Oakside Drive	MH19A	MH18A	0.595	31.148	8	3.5	47.1	28	1892	0	0	0	0	0	8.1	1892	0.1	8.0	3.60	28.7	0.0	36.8	67.3	200	0.60	25.4	0.81	0.92
Oakside Drive	MH18A	MH17A	0.64	31.788	8	3.5	43.8	28	1920	0	0	0	0	0	8.3	1920	0.1	8.1	3.60	29.1	0.0	37.4	69.0	200	0.60	25.4	0.81	0.92
Oakside Drive	MH17A	MH16A	0.474	32.262	5	3.6	38.0	18	1938	0	0	0	0	0	8.4	1938	0.1	8.2	3.60	29.4	0.0	37.8	67.4	200	1.92	45.4	1.45	1.61
Oakside Drive	MH16A	MH15A	0.815	33.077	13	3.4615385	55.2	45	1983	0	0	0	0	0	8.6	1983	0.2	8.4	3.59	30.0	0.0	38.6	94.7	200	3.68	62.9	2.00	2.09
Oakside Drive	MH15A	MH14A	0.612	33.689	12	3.3333333	65.4	40	2023	0	0	0	0	0	8.8	2023	0.2	8.5	3.58	30.5	0.0	39.3	82.0	200	2.93	56.1	1.79	1.93
Oakside Drive	MH14A	MH13A	0.789	34.478	15	3.3333333	63.4	50	2073	0	0	0	0	0	9.0	2073	0.2	8.7	3.57	31.2	0.0	40.2	95.8	200	1.24	36.5	1.16	1.32
Oakside Drive	MH13A	MH12A	0.22	34.698	2	3.5	31.8	7	2080	0	0	0	0	0	9.0	2080	0.0	8.8	3.57	31.3	0.0	40.3	13.7	200	2.48	51.6	1.64	1.81
Oakside Drive	MH12A	MH11A	0.378	35.076	5	3.6	47.6	18	2098	0	0	0	0	0	9.1	2098	0.1	8.8	3.57	31.6	0.0	40.7	64.3	200	0.47	22.5	0.72	0.82
Apple Tree Crescent	MH11-5A	MH11-4A	0.564	0.564	9	3.5555556	56.7	32	32	0	0	0	0	0	0.1	32	0.1	0.1	3.80	0.5	0.0	0.7	76.7	200	3.02	57.0	1.81	0.58
Apple Tree Crescent	MH11-4A	MH11-3A	0	0.564	0			0	32	0	0	0	0	0	0.1	32	0.0	0.1	3.80	0.5	0.0	0.7	36.2	200	1.80	44.0	1.40	0.49
Apple Tree Crescent	MH11-3A	MH11-2A	0.43	0.994	6	3.5	48.8	21	53	0	0	0	0	0	0.3	53	0.1	0.2	3.80	0.8	0.0	1.1	86.9	200	3.40	60.4	1.92	0.72
Apple Tree Crescent	MH11-2A	MH11-1A	0.448	1.442	10	3.2	71.4	32	85	0	0	0	0	0	0.4	85	0.1	0.4	3.80	1.4	0.0	1.7	93.2	200	1.65	42.1	1.34	0.63
Apple Tree Crescent	MH11-1A	MH11A	0.622	2.064	16	3.25	83.6	52	137	0	0	0	0	0	0.5	137	0.2	0.6	3.80	2.2	0.0	2.7	96.8	250	0.43	39.0	0.79	0.44
Oakside Drive	MH11A	MH10A	0.088	37.228	1	4	45.5	4	2239	0	0	0	0	0	9.7	2239	0.0	9.4	3.55	33.5	0.0	43.1	29.8	250	0.47	40.7	0.83	0.95
Oakside Drive	MH10A	MHAH14-001	0.33	37.558	5	3.6	54.5	18	2257	0	0	0	0	0	9.8	2257	0.1	9.5	3.54	33.7	0.0	43.5	39.5	250	0.46	40.3	0.82	0.94
Oakside Drive	MHAH14-001	MHAH14-001	0.335	37.893	5	3.6	53.7	18	2275	0	0	0	0	0	9.9	2275	0.1	9.6	3.54	33.9	0.0	43.8	46.7	250	0.60	46.0	0.94	1.07
Oakside Drive	MHAH14-001	MHAH14-001	0.638	0.638	10	3.5	54.9	35	35	0	0	0	0	0	0.2	35	0.1	0.1	3.80	0.6	0.0	0.7	78.1	200	1.00	32.8	1.04	0.42
Ash Green Lane	MHAH14-001	MH7A	0.098	38.629	0			0	2310	0	0	0	0	0	10.0	2310	0.0	9.7	3.54	34.4	0.0	44.5	37.0	250	0.49	41.6	0.85	0.97
Ash Green Lane	MH7A	MH6A	0	38.629	0			0	2310	0	0	0	0	0	10.0	2310	0.0	9.7	3.54	34.4	0.0	44.5	26.3	250	0.65	47.9	0.98	1.11
Future Block 110	A5a	MH6A	1.151	1.151	14	4.2857143	52.1	60	60	0	0	0	0	0	0.3	60	0.3	0.3	3.80	1.0	0.0	1.3	12.7	250	0.55	44.1	0.90	0.38
Ash Green Lane	MH6A	MH5A	0.871	40.651	13	3.5384615	52.8	46	2416	0	0	0	0	0	10.6	2416	0.2	10.2	3.52	35.8	0.0	46.4	108.2	250	0.48	41.2	0.84	0.96
Ash Green Lane	MH5A	MH4A	0.28	40.931	3	3.6666667	39.3	11	2427	0	0	0	0	0	10.6	2427	0.0	10.2	3.52	36.0	0.0	46.6	18.2	250	0.50	42.0	0.86	0.98
Ash Green Lane	MH4A	MH3A	0.284	41.215	3	3.6666667	38.7	11	2438	0	0	0	0	0	10.7	2438	0.0	10.3	3.52	36.1	0.0	46.8	59.5	250	0.50	42.0	0.86	0.98
Ash Green Lane	MH3A	MH2A	0	41.215	0			0	2438	0	0	0	0	0	10.7	2438	0.0	10.3	3.52	36.1	0.0	46.8	17.7	250	0.62	46.8	0.95	1.09
Ash Green Lane	MH2A	MH1A	0.59	41.805	5	3.6	30.5	18	2456	0	0	0	0	0	10.9	2456	0.1	10.3	3.51	36.4	0.0	47.2	94.5	250	0.40	37.6	0.77	0.87
Ash Green Lane	MH1A	EXMH28-61	0	41.805	0			0	2456	0	0	0	0	0	10.9	2456	0.0	10.3	3.51	36.4	0.0	47.2	20.6	250	0.50	42.0	0.86	0.98
North Street	EXMH28-61	EXMH28-60	0.7899	42.5949	5	3.5	22.2	17.5	2473.5	0	0	0	0	0	11.1	2473.5	0.1	10.4	3.51	36.6	0.0	47.7	76.0	250	0.50	42.0	0.86	0.98
North Street	MHS22	MHS21	1.3566	1.3566	10	3.5	25.8	35	35	0	0	0	0	0	0.4	35	0.1	0.1	3.80	0.6	0.0	0.9	110.0	200	1.00	32.8	1.04	0.44
North Street	MHS21	MHS20	1.228	2.5846	8	3.5	22.8	28	63	0	0	0	0	0	0.7	63	0.1	0.3	3.80	1.0	0.0	1.7	110.0	200	0.50	23.2	0.74	0.43
North Street	MHS20	MHS19	1.1447	3.7293	7	3.5	21.4	24.5	87.5	0	0	0	0	0	1.0	87.5	0.1	0.4	3.80	1.4	0.0	2.4	110.0	200	0.90	31.1	0.99	0.57
North Street	MHS19	MHS18	0.3657	4.095	2	3.5	19.1	7	94.5	0	0	0	0	0	1.1	94.5	0.0	0.4	3.80	1.5	0.0	2.6	35.0	200	1.80	44.0	1.40	0.75
North Street	MHS18	MHS17	1.2374	5.3324	8	3.5	22.6	28	122.5	0	0	0	0	0	1.4	122.5	0.1	0.5	3.80	2.0	0.0	3.3	110.0	200	2.00	46.4	1.48	0.85
North Street	MHS17	MHS16	1.2162	6.5486	8	3.5	23.0	28	150.5	0	0	0	0	0	1.7	150.5	0.1	0.6	3.80	2.4	0.0	4.1	110.0	200	1.00	32.8	1.04	0.70
North Street	MHS16	EXMH28-60	1.2226	7.7712	8	3.5	22.9	28	178.5	0	0	0	0	0	2.0	178.5	0.1	0.8	3.80	2.9	0.0	4.9	110.0	200	1.00	32.8	1.04	0.75
Second Street	EXMH28-60	MH28-73	0.1753	50.5414	1	3.5	20.0	3.5	2655.5	0	0	0	0	0	13.1	2655.5	0.0	11.2	3.49	39.0	0.0	52.2	69.8	250	0.71	50.1	1.02	1.16
Second Street	MH28-73	MH28-64	0	50.5414	0	3.5		0	2655.5	0	0	0	0	0	13.1	2655.5	0.0	11.2	3.49	39.0	0.0	52.2	69.5	250	0.50	42.0	0.86	0.98

SCS consulting group ltd

Sanitary Design Sheet
7370 Centre Road, Uxbridge, ON
Option 3 - Ultimate Proposed Development to Oakside Drive
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3.65
Minimum Pipe Slope (%) = 0.50

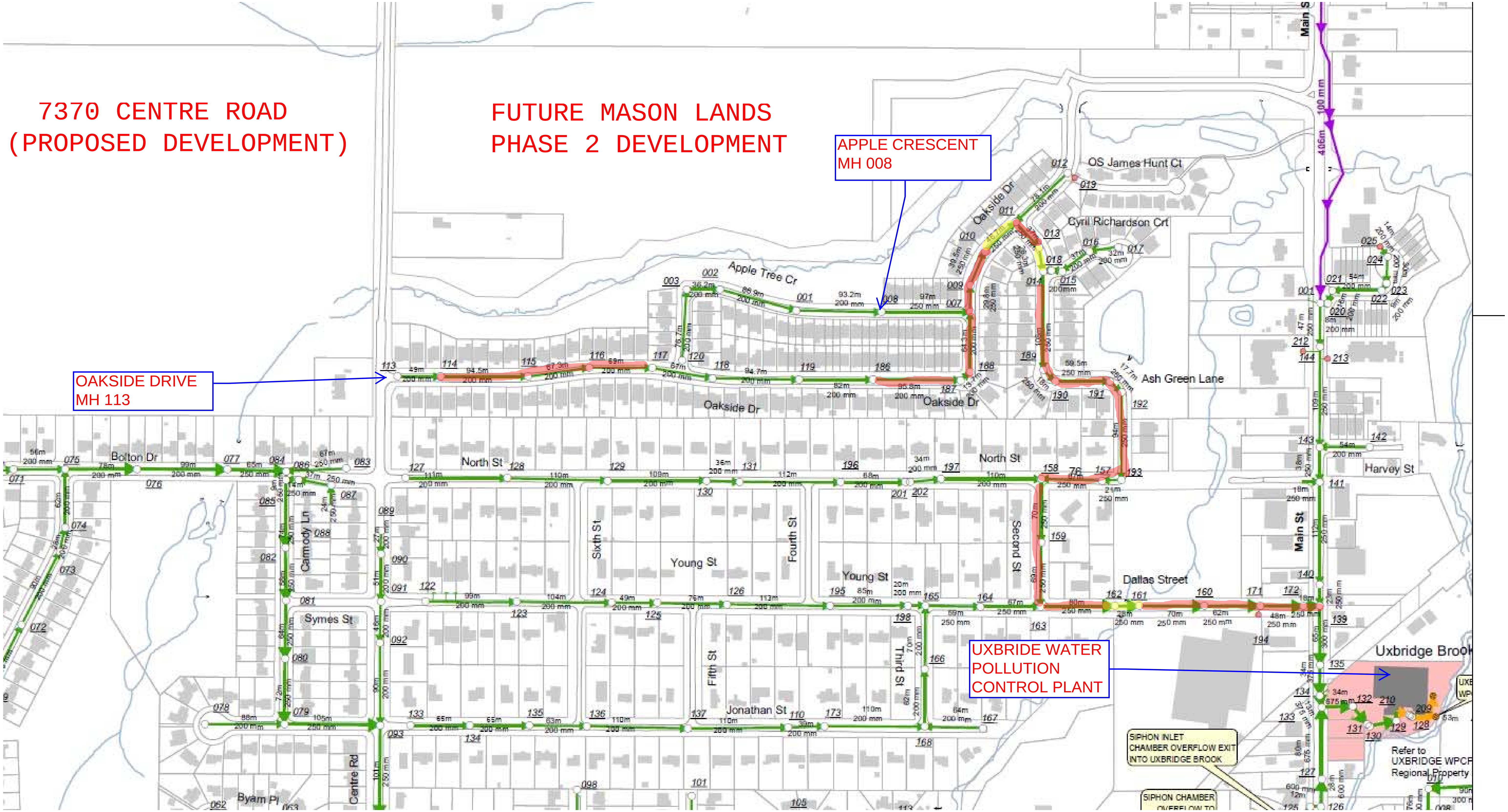
Avg. Domestic Flow (l/cap/day) = 364
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

Project: 7370 Centre Road, Uxbridge, ON
Project No. 2099
Date: 20-Dec-22
Designed By: S.S.
Reviewed By: 0

P:\2099 7370 Centre Road Uxbridge\Design\Pipe Design\Sanitary\2022 12(Dec) 05 - FSR Sanitary Design Updated\[2099-Sanitary Design Sheet (Ultimate MDTR Through Oakside).xlsm]Design

CONFIRM IF MUNICIPALITY REQUIRES
ACTUAL VELOCITY TO BE SHOWN.
HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO	(ha)	(ha)	(#)	PER UNIT (p/unit)	PER HA (p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
Dallas Street	MH28-64	MH28-65	18.8	69.3414	97	3.5	18.1	339.5	2995	0	0	0	0	0	18.0	2995	1.4	12.6	3.44	43.4	0.0	61.5	80.0	250	0.69	49.4	1.01	1.15
Dallas Street	MH28-65	MH28-66	0	69.3414	0	3.5		0	2995	0	0	0	0	0	18.0	2995	0.0	12.6	3.44	43.4	0.0	61.5	27.8	250	1.30	67.8	1.38	1.56
Dallas Street	MH28-66	MH28-67	0	69.3414	0	3.5		0	2995	0	0	0	0	0	18.0	2995	0.0	12.6	3.44	43.4	0.0	61.5	69.8	250	0.32	33.6	0.68	0.78
Dallas Street	MH28-67	MH28-9	0	69.3414	0	3.5		0	2995	0	0	0	0	0	18.0	2995	0.0	12.6	3.44	43.4	0.0	61.5	61.7	250	0.35	35.2	0.72	0.82
Dallas Street	MH28-9	EXMH28-11	0	69.3414	0	3.5		0	2995	0	0	0	0	0	18.0	2995	0.0	12.6	3.44	43.4	0.0	61.5	48.3	250	0.22	27.9	UNDER	#VALUE!
Dallas Street	EXMH28-11	EXMH28-12	0	69.3414	0	3.5		0	2995	0	0	0	0	0	18.0	2995	0.0	12.6	3.44	43.4	0.0	61.5	18.0	250	0.80	53.2	1.08	1.23



7370 CENTRE ROAD
(PROPOSED DEVELOPMENT)

FUTURE MASON LANDS
PHASE 2 DEVELOPMENT

APPLE CRESCENT
MH 008

OAKSIDE DRIVE
MH 113

UXBRIDE WATER
POLLUTION
CONTROL PLANT

OPTION 3 - ULTIMATE PROPOSED DEVELOPMENT TO
OAKSIDE DRIVE CAPACITY ANALYSIS

Sanitary Design Sheet
7370 Centre Road, Uxbridge, ON
Option 4 - Ultimate Proposed Development to Mason Lands Phase 2
Uxbridge, Ontario

SCS consulting group ltd

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3.65
Minimum Pipe Slope (%) = 0.50

Avg. Domestic Flow (l/cap/day) = 364
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

Project: 7370 Centre Road, Uxbridge, ON
Project No. 2099
Date: 20-Dec-22
Designed By: S.S.
Reviewed By: 0

P:\2099 7370 Centre Road Uxbridge\Design\Pipe Design\Sanitary\2022 12(Dec) 05 - FSR Sanitary Design Updated\[2099-Sanitary Design Sheet (Ultimate MDTR Through Mason Phase 2).xlsm]Design

CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA	ACCUM. AREA	UNITS	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA	ACCUM. AREA	POPULATION DENSITY	FLOW RATE	ACCUM. EQUIV. POPULATION	INFILTRATION	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW	ACCUM. AVG. DOMESTIC FLOW	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW	ICI FLOW	TOTAL FLOW	LENGTH	PIPE DIAMETER	SLOPE	FULL FLOW CAPACITY	FULL FLOW VELOCITY	ACTUAL VELOCITY
	FROM	TO	(ha)	(ha)	(#)	PER UNIT (p/unit)	PER HA (p/ha)			(ha)	(ha)	(p/ha)	(l/s/ha)		(L/s)		(L/s)	(L/s)		(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(L/s)	(m/s)	(m/s)
7370 Centre Road (Townhouse)	1	2	0	0	60	3		180	180	0	0	0	0	0	0.0	180	0.8	0.8	3.80	2.9	0.0	2.9	297.0	200	0.50	23.2	0.74	0.49
7370 Centre Road (Single Detached)	2	3	29.2	29.2	464	3.5		1624	1804	0	0	0	0	0	7.6	1804	6.8	7.6	3.62	27.5	0.0	35.1	858.0	200	2.00	46.4	1.48	1.62
Mason Phase 2	3	MH11-1A	12.8	42	200	4	62.5	800	2604	0	0	0	0	0	10.9	2604	3.4	11.0	3.49	38.3	0.0	49.3	9.3	250	2.00	84.1	1.71	1.78
Oakside Drive	MH21A	MH20A	0.54	0.54	6	3.5	38.9	21	21	0	0	0	0	0	0.1	21	0.1	0.1	3.80	0.3	0.0	0.5	49.0	200	2.00	46.4	1.48	0.47
Oakside Drive	MH20A	MH19A	0.813	1.353	11	3.5454545	48.0	39	60	0	0	0	0	0	0.4	60	0.2	0.3	3.80	1.0	0.0	1.3	94.5	200	1.10	34.4	1.09	0.52
Oakside Drive	MH19A	MH18A	0.595	1.948	8	3.5	47.1	28	88	0	0	0	0	0	0.5	88	0.1	0.4	3.80	1.4	0.0	1.9	67.3	200	0.60	25.4	0.81	0.47
Oakside Drive	MH18A	MH17A	0.64	2.588	8	3.5	43.8	28	116	0	0	0	0	0	0.7	116	0.1	0.5	3.80	1.9	0.0	2.5	69.0	200	0.60	25.4	0.81	0.51
Oakside Drive	MH17A	MH16A	0.474	3.062	5	3.6	38.0	18	134	0	0	0	0	0	0.8	134	0.1	0.6	3.80	2.1	0.0	2.9	67.4	200	1.92	45.4	1.45	0.81
Oakside Drive	MH16A	MH15A	0.815	3.877	13	3.4615385	55.2	45	179	0	0	0	0	0	1.0	179	0.2	0.8	3.80	2.9	0.0	3.9	94.7	200	3.68	62.9	2.00	1.08
Oakside Drive	MH15A	MH14A	0.612	4.489	12	3.3333333	65.4	40	219	0	0	0	0	0	1.2	219	0.2	0.9	3.80	3.5	0.0	4.7	82.0	200	2.93	56.1	1.79	1.07
Oakside Drive	MH14A	MH13A	0.789	5.278	15	3.3333333	63.4	50	269	0	0	0	0	0	1.4	269	0.2	1.1	3.80	4.3	0.0	5.7	95.8	200	1.24	36.5	1.16	0.83
Oakside Drive	MH13A	MH12A	0.22	5.498	2	3.5	31.8	7	276	0	0	0	0	0	1.4	276	0.0	1.2	3.80	4.4	0.0	5.8	13.7	200	2.48	51.6	1.64	1.07
Oakside Drive	MH12A	MH11A	0.378	5.876	5	3.6	47.6	18	294	0	0	0	0	0	1.5	294	0.1	1.2	3.80	4.7	0.0	6.2	64.3	200	0.47	22.5	0.72	0.61
Apple Tree Crescent	MH11-5A	MH11-4A	0.564	0.564	9	3.5555556	56.7	32	32	0	0	0	0	0	0.1	32	0.1	0.1	3.80	0.5	0.0	0.7	76.7	200	3.02	57.0	1.81	0.58
Apple Tree Crescent	MH11-4A	MH11-3A	0	0.564	0			0	32	0	0	0	0	0	0.1	32	0.0	0.1	3.80	0.5	0.0	0.7	36.2	200	1.80	44.0	1.40	0.49
Apple Tree Crescent	MH11-3A	MH11-2A	0.43	0.994	6	3.5	48.8	21	53	0	0	0	0	0	0.3	53	0.1	0.2	3.80	0.8	0.0	1.1	86.9	200	3.40	60.4	1.92	0.72
Apple Tree Crescent	MH11-2A	MH11-1A	0.448	1.442	10	3.2	71.4	32	85	0	0	0	0	0	0.4	85	0.1	0.4	3.80	1.4	0.0	1.7	93.2	200	1.65	42.1	1.34	0.63
Apple Tree Crescent	MH11-1A	MH11A	0.622	44.064	16	3.25	83.6	52	2741	0	0	0	0	0	11.5	2741	0.2	11.5	3.48	40.1	0.0	51.6	96.8	250	0.43	39.0	0.79	0.91
Oakside Drive	MH11A	MH10A	0.088	50.028	1	4	45.5	4	3039	0	0	0	0	0	13.0	3039	0.0	12.8	3.44	44.0	0.0	57.0	29.8	250	0.47	40.7	0.83	0.95
Oakside Drive	MH10A	MHAH14-001	0.33	50.358	5	3.6	54.5	18	3057	0	0	0	0	0	13.1	3057	0.1	12.9	3.44	44.2	0.0	57.3	39.5	250	0.46	40.3	0.82	0.94
Oakside Drive	MHAH14-001	MHAH14-001	0.335	50.693	5	3.6	53.7	18	3075	0	0	0	0	0	13.2	3075	0.1	13.0	3.43	44.5	0.0	57.7	46.7	250	0.60	46.0	0.94	1.07
Oakside Drive	MHAH14-001	MHAH14-001	0.638	0.638	10	3.5	54.9	35	35	0	0	0	0	0	0.2	35	0.1	0.1	3.80	0.6	0.0	0.7	78.1	200	1.00	32.8	1.04	0.42
Ash Green Lane	MHAH14-001	MH7A	0.098	51.429	0			0	3110	0	0	0	0	0	13.4	3110	0.0	13.1	3.43	44.9	0.0	58.3	37.0	250	0.49	41.6	0.85	0.97
Ash Green Lane	MH7A	MH6A	0	51.429	0			0	3110	0	0	0	0	0	13.4	3110	0.0	13.1	3.43	44.9	0.0	58.3	26.3	250	0.65	47.9	0.98	1.11
Future Block 110	A5a	MH6A	1.151	1.151	14	4.2857143	52.1	60	60	0	0	0	0	0	0.3	60	0.3	0.3	3.80	1.0	0.0	1.3	12.7	250	0.55	44.1	0.90	0.38
Ash Green Lane	MH6A	MH5A	0.871	53.451	13	3.5384615	52.8	46	3216	0	0	0	0	0	13.9	3216	0.2	13.5	3.42	46.3	0.0	60.2	108.2	250	0.48	41.2	0.84	0.96
Ash Green Lane	MH5A	MH4A	0.28	53.731	3	3.6666667	39.3	11	3227	0	0	0	0	0	14.0	3227	0.0	13.6	3.42	46.4	0.0	60.4	18.2	250	0.50	42.0	0.86	0.98
Ash Green Lane	MH4A	MH3A	0.284	54.015	3	3.6666667	38.7	11	3238	0	0	0	0	0	14.0	3238	0.0	13.6	3.41	46.6	0.0	60.6	59.5	250	0.50	42.0	0.86	0.98
Ash Green Lane	MH3A	MH2A	0	54.015	0			0	3238	0	0	0	0	0	14.0	3238	0.0	13.6	3.41	46.6	0.0	60.6	17.7	250	0.62	46.8	0.95	1.09
Ash Green Lane	MH2A	MH1A	0.59	54.605	5	3.6	30.5	18	3256	0	0	0	0	0	14.2	3256	0.1	13.7	3.41	46.8	0.0	61.0	94.5	250	0.40	37.6	0.77	0.87
Ash Green Lane	MH1A	EXMH28-61	0	54.605	0			0	3256	0	0	0	0	0	14.2	3256	0.0	13.7	3.41	46.8	0.0	61.0	20.6	250	0.50	42.0	0.86	0.98
North Street	EXMH28-61	EXMH28-60	0.7899	55.3949	5	3.5	22.2	17.5	3273.5	0	0	0	0	0	14.4	3273.5	0.1	13.8	3.41	47.0	0.0	61.4	76.0	250	0.50	42.0	0.86	0.98
North Street	MHS22	MHS21	1.3566	1.3566	10	3.5	25.8	35	35	0	0	0	0	0	0.4	35	0.1	0.1	3.80	0.6	0.0	0.9	110.0	200	1.00	32.8	1.04	0.44
North Street	MHS21	MHS20	1.228	2.5846	8	3.5	22.8	28	63	0	0	0	0	0	0.7	63	0.1	0.3	3.80	1.0	0.0	1.7	110.0	200	0.50	23.2	0.74	0.43
North Street	MHS20	MHS19	1.1447	3.7293	7	3.5	21.4	24.5	87.5	0	0	0	0	0	1.0	87.5	0.1	0.4	3.80	1.4	0.0	2.4	110.0	200	0.90	31.1	0.99	0.57
North Street	MHS19	MHS18	0.3657	4.095	2	3.5	19.1	7	94.5	0	0	0	0	0	1.1	94.5	0.0	0.4	3.80	1.5	0.0	2.6	35.0	200	1.80	44.0	1.40	0.75
North Street	MHS18	MHS17	1.2374	5.3324	8	3.5	22.6	28	122.5	0	0	0	0	0	1.4	122.5	0.1	0.5	3.80	2.0	0.0	3.3	110.0	200	2.00	46.4	1.48	0.85
North Street	MHS17	MHS16	1.2162	6.5486	8	3.5	23.0	28	150.5	0	0	0	0	0	1.7	150.5	0.1	0.6	3.80	2.4	0.0	4.1	110.0	200	1.00	32.8	1.04	0.70
North Street	MHS16	EXMH28-60	1.2226	7.7712	8	3.5	22.9	28	178.5	0	0	0	0	0	2.0	178.5	0.1	0.8	3.80	2.9	0.0	4.9	110.0	200	1.00	32.8	1.04	0.75

Sanitary Design Sheet
7370 Centre Road, Uxbridge, ON
Option 4 - Ultimate Proposed Development to Mason Lands Phase 2
Uxbridge, Ontario

Minimum Sewer Diameter (mm) = 200
Mannings n = 0.013
Minimum Velocity (m/s) = 0.60
Maximum Velocity (m/s) = 3.65
Minimum Pipe Slope (%) = 0.50

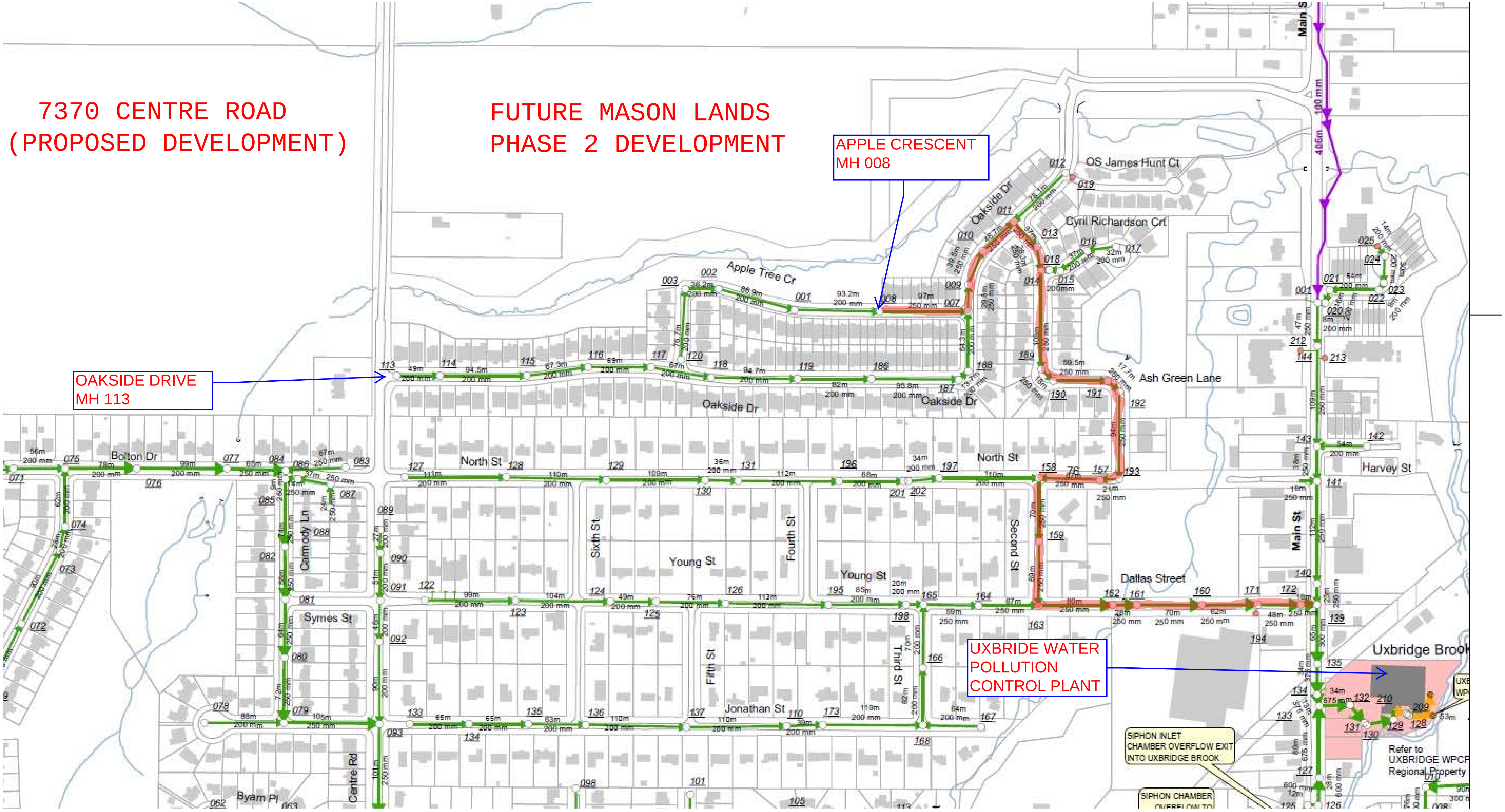
Avg. Domestic Flow (l/cap/day) = 364
Infiltration Rate (l/s/ha) = 0.26
Max. Harmon Peaking Factor = 3.8
Min. Harmon Peaking Factor = 1.5
NOMINAL PIPE SIZE USED

Project: 7370 Centre Road, Uxbridge, ON
Project No. 2099
Date: 20-Dec-22
Designed By: S.S.
Reviewed By: 0

P:\2099 7370 Centre Road Uxbridge\Design\Pipe Design\Sanitary\2022 12(Dec) 05 - FSR Sanitary Design Updated\[2099-Sanitary Design Sheet (Ultimate MDTR Through Mason Phase 2).xlsm]Design

CONFIRM IF MUNICIPALITY REQUIRES ACTUAL VELOCITY TO BE SHOWN. HIDE COLUMN IF NOT REQUIRED

LOCATION			RESIDENTIAL							INDUSTRIAL/COMMERCIAL/INSTITUTIONAL					FLOW CALCULATIONS								PIPE DATA					
STREET	MANHOLE		AREA (ha)	ACCUM. AREA (ha)	UNITS (#)	DENSITY		RESIDENTIAL POPULATION	ACCUM. RESIDENTIAL POPULATION	AREA (ha)	ACCUM. AREA (ha)	POPULATION DENSITY (p/ha)	FLOW RATE (l/s/ha)	ACCUM. EQUIV. POPULATION	INFILTRATION (L/s)	TOTAL ACCUM. POPULATION	AVG. DOMESTIC FLOW (L/s)	ACCUM. AVG. DOMESTIC FLOW (L/s)	PEAKING FACTOR	PEAKED RESIDENTIAL FLOW (L/s)	ICI FLOW (L/s)	TOTAL FLOW (L/s)	LENGTH (m)	PIPE DIAMETER (mm)	SLOPE (%)	FULL FLOW CAPACITY (L/s)	FULL FLOW VELOCITY (m/s)	ACTUAL VELOCITY (m/s)
	FROM	TO				PER UNIT (p/unit)	PER HA (p/ha)																					
Second Street	EXMH28-60	MH28-73	0.1753	63.3414	1	3.5	20.0	3.5	3455.5	0	0	0	0	0	16.5	3455.5	0.0	14.6	3.39	49.3	0.0	65.8	69.8	250	0.71	50.1	1.02	1.16
Second Street	MH28-73	MH28-64	0	63.3414	0	3.5		0	3455.5	0	0	0	0	0	16.5	3455.5	0.0	14.6	3.39	49.3	0.0	65.8	69.5	250	0.50	42.0	0.86	0.98
Dallas Street	MH28-64	MH28-65	18.8	82.1414	97	3.5	18.1	339.5	3795	0	0	0	0	0	21.4	3795	1.4	16.0	3.35	53.6	0.0	75.0	80.0	250	0.69	49.4	1.01	1.15
Dallas Street	MH28-65	MH28-66	0	82.1414	0	3.5		0	3795	0	0	0	0	0	21.4	3795	0.0	16.0	3.35	53.6	0.0	75.0	27.8	250	1.30	67.8	1.38	1.57
Dallas Street	MH28-66	MH28-67	0	82.1414	0	3.5		0	3795	0	0	0	0	0	21.4	3795	0.0	16.0	3.35	53.6	0.0	75.0	69.8	250	0.32	33.6	0.68	0.78
Dallas Street	MH28-67	MH28-9	0	82.1414	0	3.5		0	3795	0	0	0	0	0	21.4	3795	0.0	16.0	3.35	53.6	0.0	75.0	61.7	250	0.35	35.2	0.72	0.82
Dallas Street	MH28-9	EXMH28-11	0	82.1414	0	3.5		0	3795	0	0	0	0	0	21.4	3795	0.0	16.0	3.35	53.6	0.0	75.0	48.3	250	0.22	27.9	UNDER	#VALUE!
Dallas Street	EXMH28-11	EXMH28-12	0	82.1414	0	3.5		0	3795	0	0	0	0	0	21.4	3795	0.0	16.0	3.35	53.6	0.0	75.0	18.0	250	0.80	53.2	1.08	1.23



OPTION 4 - ULTIMATE PROPOSED DEVELOPMENT TO MASON LANDS PHASE 2 CAPACITY ANALYSIS

APPENDIX H

WATER DISTRIBUTION ANALYSIS

SCS consulting group ltd

TECHNICAL MEMORANDUM

To: Nick McIntosh, P.Eng - SCS Consulting Group
From: Kristin St-Jean, P.Eng - Municipal Engineering Solutions
Date: February 1, 2023
Project: 17002-91
Re: 7370 Centre Road, Uxbridge
Hydraulic Analysis – Water Distribution Options

Please find attached some water distribution alternative strategies for the proposed 7370 Centre Road Development in the Township of Uxbridge. These are conceptual servicing strategies, showing the feasibility of water service for the development. The alternatives were developed using a hydraulic model that was created using the results of the hydrant tests performed by the Region in November 2020.

Demands

The calculated demands for the development were updated based on the most recent site layout, which includes 464 single family homes and 60 townhouses. The total demands for the development are summarized in **Table 1**. A minimum required Fire Flow of 75 L/s (4,500 L/min) was used in the analysis.

Table 1 – Water Demands

	Average Day Demand (L/s)	Minimum Hour Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
Zone 2	7.63	3.44	17.21	25.80
Zone 1	1.79	0.82	4.06	6.06
TOTAL	9.42	4.26	21.27	31.86

Zone 1 Servicing

The Zone boundary was placed in the eastern portion of the development at an elevation of approximately 300 m, at the intersection of Street A and Street B. Pressures in the proposed Zone 1 area are within the required system pressures (275-700 kPa). The portion of Street A between Street D and Street B will be serviced from Zone 2. The zone boundary in the model is preliminary and the actual zone boundary will be determined once more detailed modelling has been completed and in consultation with the Region.

Zone 2 Servicing Alternatives

The elevation range in the western portion of the development is beyond the current service elevations for Zone 2 (337.0 m vs 330 m). This leads to pressures below 275 kPa (40 psi) for elevations exceeding 331.5 m. It has already been determined that additional pumping capacity will be required for Zone 2 to service this development (Quaker Hill PS). The current target HGL of the Quaker Hill PS is 360 m. The hydrant test indicated that the current HGL of Zone 2 was approximately 362 m.

By upgrading the existing pumps at Quaker Hill PS for capacity only (HGL remains the same) the service pressure at the highest point in the development (337.0 m) is shown to be approximately 214 kPa (31 psi).

Several servicing alternatives for the western portion of the proposed development are described below:

Option 1 – Raise HGL of Zone 2

Upgrade the Quaker Hill (Zone 2) PS to raise the Hydraulic Grade Line (HGL) of Zone 2 from 360 m to 366 m. This would increase pressures within Zone 2 by approximately 60 kPa (9 psi) in all existing areas.

As part of this servicing strategy, three (3) pressure reducing valves (PRVs) could be installed on existing watermains within the Zone 2 serviced area to maintain current service pressures for existing areas. The PRVs would be placed to maintain pressures below 550 kPa as required by the Ontario Building Code. PRVs would be located on Bolton Drive, on the south feed from the PS, and within the new development (see schematic attached).

Key Points:

- Requires pump upgrades to the Quaker Hill (Zone 2) PS
- Requires 3 PRVs
- Creates a Zone 2 Reduced pressure district.
- HGL of Zone 2 would be raised from 360 m to approximately 366 m.

Additional alternatives:

- The PRVs have been placed on the watermains to minimize disruptions to existing areas, however individual PRVs could be placed on the services to each unit where pressure are expected to exceed 550 kPa (80 psi) at fixture.

Option 2 – Booster Pump Station

Upgrade Quaker Hill (Zone 2) PS and build a second booster pump station for the low pressure areas of Zone 2, just east of 6th Concession. Booster pump station would be located within the proposed development.

Key Points:

- Requires upgrades to the Quaker Hill PS and the construction of a second pumping station.
- Creates a boosted Zone 2A pressure district.
- The redundant supply to the boosted area of the development would be provided from Zone 2 at a lower service pressure.

Additional alternatives:

- Booster pump station could be located on Concession 6.

Option 3 – Dedicated Pumping Station

Leave the Quaker Hill (Zone 2) PS as is and build a new Water Pumping Station to service the entirety of the higher pressure zone for the proposed development area. The new Pumping Station could be built on Quaker Village Drive within the development, fed from Zone 1 watermains at Quaker Village Drive and Bolton Drive. Alternatively, if space permits the new pumping station could be built on the existing Quaker Hill Reservoir and PS site, and feed the development through a new watermain on Concession 6.

Key Points:

- Service pressures in existing areas remain as is
- Proposed development area is serviced (boosted) from Zone 1 watermains
- Creates a Zone 3 pressure district.
- A redundant supply to the development could be provided from a Zone 2 bypass (with trickle valve to maintain water quality) around the Zone 3 pumping station, at a lower service pressure.

Additional alternatives:

- The dedicated pumping station could be located on the existing Pumping Station and Reservoir site if space permits, feeding the development along Concession 6.

Option 4 – Lowering the Development

An additional option to service the development may be to regrade the development, if possible, so that serviced elevations do not exceed 330 m and can be serviced by Zone 2. This option would require significant grading as there is a difference of 5-7 m along the west side of the development, along Concession 6. This alternative would limit road access/egress opportunities to Concession 6 due to the significant grade differences that would be required along the west property limit.

Other Considerations

Due to the size of this development and the servicing constraints identified, it is recommended that modelling be completed with the Region's complete water model of the Township. The recommended servicing strategy for this development should take into account pressure variations not captured by the hydrant tests as well as the typical operation of the Township's water system.

Fire flow requirements for this development must be confirmed with the Township/Region. Preliminary results show that the estimated fire flow available is quite low and may be lower than ultimately required by the Township/Region.

Future pumping capacity requirements, storage and water allocation were not investigated as part of this analysis.

File Location: C:\Users\krist\Documents\Projects\17002-91 7370 Centre Road Uxbridge\5.0 Report\Tech memo January 2023\Centre Road Uxbridge TM_Water System Options_20230201.docx

Attachments:

Water Demands
Existing System
Option 1 (Raise HGL of Zone 2)
Option 2 (Booster Pump Station)
Option 3 (Dedicated Pumping Station)

Water Demand
7370 Center Road Development, Uxbridge
January 2023

Municipal Engineering Solutions

Zone 2 Demands

Node	Type of Development		Equivalent Population	Demands			
	Single/Semi	Townhouse	Total Population	Avg Day	Min Hour	Max Day	Peak Hour
	(units)	*(units)*	*(Residential)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*
J-13	*9*		32	0.16	0.07	0.36	0.54
J-14	*16*		56	0.29	0.13	0.65	0.98
J-15	*4*		14	0.07	0.03	0.16	0.24
J-16	*8*		28	0.15	0.07	0.34	0.51
J-17	*9*		32	0.16	0.07	0.36	0.54
J-18			0	0.00	0.00	0.00	0.00
J-21	*16*		56	0.29	0.13	0.65	0.98
J-22	*12*		42	0.22	0.10	0.50	0.74
J-29	*11*		39	0.20	0.09	0.45	0.68
J-30	*12*		42	0.22	0.10	0.50	0.74
J-31	*17*		60	0.31	0.14	0.70	1.05
J-32	*21*		74	0.38	0.17	0.86	1.28
J-33		16	48	0.25	0.11	0.56	0.85
J-34	*6*		21	0.11	0.05	0.25	0.37
J-35	*6*		21	0.11	0.05	0.25	0.37
J-36	*6*		21	0.11	0.05	0.25	0.37
J-37	*19*		67	0.35	0.16	0.79	1.18
J-38	*7*		25	0.13	0.06	0.29	0.44
J-39	*8*		28	0.15	0.07	0.34	0.51
J-40	*8*		28	0.15	0.07	0.34	0.51
J-41	*8*		28	0.15	0.07	0.34	0.51
J-42	*21*		74	0.38	0.17	0.86	1.28
J-43	*20*		70	0.36	0.16	0.81	1.22
J-44	*9*		32	0.16	0.07	0.36	0.54
J-45	*21*		74	0.38	0.17	0.86	1.28
J-46	*24*		84	0.44	0.20	0.99	1.49
J-47	*18*		63	0.33	0.15	0.74	1.12
J-67	*8*		28	0.15	0.07	0.34	0.51
J-68		30	90	0.47	0.21	1.06	1.59
J-69		14	42	0.22	0.10	0.50	0.74
J-70	*16*		56	0.29	0.13	0.65	0.98
J-71	*11*		39	0.20	0.09	0.45	0.68
J-72	*16*		56	0.29	0.13	0.65	0.98
TOTAL	**367**	**60**	**1465**	**7.63**	**3.44**	**17.21**	**25.80**

Water Demand
7370 Center Road Development, Uxbridge
January 2023

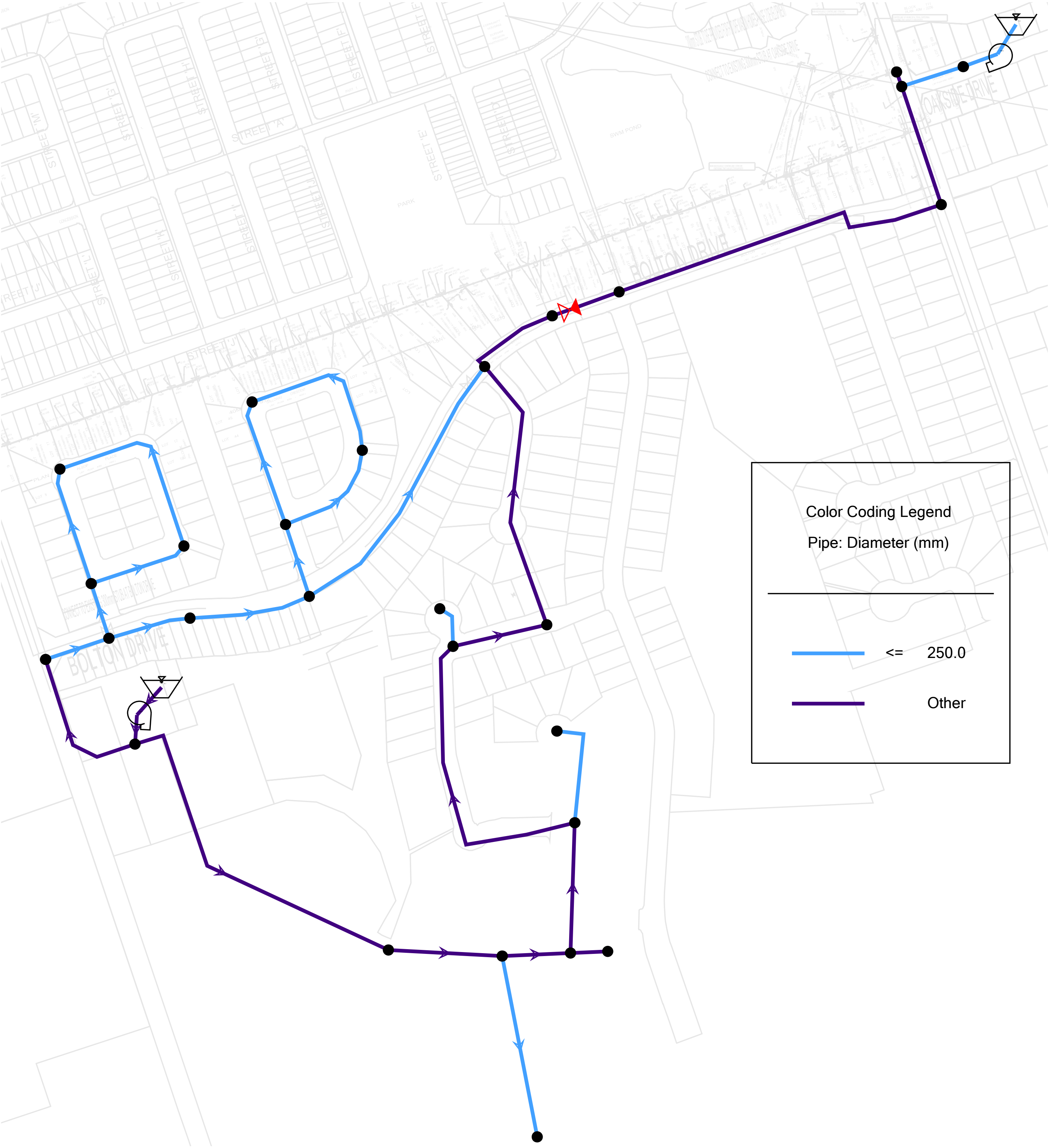
Municipal Engineering Solutions

Zone 1 Demands

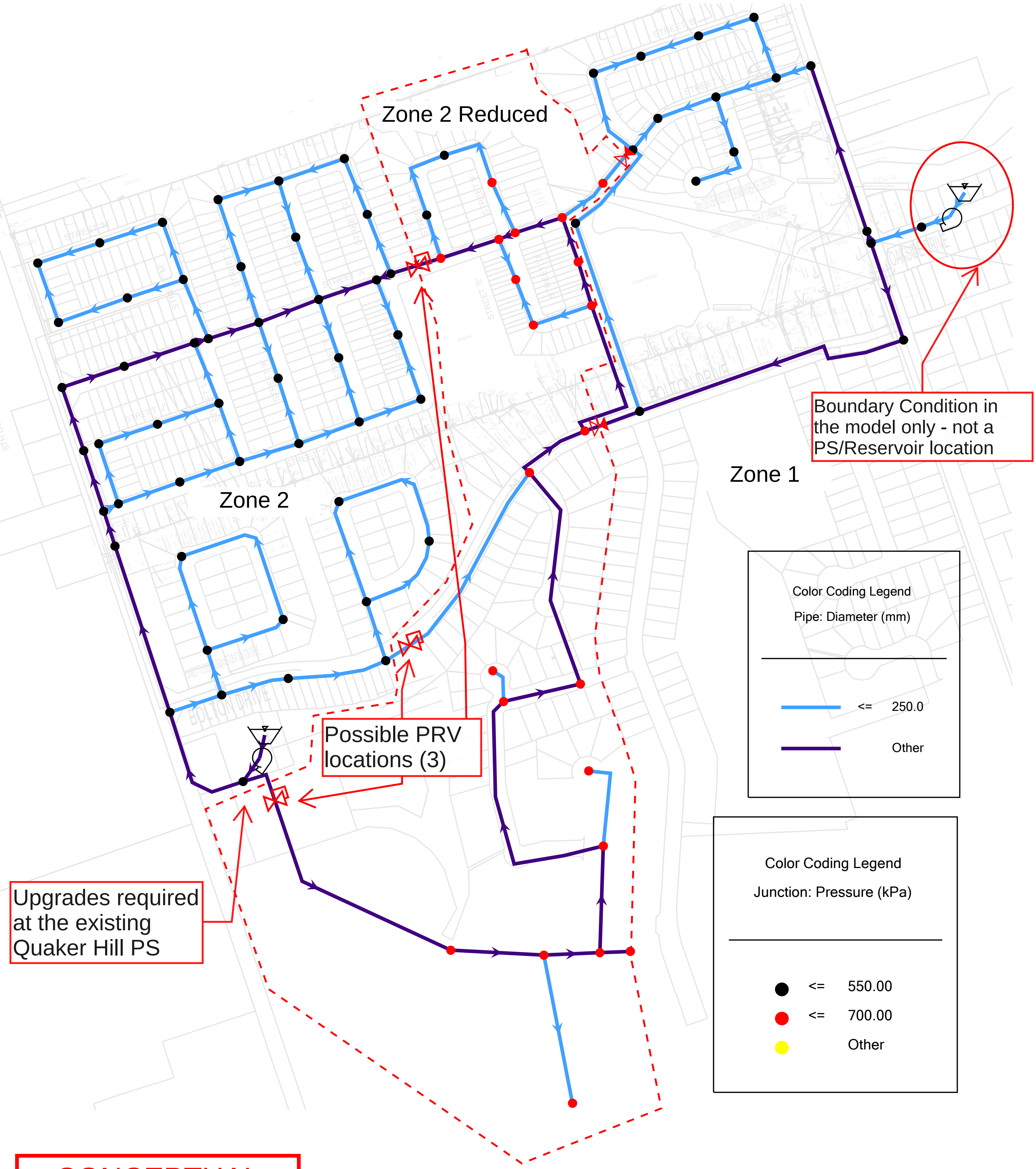
Node	Type of Development		Equivalent Population	Demands			
	Single/Semi	Townhouse	Total Population	Avg Day	Min Hour	Max Day	Peak Hour
	(units)	*(units)*	*(Residential)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*
J-50	8		28	0.15	0.07	0.34	0.51
J-51	12		42	0.22	0.10	0.50	0.74
J-52	8		28	0.15	0.07	0.34	0.51
J-55	10		35	0.18	0.08	0.41	0.61
J-56	8		28	0.15	0.07	0.34	0.51
J-57	14		49	0.26	0.12	0.59	0.88
J-58	14		49	0.26	0.12	0.59	0.88
J-59	13		46	0.24	0.11	0.54	0.81
J-53	10		35	0.18	0.08	0.41	0.61
TOTAL	**97**	**0**	**340**	**1.79**	**0.82**	**4.06**	**6.06**

	Type of Development		Equivalent Population	Demands			
	Single/Semi	Townhouse	Total Population	Avg Day	Min Hour	Max Day	Peak Hour
	(units)	*(units)*	*(Residential)*	*(L/s)*	*(L/s)*	*(L/s)*	*(L/s)*
TOTAL	**464**	**60**	**1804**	**9.42**	**4.26**	**21.27**	**31.86**

Existing System



Scenario: Option 1 (Raise HGL of Zone 2)



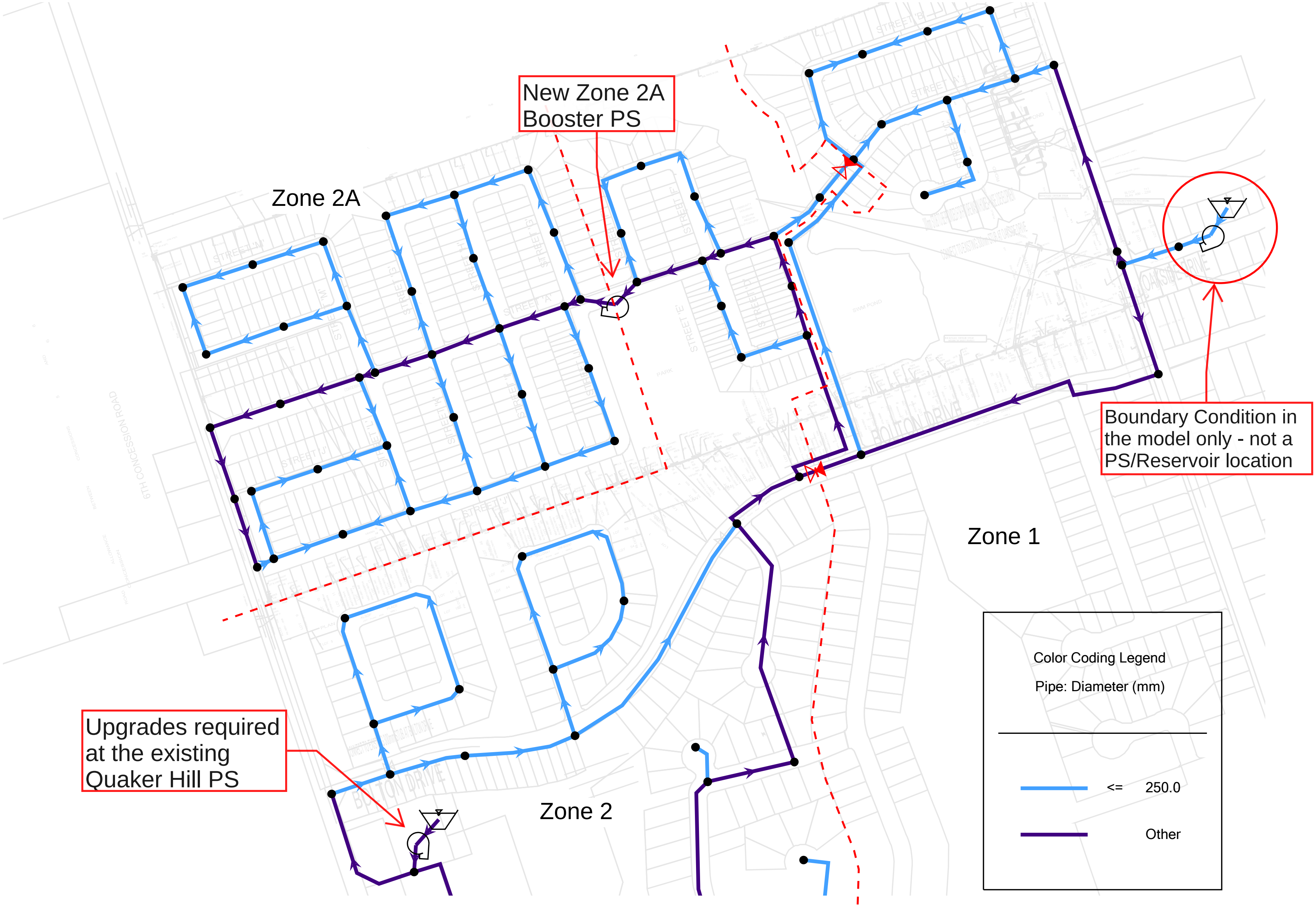
Boundary Condition in the model only - not a PS/Reservoir location

Possible PRV locations (3)

Upgrades required at the existing Quaker Hill PS

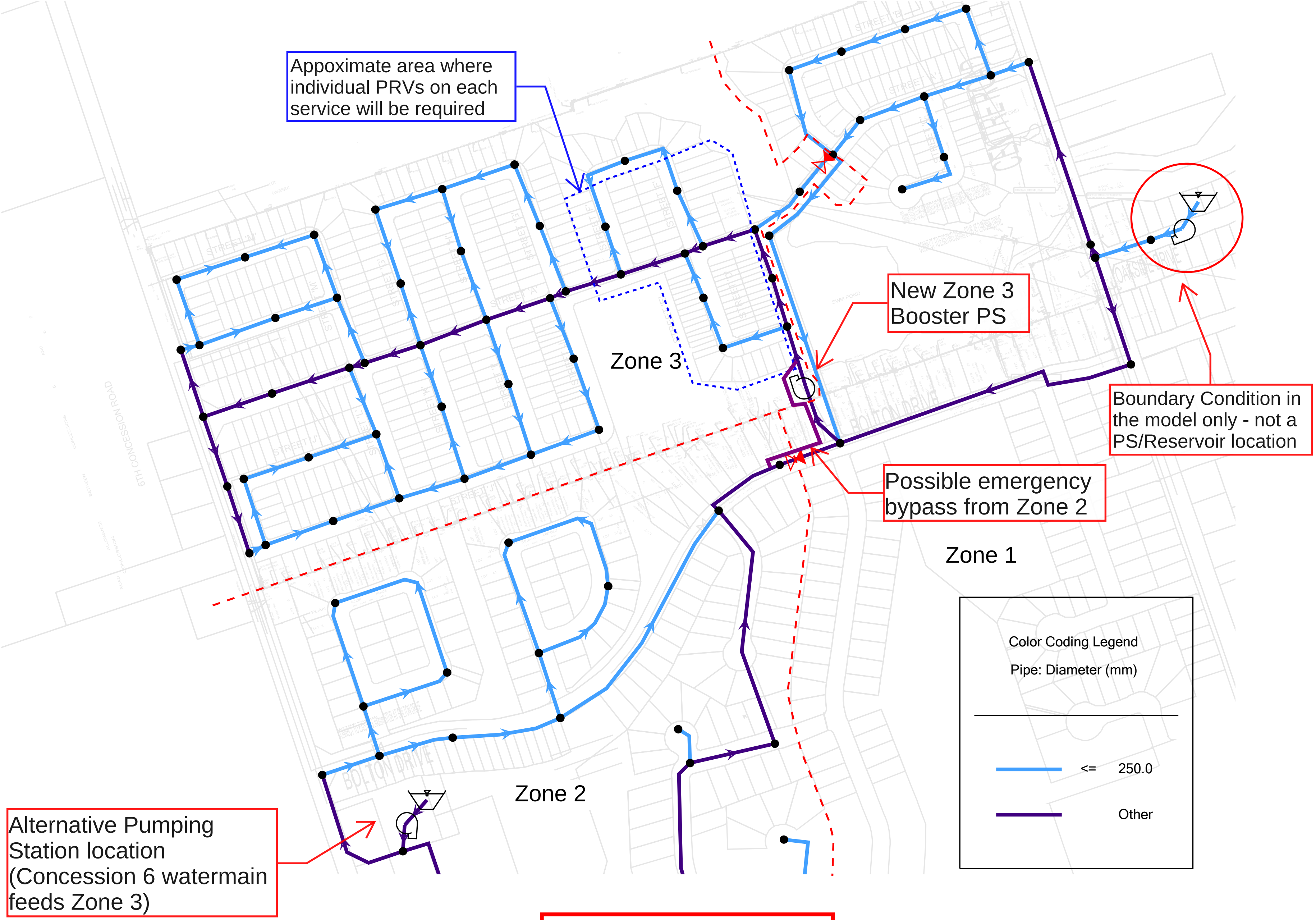
CONCEPTUAL

Scenario: Option 2 (Booster Pump Station)



CONCEPTUAL

Scenario: Option 3 (Dedicated Pumping Station)



Appoximate area where individual PRVs on each service will be required

New Zone 3 Booster PS

Boundary Condition in the model only - not a PS/Reservoir location

Possible emergency bypass from Zone 2

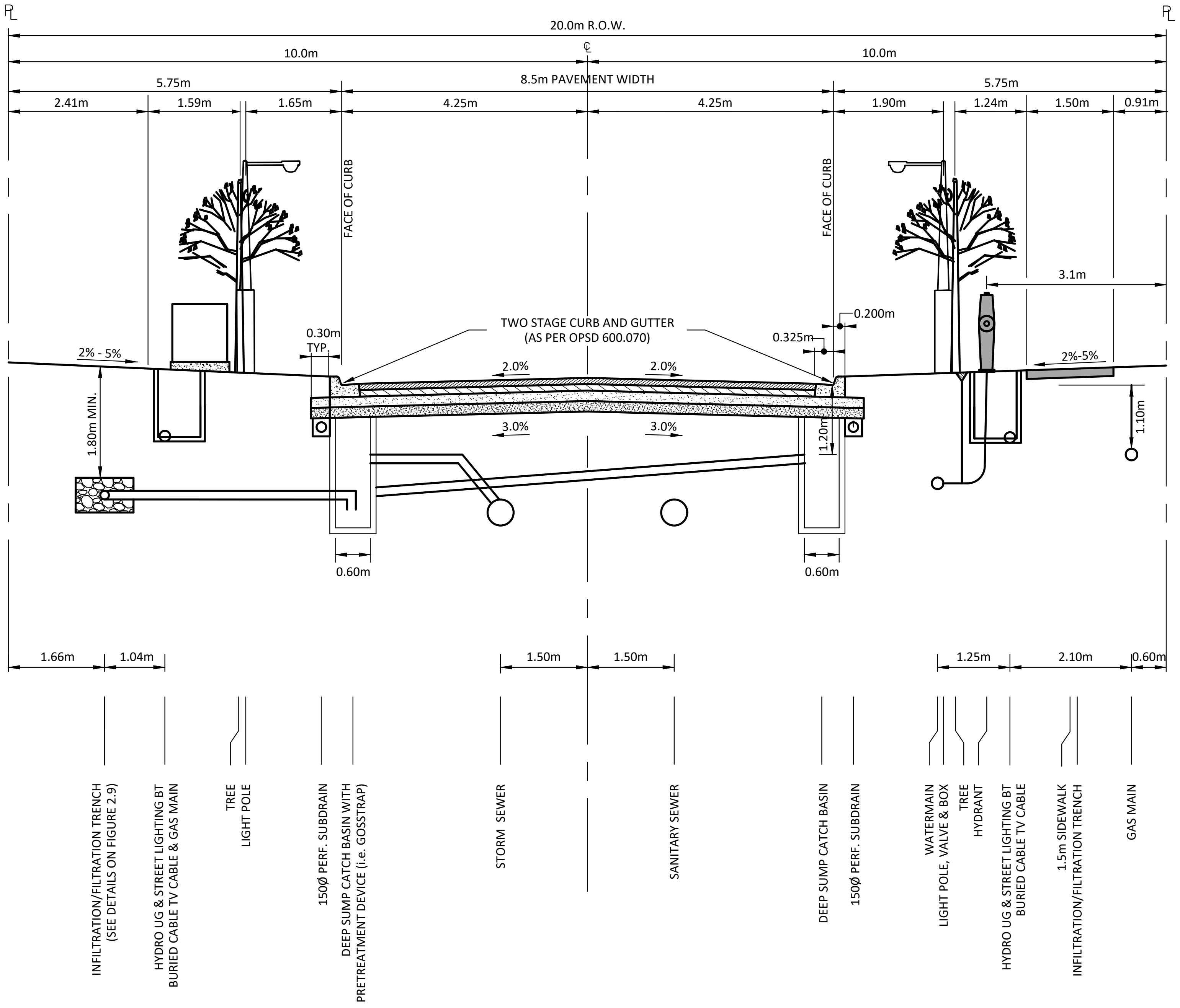
Alternative Pumping Station location (Concession 6 watermain feeds Zone 3)

CONCEPTUAL

APPENDIX I

RIGHT-OF-WAY CONCEPTS

SCS consulting group ltd



*NOTE: LAYOUT IS SCHEMATIC ONLY, DETAILS TO BE PROVIDED AT DETAILED DESIGN STAGE.

FSSR

LEGEND:

7370 CENTRE ROAD UXBRIDGE

MODIFIED URBAN RESIDENTIAL MAJOR
LOCAL 20m R.O.W.

SCS consulting group ltd
30 CENTURIAN DRIVE, SUITE 100
MARKHAM, ONTARIO L3R 8B8
TEL: (905) 475-1900
FAX: (905) 475-8335

DESIGNED BY:	N.D.M.	CHECKED BY:	L.C.M.
SCALE:	1:100	DATE:	DECEMBER 2022

PROJECT No: 2099

FIGURE No: I.1

File: P:\2099 7370 Centre Road Uxbridge\Drawings\FSP\Fig\Report Figures\2099P-XSEC-I.1.dwg – Revised by <GMURRIA> : Wed, Dec 21 2022 – 10:24am

SCS Consulting Group Ltd
30 Centurian Drive, Suite 100
Markham, ON, L3R 8B8
Phone 905 475 1900
Fax 905 475 8335

BEACON
ENVIRONMENTAL
GUIDING SOLUTIONS IN THE NATURAL ENVIRONMENT

February 3, 2023 BEL 217431.1

Mr. John Spina
Bridge Brook Corp.
7681 Highway 27 (Unit 16)
Woodbridge, ON L4L 4M5

Re: 7370 Centre Road Geomorphic Assessment, Uxbridge Brook Tributary; Township of Uxbridge, Regional Municipality of Durham

Dear Mr. Spina:

Beacon Environmental Limited (Beacon) was retained by Bridge Brook Corporation to undertake a geomorphic assessment for the property located at 7370 Centre Road (Part of Lot 33, Concession 6), in the Township of Uxbridge, Regional Municipality of Durham ('subject property'; **Figure 1**). The subject property is approximately 40.2 hectares in area and extends between 6th Concession Road and Centre Road.

The subject property is located within the Protected Countryside – Towns and Villages lands of the Greenbelt Plan area, and is therefore, subject to the corresponding policies of the Greenbelt Plan as well as the Regional Municipality of Durham and Township of Uxbridge Official Plans and Lake Simcoe Region Conservation Authority (LSRCA) regulations. Two tributaries of Uxbridge Brook traverse the subject property.

Beacon (2021) previously completed a geomorphic assessment for the tributary of Uxbridge Brook that traverses the southeast corner of the subject property to inform the determination of environmental constraint limits. Following the submission of the development application submission, which included the Beacon (2021) geomorphic assessment, LSRCA issued the following comment:

> *Please demonstrate the proposed limits to development are outside LSRCA's meanderbelt delineation (not including the setback) for the watercourse running diagonally through the site from north to south. Alternatively, a meanderbelt width analysis can be conducted. A 6m access allowance will need to be included in addition to the results from this analysis.*

As such, the purpose of this geomorphic assessment is to characterize existing conditions along the portion of north-south tributary within the subject property and inform the determination of development limits through delineation of the meander belt. Specifically, the following tasks were undertaken:

- Background review of available materials including the Beacon (2021) Geomorphic Assessment report, watershed reports, topographic mapping and recent and historic aerial photography;
- Desktop assessment to delineate reaches based on underlying geomorphic controls;

- Field investigation to characterize geomorphic conditions and document evidence of active channel processes on a reach basis using standardized rapid assessment protocols; and
- In accordance with applicable policies and guidelines, delineate the meander belt on a reach basis.

Policy Context

Provincial Policy Statement (2020)

The Provincial Policy Statement (MMAH 2020) issued under the *Planning Act* (1990) outlines areas of provincial interest with respect to natural hazards. In support of the Policy Statement, a Technical Guide - Rivers and Streams: Erosion Hazard Limit document was prepared (MNR 2002) to outline standardized procedures for the delineation and management of riverine erosion hazards in the Province of Ontario. The guide presents erosion hazard protocols based on two generalized landform systems through which watercourses flow: confined and unconfined valley systems. Through this approach, the meander belt width plus an erosion access allowance is defined to determine the erosion hazard limit of an unconfined valley system. For confined valley systems, the erosion hazard limit is governed by geotechnical considerations, including the stable slope allowance and an applicable toe erosion allowance (i.e., channel migration component). In the case of unconfined valley systems, the limits of the erosion hazard are guided by the greater of the regulatory floodline and meander belt.

Lake Simcoe Region Conservation Authority Watershed Policies and Regulations

The Lake Simcoe Region Conservation Authority (LSRCA) regulates hazard lands including watercourses, valleylands, flood hazards, shorelines, and wetlands, and lands adjacent to these features under Ontario Regulation 179/06. The LSRCA *Watershed Development Guidelines* (2020) implement the Conservation Authorities Act (1990), as well as provide details on the requirements for assessing hazard lands. The LSRCA also provides guidance to the Township of Uxbridge on matters related to natural hazards through peer review and technical comment.

In accordance with Section 2(b) of Ontario Regulation 179/06, development is prohibited within river or stream valleys that have depressional features associated with a river or stream, whether or not they contain a watercourse. The limits associated with river or stream valleys are determined in accordance with the following rules:

- Where the river or stream valley is apparent and has stable slopes, the valley extends from the stable top of bank, plus 15 metres, to a similar point on the opposite side;
- Where the river or stream valley is apparent and has unstable slopes, the valley extends from the predicted long term stable slope projected from the existing stable slope or, if the toe of the slope is unstable, from the predicted location of the toe of the slope as a result of stream erosion over a projected 100-year period, plus 15 metres, to a similar point on the opposite side;
- Where the river or stream valley is not apparent, the valley extends the greater of:
    - The distance from a point outside the edge of the maximum extent of the flood plain under the applicable flood event standard, plus 15 metres, to a similar point on the opposite side; and

- The distance from the predicted meander belt of a watercourse, expanded as required to convey the flood flows under the applicable flood event standard, plus 15 metres, to a similar point on the opposite side.

Background Review

Climate

Climate provides the driving energy for a fluvial system and directly influences basin hydrology and rates of channel erosion, particularly through precipitation. Precipitation records obtained from climate normals (1981-2010) recorded at the Udora Station (ID 6119055), located approximately 17 km north of the subject property, averaged 64 mm per month in winter (November through February), and 80 mm in summer (July and August; Environment Canada 2022). This increase over the summer months is likely a result of convective thunderstorms. While total precipitation amounts are greater during the summer months, snowmelt and rain-on-snow events tend to produce the highest flows within a watershed.

Geology

The planimetric form of a watercourse is fundamentally a product of the channel flow regime and the availability of sediments (i.e., surficial geology) within the stream corridor. The ‘dynamic equilibrium’ of these inputs governs channel planform. These factors are influenced in smaller systems by physiography, riparian vegetation and land use. The subject property falls within the Peterborough Drumlin Field physiographic region (Chapman and Putnam 1984), which is characterized by drumlinized till plains. Bedrock geology consists of Ordovician, grey and black shale of the Whitby Formation (Hewitt 1972). Surficial geology consists of alternating bands of coarse-textured glaciolacustrine deposits, consisting of sand, gravel, and minor silt and clay, and stone-poor sandy silt to silty sand-textured till. Modern alluvial surficial deposits are found in the vicinity of the tributary within the subject property.

Historical Assessment

The following section presents an overview of historic conditions in the vicinity of the subject property with respect to land use, land cover and channel conditions. Historic analyses provide insight into the scale of natural and human-induced changes within a watershed, particularly the degree to which channel planform adjustment and land use has changed over time. In support of the historic assessment, black and white aerial photographs and digital colour imagery from 1967, 1974, 1989, 2002 and 2021 were analysed and compared to obtain a simple, qualitative assessment of the degree of land use and channel planform change over time.

Table 1 provides a summary of specific observations regarding change in land use based on available historical aerial imagery. Historic aerial imagery from each year of record is provided in **Attachment A**.

Table 1. Summary of Key Historical Observations.

Time Period	Scale, Source	Observations
1967	1:5,000 Northway/Photomap/Remote Sensing Ltd.	Land use is predominantly agricultural. A single dwelling (farmhouse) was noted within the subject property. Centre Road to the east and 6th Concession Road to the west were visible, bounding the subject property. Generally, treed areas were limited to hedgerows between agricultural fields, and along roads. Within the subject property, the tributary of Uxbridge Brook could not be clearly discerned. Existing disturbances included a laneway crossing and active farming of the feature.
1974	1:5,000 Northway/Photomap/Remote Sensing Ltd.	Land use remained agricultural. The tributary remained difficult to discern due to dense vegetation cover.
1989	1:5,000 Northway/Photomap/Remote Sensing Ltd.	While land use remained consistent within the subject property, residential development could be observed to the south in 1989. The residential subdivision southeast of North Street and Centre Road had been constructed. Bolton Drive was under construction, as had the online pond within Quaker Common Park. The tributary remained difficult to discern due to dense vegetation cover.
2002	1:5,000 Northway/Photomap/Remote Sensing Ltd.	By 2002, residential development south of the subject property to Brock Street West had largely been completed. Within the subject property, land use remained consistent. The tributary remained difficult to discern due to dense vegetation cover.
2018	1:5,000 Northway/Photomap/Remote Sensing Ltd.	Residential development has continued to expand south of the subject property. The single dwelling within the subject property can no longer be observed. The tributary remained difficult to discern due to dense vegetation cover.

Reach Delineation

To facilitate a systematic evaluation of the tributary of Uxbridge Brook, the watercourse was delineated into reaches. Reaches are homogenous sections of channel with regard to form and function and can, therefore, be expected to behave consistently along their length to changes in hydrology and sediment inputs, as well as to other modifying factors (Montgomery and Buffington 1997; Richards et al. 1997). For the purposes of this study, the entire length of tributary within the subject property was delineated as a single reach (Reach UBTA-1; **Figure 2**).

Existing Conditions

In order to confirm existing geomorphic conditions along the relevant portion of the Uxbridge Brook tributary, a field investigation was conducted on October 17, 2022.

Methods

The following standardized rapid visual assessment methods were applied during the field assessment:

Rapid Geomorphic Assessment (RGA – MOE 2003)

The RGA documents observed indicators of channel instability by quantifying observations using an index that identifies channel sensitivity. Sensitivity is based on evidence of aggradation, degradation, channel widening and planimetric form adjustment. The index produces values that indicate whether the channel is stable/in regime (score <0.20), stressed/transitional (score 0.21-0.40) or in adjustment (score >0.41).

Rapid Stream Assessment Technique (RSAT – Galli 1996)

The RSAT uses an index to quantify overall stream health and includes the consideration of biological indicators (Galli 1996). Observations concerning channel stability, channel scouring/sediment deposition, physical in-stream habitat, water quality, and riparian habitat conditions are used to calculate a rating that indicates whether the channel is in poor (<13), fair (13-24), good (25-34), or excellent (35-42) condition.

Downs Classification Method (Downs 1995)

The Downs (1995) classification method infers present and future potential adjustments based on physical observations, which indicate the stage of evolution, and type of adjustments that can be anticipated based on the channel evolution model. The resultant index classifies streams as stable, laterally migrating, enlarging, undercutting, aggrading, or recovering.

Results

Results of the rapid assessments are summarized in **Tables 2** and **3** below. A photographic record of site conditions at the time of the assessment is provided in **Attachment B**. Photo locations are shown in **Figure 2**.

Reach UBTA-1 was characterized as an ephemeral drainage feature situated within an unconfined valley setting. The tributary was dry at the time of assessment. Riparian vegetation extended greater than 5 channel widths and consisted mainly of trees and shrubs, with localized areas of grasses and herbaceous species. The drainage feature was intermittently defined. Where the feature displayed a discernable channel, bankfull widths and depths were estimated to range 0.80-1.9 m in width and 0.25-0.60 m, respectively. Boundary materials consisted of clay, silt and sand.

An RGA score of 0.10 indicated that Reach UBTA-1 was in regime (stable). Minor evidence of erosion was observed in association with an existing culvert crossing. The RSAT score of 18 indicated that this reach displayed a fair degree of stream health, with lack of flow identified as the primary factor limiting overall ecological health of the reach. The Downs model classified this reach as S – 'stable', consistent with the RGA results.

Table 2. General Reach Characteristics – Tributary of Uxbridge Brook

Reach	Bankfull Width (m)	Bankfull Depth (m)	Channel Substrate	Riparian Vegetation	Notes
UBTA-1	0.80-1.9	0.25-0.60	Clay, silt, sand	Trees and shrubs	• Intermittently defined drainage feature • Feature was dry at the time of assessment

Table 3. Rapid Assessment Results – Tributary of Uxbridge Brook

Reach	Rapid Geomorphic Assessment			Rapid Stream Assessment Technique			Downs Classification Method
	Score	Condition	Dominant Mode of Adjustment	Score	Condition	Limiting Factor	
UBTA-1	0.10	In Regime	N/A	18	Fair	Physical Instream Habitat	S – 'stable'

Meander Belt

The meander belt width is generally defined as the lateral extent that a meandering channel has historically occupied and will likely occupy in the future. The TRCA (2004) Meander Belt Width Delineation Procedures guideline generally represents the standard of practice for the determination of meander belt limits in Southern Ontario. Given the poorly defined nature of Reach UBTA-1, historical delineation of the channel planform could not be determined reliably. As such, an empirical modelling approach was employed to estimate an appropriate meander belt dimension. These models use simple power functions based on field-based measurements of the bankfull width (W_b) and cross-sectional area (A), following relations from Williams (1986 – Equations 1 and 2) and Ward (2001 – Equation 3). Research by Ward et al. (2002) indicated that the Williams (1986) equation, at times, under-predicted the belt width dimensions. As such, a modified approach to the relation, which incorporates the average bankfull width and a 20% factor of safety, was applied.

$$B_w = ([18*A^{0.65}]) \qquad [\text{Eq. 1}]$$

$$B_w = ([4.3*W_b^{1.12}])*1.2 \qquad [\text{Eq. 2}]$$

$$B_w = ([6*W_b^{1.12}]+W_b) \qquad \text{[Eq. 3]}$$

Given that the empirical models were not developed based on channels in Southern Ontario, and to ensure an integrated and comprehensive approach, model results were averaged to provide an output for the empirical method. In order to ensure a conservative approach, the maximum bankfull dimensions recorded for Reach UBTA-1 were used in the empirical modelling, which recommended a meander belt dimension of 15 m. As the bankfull channel was difficult to discern on available aerial imagery for the subject property, a 2.0 m factor of safety was applied to the 15 m meander belt to account for the active channel. Results of the meander belt analysis are summarized in **Table 4**.

Table 4. Recommended Meander Belt – Reach UBTA-1

Reach	Maximum Bankfull Dimensions		Empirical Approach				Recommended Meander Belt (m)
	Width (m)	Depth (m)	Williams – Area (m) (1986)	Williams – Width (m) (1986)	Ward – Width (m) (2001)	Average (m)	
UBTA-1	1.9	0.60	18	11	14	15	17 (15 m + Bankfull Width)

Conclusions

Beacon Environmental Limited (Beacon) was retained by Bridge Brook Corporation to undertake a geomorphic assessment for the subject property located at 7370 Centre Road (Part of Lot 33, Concession 6), in the Township of Uxbridge, Regional Municipality of Durham. Beacon (2021) previously completed a geomorphic assessment for the tributary of Uxbridge Brook that traverses the southeast corner of the subject property. The purpose of this geomorphic assessment was to characterize existing conditions along the portion of the north-south tributary that traverses the subject property to delineate the meander belt and inform the determination of environmental constraint limits. The following points summarize the key findings of this study:

- A review of background information and aerial imagery indicated that minimal land use change has occurred within the subject property over the available historic record;
- The Uxbridge Brook tributary was characterized as a poorly defined drainage feature that was dry at the time of assessment;
- Rapid geomorphic assessment results for Reaches UBTA-1 identified the reach as being ‘in regime’ or stable (score of 0.10);
- Referencing an empirical modelling approach and maximum bankfull dimensions from the field assessment, a meander belt width of 17 m is recommended for Reach UBTA-1; and
- The findings of this study are in conformance with Ontario Regulation 179/06.

As the procedures used in this report to delineate the meander belt are in accordance with applicable guidelines (TRCA 2004) and Provincial Policy, it is our opinion that the findings of this report are in conformance with Ontario Regulation 179/06 and LSRCA Policies.

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M. Attard

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Report reviewed by:
Beacon Environmental

Shelley Gorenc

Shelley Gorenc, M.Sc., P.Geo.
Senior Geomorphologist

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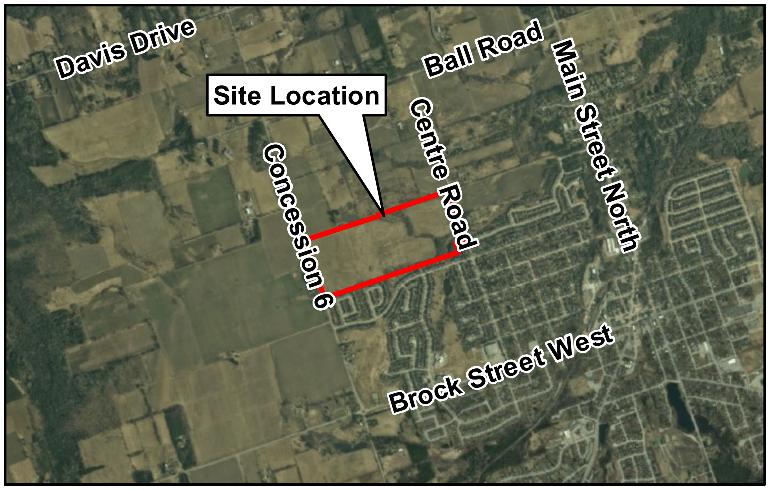

Site Location	**Figure 1**

7370 Centre Road, Uxbridge,
Geomorphic Assessment

BEACON ENVIRONMENTAL

Project: 217431.1
Last Revised: November, 2022

Client: Bridge Brook Corp. c/o John Spina	Prepared by: SZ Checked by: SG

N	1:7,000	Inset Map:1:50,000

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Reach, Photo Locations and Meander Belt

Figure 2

7370 Centre Road, Uxbridge, Geomorphic Assessment

Legend

- ▭ Subject Property
- — Proposed Development
- ● Photo Locations
- — Meander Belt (17 m)
- — Reach Break
- — Watercourse (Beacon 2021)

BEACON ENVIRONMENTAL

Project: 217431.1
Last Revised: February 2023

Client: Bridge Brook Corp. c/o John Spina

Prepared by: SZ
Checked by: SG

DRAFT

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Attachment A

Legend

🟥 Subject Property

Historical Assessment

1967

7370 Centre Road, Uxbridge,
Geomorphic Assessment

BEACON ENVIRONMENTAL

Project: 217431.1
Last Revised: November, 2022

Client: Bridge Brook Corp.
c/o John Spina

Prepared by: SZ
Checked by: SG

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Legend

🟥 Subject Property

Historical Assessment

1974

7370 Centre Road, Uxbridge,
Geomorphic Assessment

BEACON
ENVIRONMENTAL

Project: 217431.1
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c/o John Spina

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Checked by: SG

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Legend

🟥 Subject Property

Historical Assessment

1989

7370 Centre Road, Uxbridge,
Geomorphic Assessment

BEACON ENVIRONMENTAL

Project: 217431.1
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Checked by: SG

N

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Legend

🟥 Subject Property

Historical Assessment 2002

7370 Centre Road, Uxbridge,
Geomorphic Assessment

BEACON ENVIRONMENTAL

Project: 217431.1
Last Revised: November, 2022

Client: Bridge Brook Corp.
c/o John Spina

Prepared by: SZ
Checked by: SG

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Legend

▭ Subject Property

Historical Assessment | **2021**

7370 Centre Road, Uxbridge,
Geomorphic Assessment

BEACON ENVIRONMENTAL

Project: 217431.1
Last Revised: November, 2022

Client: Bridge Brook Corp.
c/o John Spina

Prepared by: SZ
Checked by: SG

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Attachment B

Photograph 1.
Reach UBTA1
Upstream view of general conditions at property limit.

Photograph 2.
Reach UBTA-1
Downstream view of general conditions.

Photograph 3.
Reach UBTA-1
Downstream-facing view of general conditions.

Photograph 4.
Reach UBTA-1
Upstream view of existing culvert.

Photograph 5.
Reach UBTA-1
Downstream view of general conditions.

Photograph 6.
Reach UBT-1
Upstream view of tributary confluence with main tributary to Uxbridge Brook within subject property.

HYDROGEOLOGICAL INVESTIGATION REPORT

BRIDGE BROOK CORPORATION

WATER BALANCE AND CATCHMENT-BASED WATER BALANCE

7370 Centre Road
Uxbridge, Ontario

DRAFT REPORT

February 16, 2023

CT3058.00

Terrapex Environmental Ltd.
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Toronto, Ontario, M3B 2R7
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DISTRIBUTION: Bridge Brook Corporation

PROJECT #CT3058.00

TABLE OF CONTENTS

FIGURES

TABLES

APPENDICES

1. INTRODUCTION

This report includes the preliminary findings of the hydrogeological investigation, water balance and catchment-based water balance assessments undertaken by Beacon Environmental Limited (Beacon) for the property located at 7370 Centre Road, Uxbridge, Ontario (hereafter referred to as the "subject property"). Permission was provided to Terrapex to provide revisions to the materials by Brian Henshaw, dated XXX.

The purpose of this hydrogeological investigation, water balance and catchment-based water balance assessment is to provide further information regarding the proposed development of the subject property.

This report is a revision of the Beacon report, dated XXX, which was preliminary and based on information collected between December of 2017 and August 2020. A revised report will be forthcoming which includes hydrochemical analyses for the purposes of dewatering discharge plans, as well as water balance components to be based on provided Site Plans.

2. SITE AND AREA PHYSICAL CONTEXT

The subject property is approximately 39.9 hectares in area. As shown on **Figure 1**, the subject property is generally rectangular in shape, and is bounded to the east and west by Centre Road and Concession Road 6, respectively, and located north of Bolton Drive in Uxbridge, Ontario.

The subject property is currently occupied by agricultural farm fields, with untilled areas at the south-east and northeast corners.

2.1 TOPOGRAPHY AND DRAINAGE CONTEXT

Surface

The subject property is situated within the jurisdiction of the Lake Simcoe Region Conservation Authority (LSRCA) and the Lake Simcoe and Couchiching/Black River Source Protection Area (SPA) in the City of Uxbridge. The subject property is located within the Severn-Lake Simcoe Quaternary Watershed (02EC-04).

The subject property is located within the *Protected Countryside – Towns and Villages* lands of the *Greenbelt Plan* area, and is therefore, subject to the corresponding policies of the *Greenbelt Plan* as well as the Regional Municipality of Durham and Township of Uxbridge Official Plans and Lake Simcoe Region Conservation Authority (LSRCA) regulations. A tributary of Uxbridge Brook traverses the southeast corner of the subject property.

The topography of the subject property is summarized as highest in the west, with a general gradient downward towards the east. Topographic elevations for the subject property range from approximately 330 metres above sea level (masl) to approximately 280 masl. The subject property is drained by sheet overflow to the wetlands and a portion of Uxbridge Brook, located in the east of the property.

Subsurface

Ministry of the Environment, Conservation and Parks (MECP) mapping indicates that the subject property is located within a Wellhead Protection Area for quantity (WHPA-Q2; Stress = moderate) and Intake Protection Zone (Score = 4.5). Parts of the subject property are situated over Highly Vulnerable Aquifers, and significant groundwater recharge areas (Score = 2).

MW6 Uxbridge Well Supply (220000763) lies approximately 1.2 km to the south of the subject property. The closest extent of the Wellhead Protection Area (WHPA-D) lies approximately 1.2 km south of the subject property.

A reconnaissance of the subject property was carried out by a certified Hydrogeologist on August 22, 2019. Within the subject property, no obvious groundwater-dependent features or seepage areas were observed at that time. It is understood that there are four Headwater Drainage Features, as defined in the EIS report (Beacon 2020).

2.2 PHYSIOGRAPHY AND GEOLOGY

The subject property is located on drumlinized Till Plains (MRD228), in an areas dominated by glaciolacustrine, glacial outwash, and till deposits (OGS, 2000) adjacent to sandplains in the east. Coarse-textured glaciolacustrine deposits, characterized by sand, gravel and minor silt and clay are reported on the east and west parts of the subject property, bisected by a deposit of stone-poor sandy silt to silty sand textured till (in the general area of BH3, BH4, and BH8 described in the methodology below; MRD128).

The bedrock beneath the described overburden is reported to be composed of limestone, dolostone and shale (MRD126 2011). Bedrock units were not encountered during this investigation or during the drilling operations required to install the groundwater monitoring wells.

2.3 AVAILABLE BACKGROUND GROUNDWATER INFORMATION

Based on a search of the available MECP water well record database entries, nine wells are reported on the subject property, designated 7304950, 7304143/7304142, 7304144, 7304138, 7304141, 7304145, 7304140/7304139. These wells appear to represent the groundwater monitoring wells constructed as part of the SoilEng geotechnical investigation. Three other wells, designated ID-1910316 and ID-1916323, appear to be drilled for the purposes of fresh drinking water between 2002 and 1989. The reported locations of the wells are included in **Figure 2.**

A review of the available well records shows that there are 104 reported wells within 500 metres of the subject property (see **Figure 2**). Groundwater monitoring wells purposed for domestic use were constructed between 1962 and 2011. Further information for the 104 wells are provided in **Appendix A**. It is noted that older wells may no longer be operational, and that historically there was not a requirement to register dug wells with the MECP; as such, they can be under-represented in the water well record database.

3. SITE CHARACTERIZATION

3.1 BOREHOLE DRILLING AND MONITORING WELL CONSTRUCTION

A geotechnical investigation was carried out Soil Engineers Limited (SoilEng, 2018), which included advancing fifteen boreholes, designated BH1 through BH15. The boreholes reached a maximum depth of approximately 15.7 metres below ground level (mbgl), with most being advanced to approximately 6.6 mbgl. These depths equate to elevations, in lieu of topography, ranging from approximately 272.2 metres above sea level (masl) to approximately 327.0 masl. The locations of these wells are indicated on **Figure 1**.

Review of the SoilEng report (available in **Appendix B**) indicates that the overburden is comprised of alternating layers of silty clay and layers of silty sand. Layers of sand were reported beginning at an elevation of approximately 329 masl at BH5 and BH15, located on the west of the subject property. A layer of sand was also reported at between 321.8 masl and 318.0 masl at location BH13, located in the central north area of the property.

Standard Penetration Tests (SPT N-values) were carried out as part of the SoilEng geotechnical drilling operations. The Log of Borehole reports (**Appendix B**) indicate that soil N-values are generally less than 30 to depths of approximately 3 mbgl. Layers of more compact soils are noted at elevations of 298 masl to 285 masl at locations BH12 and BH6, respectively, and elevations of 319 masl to 310 masl at locations BH13, BH14, and BH9. These more compact areas are not specific to a sedimentary grainsize layer, and are noted because of the implied loss of effective porosity due to compaction.

It is noted that the boundaries between the strata have been inferred from drilling observations carried out by Beacon and others from non-continuous samples. They generally represent a transition from one soil type to another and should not be inferred to represent an exact plane of geological change. Further, conditions will vary between and beyond the boreholes.

Beacon cannot guarantee the accuracy of work carried out by others. Any comment based on work carried out by others is subject to the accuracy of the information supplied to Beacon. Any use of the proposed comments by parties, or any reliance on or decisions to be made based on work not carried out by Beacon is the responsibility of those parties.

3.2 WATER LEVEL MONITORING

To date, groundwater depths have been measured manually at all accessible monitoring locations over the course of the monitoring period (December 2017 to August 2020). The recorded water levels reflect the groundwater conditions on the dates they were measured and are provided in **Table 2**.

Table 1. Summary of Groundwater Monitoring Well Conditions

Location ID	Reported Date of Construction	Approximate Location		Approximate Ground Surface	Reported Screened Interval	Soils Reported at Screened Interval	Approximate SPT N-Value at Screened Interval
		Latitude	Longitude	SoilEng, 2018 (Beacon, 2019)[3]	mbgl (masl)[5]		
BH3 [1]	*December 15, 2017*	44.1130°	-79.1416°	*305.0* (304.421)	*2.4 to 6.1* *(302.0 to 298.3)*	*Silty Clay Till*	*37 to 27*
BH6 (S)[2]	-[2]	-[2]	-[2]	(288.078)	-[2]	BOW 7.01 m on March 16, 2020[2]	-[2]
BH6 (D)	*December 12, 2017*	44.1148°	-79.1378°	*287.9* (288.075)	*11.6 to 15.2* *(276.4 to 272.9)*	*Silty Clay Till*	*42 to 74*
BH7	*December 15, 2017*	*44.1138°*	*-79.1399°*	*297.8* (297.606)	*2.4 to 6.1* *(295.2 to 291.5)*	*Silty Sand Till*	*20 to 48*
BH9 (S)[2]	-[2]	-[2]	-[2]	(323.17)	-[2]	BOW 6.95 m on March 16, 2020[2]	-[2]
BH9 (D)	*December 20, 2017*	44.1135°	-79.1447°	*321.9* (323.343)	11.6 to 15.2 (311.7 to 308.1)	Silty Clay Till to Silt	68 to 74
BH10	*December 21, 2017*	44.1129°	-79.1474°	*332.6* (332.254)	2.4 to 6.1 (329.8 to 326.1)	Silty Sand Till to Silty Clay Till	18 to >100
BH11	*November 27, 2017*	44.1158°	-79.1380°	*291.4* (289.224)	2.4 to 6.1 (286.8 to 283.1)	Silty Sand Till	35 to >100
BH13	*January 15, 2018*	44.1148°	-79.1448°	322.6 (322.284)	2.4 to 6.1 (319.8 to 316.8)	Sand to Silty Clay Till	62 to >100

Italics – indicates data collected by others (SoilEng, 2018)

BOW – "bottom of well"

[1] BH3 was confirmed destroyed

[2] borehole logs were not provided in the geotechnical report

[3] ground elevations provided by SoilEng.

[4] elevation measurements from survey carried out March 19, 2020.

[5] masl measurements corrected to survey carried out March 19, 2020 using the mbgl measurements in SoilEng, 2018.

Table 2. Summary of Measured Groundwater Levels

Location ID	Approximate Top of Pipe	Approximate Ground Surface Elevation	Groundwater Measurements									
			Upon Completion	2018					2019	2020		
				Jan 31	Mar 22	June19 and July 4	Sept 6	Dec 4	Sept 11	Mar 16	Apr 28	Aug 25
	masl (mbgl)	masl	mbgs (masl)	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl) [3]	mbgs (masl)	mbgs (masl)	mbgs (masl)	mbgs (masl)
BH3		(304.421)	302.3	0.4 (304.0)	*0.5* *(303.9)*	*1.1* *(303.3)*	*0.7* *(303.7)*	*0.2* *(304.2)*	confirmed destroyed			
BH6 S	+ 0.83	(288.078)	- [2]	- [2]	*1.2* *(286.8)*	*1.4* *(286.6)*	*1.8* *(286.2)*	*0.9* *(287.2)*	2.44 (285.63)	**0.87** **(287.13)**	1.2 (286.87)	2.49 (285.59)
BH6 D	+0.70	(288.075)	273.0	1.3 (286.7)	*1.4* *(286.6)*	*1.6* *(286.4)*	*2.0* *(286.0)*	*1.1* *(286.9)*	2.81 (285.26)	**0.98** **(287.10)**	1.45 (286.63)	2.80 (285.27)
BH7	+0.80	(297.606)	293.0	0.9 (296.7)	*1.1* *(296.5)*	*2.2* *(295.4)*	*2.5* *(295.1)*	*0.5* *(297.1)*	3.91 (293.70)	**1.04** **(296.56)**	1.71 (295.90)	3.95 (293.65)
BH9 S	+ 0.82	(323.170)	- [2]	- [2]	*1.0* *(322.1)*	*2.1* *(321.0)*	*2.3* *(320.8)*	*0.7* *(322.4)*	3.39 (319.78)	**1.30** **(321.87)**	1.50 (321.67)	3.20 (319.97)
BH9 D	+ 0.82	(323.343)	*307.3*	*7.4* *(315.9)*	*7.5* *(315.8)*	*7.9* *(315.4)*	*8.1* *(315.2)*	*7.4* *(315.9)*	8.9 (314.44)	**7.53** **(315.81)**	7.74 (315.60)	8.92 (314.42)
BH10	+ 0.93	(332.254)	*329.0*	*0.2* *(332.0)*	*0.9* *(331.3)*	*1.7* *(330.5)*	*1.4* *(330.8)*	*0.3* *(331.9)*	2.39 (329.85)	**0.52** **(331.73)**	1.20 (331.05)	2.22 (330.03)
BH11	+ 0.91	(289.224)	290.2	1.1 (288.1)	*1.1* *(288.1)*	*1.4* *(287.8)*	*1.8* *(287.4)*	*0.7* *(286.6)*	2.56 (286.66)	**0.54** **(288.68)**	1.07 (288.15)	2.56 (286.66)
BH13	+ 0.73	(322.284)	319.0	3.5 (318.8)	*3.3* *(319.0)*	*3.2* *(319.0)*	*3.7* *(318.6)*	*3.7* *(317.8)*	4.47 (317.81)	**3.08** **(319.20)**	3.24 (319.04)	4.59 (317.69)

Italics – indicates data collected by others (SoilEng, 2018)

Grey shading - indicates water level measured at the time of drilling completion - water levels measured at the time of completion are not directly comparable to the other measurements.

Bold values – indicates the highest measured groundwater levels

[2] reference to the shallow nested wells were not provided in the geotechnical report (SoilEng, 2018) – water levels are found in the subsequent monitoring program letters.

[3] masl measurements corrected to survey carried out March 19, 2020 using the mbgl measurements in SoilEng, 2018.

As summarized in **Table 2**, groundwater depths ranged from approximately 0.2 mbgs to 8.92 mbgs in relation to the topography. Groundwater elevations were found to range from approximately 332.0 masl to 285.2 masl. Groundwater elevations measured at all locations on a single site visit range from 44.4 m to 45.3 m during the length of this investigation, indicating that groundwater is responsive and connected throughout the site, including freshet periods.

Based on the information above, groundwater appears to reside unconfined within layers of silty clay and silty sand. This layer is generally interpreted to become more compact with depth. Three cross-sections are provided in **Appendix XXX** which show the groundwater in context with redox and general stratigraphy.

3.3 HYDRAULIC TESTING

3.3.1 Single Well Response Tests ('slug testing' – saturated soils)

To estimate the hydraulic conductivity (K) of the soil materials adjacent to the screened intervals at the tested monitoring wells, a single well response test was carried out at location BH6, BH7 and BH11 on April 28, 2020. The tests were carried out by rapidly removing a volume of water to the well and monitoring the subsequent water level recovery to previous conditions. The Bouwer and Rice (1976) method was applied to falling head test data, using the unconfined solution. The data was analyzed using AQTESOLV™ (v. 4.50). A summary of the single well response tests carried out is presented below in **Table 3**.

Table 3. Hydraulic conductivity estimates at Locations BH6, BH7, and BH11

Location Identification	Description of Soil Materials Adjacent to Screened Interval	Reported SPT N-Value At Screened Interval	Reported Screened Interval	Estimated Hydraulic Conductivity
			mbgl (masl)	K (cm/s)
BH6	Silty Clay Till	42 to 74	11.6 to 15.2 (276.4 to 272.9)	1.4×10^{-4}
BH7	Silty Sand Till	20 to 48	2.4 to 6.1 (295.2 to 291.5)	1.3×10^{-4}
BH11	Silty Sand Till	35 to >100	2.4 to 6.1 (286.8 to 283.1)	9.5×10^{-5}

As summarized in **Table 3**, hydraulic conductivities ranged from approximately 0.9×10^{-4} cm/s to 1.4×10^{-4} cm/s in the locations tested. These results indicate materials with semi-pervious relative permeability (Bear 1972). Reports for the *in situ* single well response tests are provided in **Appendix C.**

The estimates provided in **Table 3** are based on *in situ* testing. In addition to the size of grains in the soil, *in situ* testing considers compaction, effective porosity (as opposed to simple porosity), and existing sedimentary feature factors. The SPT N-values summarized in **Table 3**, above, are consistent with a till provenance and with specific reference to SPT's greater than 75, introduce hydraulic consideration for till fracturing associated with large nearby construction operations and stratigraphic expansion.

3.3.2 Infiltration Testing (permeameter testing – unsaturated soils)

Soil infiltration rate testing was carried out in unsaturated soils, using a Pask Permeameter instrument. Three permeameter testing locations were tested on April 28, 2020, next to locations BH6, BH7, and BH11. These were designated PT20-1, PT20-2, and PT20-3, respectively. At each of the testing locations, the permeameter was used to measure the steady-state flow rate of gravimetrically-fed water into the select unsaturated soil horizon. Field-saturated hydraulic conductivity, (K_{fs}) was calculated from the measurements using following equation:

$$K_{fs} = \frac{C_1 Q_1}{2\,\pi\, H_1^2 + \pi\, a^2\, C_1 + 2\,\pi \frac{H_1}{\alpha^*}}$$

Where: C_1 = shape factor
Q_1 = flow rate (cm^3/s)
H_1 = water column height (cm)
a = well radius (cm)
α^* = alpha factor (0.15 cm^{-1})

(Elrick *et. al*., 1989)

The field measurement data and analysis of the infiltration rate testing are provided in **Appendix C**. Based on the resulting K_{fs} (cm/s), the corresponding infiltration rates (mm/hr) were estimated using the approximate relationship presented in the *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA and CVCA, 2010). A summary of the infiltration rate testing results is presented below in **Table 4**.

Table 4. Summary of Estimated Infiltration Rates

Location ID	Soil Description	Approximate Test Depth	Estimated Field-Saturated Hydraulic Conductivity	Theoretical K_{fs} @ 4°C "freshet"	Theoretical K_{fs} @ 24°C "summer"	Estimated Infiltration Rate[1]	Correction Factor Used	Estimated Design Infiltration Rate[2]
		(mbgl)	K_{fs} (cm/s)	K_{fs} (cm/s)	K_{fs} (cm/s)	(mm/hr)		(mm/hr)
PT20-1 (near BH6)	Brown silty sand, rootlets, moist	0.42	9×10^{-5}	8×10^{-5}	1×10^{-4}	49	2.5	20
PT20-2 (near BH7)	Brown silty sand, rootlets, moist	0.26	4×10^{-5}	3×10^{-5}	6×10^{-5}	42	2.5	17
PT20-3 (near BH11)	Brown silty sand, rootlets, moist	0.62	4×10^{-5}	3×10^{-5}	5×10^{-5}	42	2.5	17

Notes:

mbgl = metres below ground surface

cm/s = centimetres per second

mm/hr = millimetres per hour

[1] – based on Estimated Field-Saturated Conductivity and Table C1 from TRCA and CVCA (2010).

[2] – correction factor in accordance with Table C2 from TRCA and CVCA (2010).

The infiltration rate estimates from this investigation are based on the test methods discussed above, and are for the corresponding native soil types encountered in undisturbed conditions. They represent the soil conditions at the tested locations and depths only; conditions may vary between and beyond the tested locations. Care should be taken during construction of the proposed infiltration measures to preserve the existing soil structure and avoid compaction and re-working which could reduce its infiltrative properties.

For detailed design purposes, a correction factor was applied to estimate the design infiltration rate in accordance with guidance provided in the *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA and CVCA, 2010), to account for potential reductions in soil permeability due to compaction, smearing during the construction of a given infiltration feature and the gradual accumulation of fine sediments over the lifespan of the infiltration feature. Based on the guidance, a correction factor of 2.5 was typically applied to the estimated infiltration rates.

The estimated field saturated hydraulic conductivity values are considered to be reasonable for the soil types tested. Based on these estimates and the guidance described above, the silty sand soils have a design infiltration rate of approximately 17 mm/hr to 20 mm/hr.

3.4 INTERPRETED GROUNDWATER FLOW DIRECTION AND SPEED

Groundwater flow direction was estimated using groundwater levels measured on March 16, 2020 using manual piezometric head measurements reported at locations BH7, BH11, and BH13 (**Figure 2**). Groundwater within the area of interest is estimated to have a general horizontal gradient of approximately 0.02 in an approximate heading of 87.7^{o} (east) at that time.

Based on the horizontal hydraulic gradient provided above, and the hydraulic conductivity estimates in **Table 3**, groundwater on the subject property can be estimated to be flowing at an approximately velocity of 0.45 cms/day to 0.66 cms/day toward the east. Spatial contours of the groundwater hydraulic head elevation at ‘high ground water levels’ and ‘low groundwater levels’ are provided in **Figure 3 and Figure 4**, respectively.

4. WATER BALANCE

4.1 METHODS

Pre-development and post-development groundwater recharge (infiltration) and surface water run-off were estimated at monthly resolutions to characterize the hydrological and hydrogeological dynamics of the subject property. The estimates take into account the following seven components:

"Inputs"	(P) Precipitation (S_i) Surface water inflow (G_i) Groundwater inflow
"Outputs"	(So) Surface water outflow (Go) Groundwater outflow (ET) Evapotranspiration
Available Storage	(SMC) soil moisture holding capacity

The basic water balance for a particular area can be expressed as:

$$P = Qs + ET + RE + \Delta S$$

(Thornthwaite and Mather 1955)

where,

P = Precipitation (rain and snow)
Q_s = Runoff
ET = Evapotranspiration
RE = Recharge
ΔS = Change in Storage (assumed to be zero under steady state conditions)

Climate data was sourced from historical Environment Canada data available for Uxbridge West weather station located approximately 5 km northeast of the subject property, using an average of three years (2018 through 2020) for the estimates. Precipitation volumes were used from 2015, 2016, 2017, 2018, 2019, and 2020 to compensate for incomplete datasets from the weather station.

Based on the information above, monthly precipitation rates varied from 15.4 mm/m^2/month through 145 mm/m^2/month, for an annual average annual precipitation rate of 597.2 mm/m^2/month. With reference to the surface area of the site, these rates translate to volumes of 8,268 m^3/year through 48,304 m^3/year, for an annual precipitation rate of 304,271 m^3/year. Further details are included in the Water Balance Report Summaries provided in **Appendix D**.

Further detail can be found in the response to Lake Simcoe Region Conservation Authority Comment, dated March 2, 2022 (**Appendix F**).

Local solar radiation, incoming solar radiation, sunset hour angles, and solar declination conditions were sourced from the National Aeronautical and Space Administration Langley Research Center (NASA 2018) to estimate the monthly site-specific evapotranspiration rate using the Penman-Monteith Evapotranspiration (FAO-56 Method). Monthly values were calculated using thirty years of data.

Based on the information above, evapotranspiration rates were estimated to range from 0.67 mm/day to 4.01 mm/day with an annual average rate of 2.0 mm/day. With reference to the pre-development surface area of the site, these rates translate to volumes of 7,558 m^3/month to 44,944 mm/month, for an annual average evapotranspiration rate of 269,562 m^3/month (approximately 89% of incoming precipitation). Further detail can be found in the response to Lake Simcoe Region Conservation Authority Comment, dated March 2, 2022 (**Appendix F**).

Standard soil water holding capacities and infiltration coefficients used were provided in the *Stormwater Management Planning and Design Manual* (MOECC 2003).

Table 5 summarizes the pre-development water-holding capacities assigned in the calculations based on the above descriptions and assumptions, as well as proposed conditions.

Table 5. Summary of Soil Type, Land Use, and Assigned Water Holding Capacity [1]

Soil Type	Vegetation Community Type	Assigned Water Holding Capacity (mm/m^2)
Silty and Clayey Loam	Fallow grasses	125
Silty and Clayey Loam	Moderately rooted crops (corn and cereal grains)	200
Silty and Clayey Loam	Mature Forest	400
Silty and Clayey Loam	Urban lawn/shallow rooted crops	115
Silty and Clayey Loam	Swamps and Marshes	800

[1] Terms and assigned water holding capacities as per the *Stormwater Management Planning and Design Manual* (MOECC 2003)

The infiltration coefficients used in the estimate calculations were based on the sum of topography, surficial soil classification and cover factors, provided in the *Stormwater Management Planning and Design Manual* (MOECC 2003). The general topography of the catchment area was assigned a topographic factor of 0.2 based on visual observation. The surficial soil classification was considered 'Silt Loam' or 'Clay Loam' and assigned a soil factor of 0.2. The cover was considered 'cultivated land' based on the general root depth of the vegetation observed and assigned a cover factor of 0.1. A cover factor of 0.2 was given to forested areas. Further details on the infiltration co-efficients used are provided in **Table 6** and **Table 7**, below.

Based on the above sums, the total infiltration coefficients used in the estimate calculations was 0.5 for most areas. A total infiltration coefficient of 0.6 was used for forested areas. Forested areas for predevelopment include mature forest areas (**Table 6**, below). Forested areas for post-development include the forested areas of the Uxbridge Brook NHS (**Table 7**, below).

4.2 GLOBAL SITE-SPECIFIC WATER BALANCE

4.2.1 Pre-Development Constraints

The existing pre-development conditions of the subject property includes three general vegetation types, including ‘moderately rooted crops’ (corn), ‘mature forest’, and ‘swamps and marshes’, as summarized in **Table 6.** A small amount of land dedicated to a dirt driveway bisects the property and is characterized as impermeable, due to long term compaction**.**

As summarized in **Table 6**, the area of the subject property used in the calculations was 403,800 m^2 in area, which includes approximately 2,928 m^2 of impermeable area.

4.2.2 Post-Development Constraints

Post-development conditions for Phase One Conditions were based on drawings provided by SCS, dated December 2020 (**Figure**; **Appendix A**). The proposed conditions of the subject property include one general vegetation type which have been classified as Urban Lawn/Shallow Rooted Crops, aswell as impervious lands comprised of concrete pavements, asphalt pavements, and building structures, as summarized in **Table 7.**

The subject property remains approximately 403,800 m2 in area. Impermeable areas are increased from approximately 1% of the subject property in pre-development conditions, to approximately 50% of the subject property in post-development conditions.

Table 6. Existing Pre-Development Conditions

Existing Catchment Land Use	Approximate Pervious Land Area (m^2)	Approximate Impervious Land Area (m^2)	Sums (m^2)	General Topography (A)	Soil Classification (B)	Cover Factor (C)	Infiltration Factor (A+B+C)
				(for permeable fraction)			
Principle Area – (corn fields)	349,668	-	349,668	0.2	0.2	0.1	0.5
Mature Forest Areas (areas defined as FOD [1])	41,220	-	41,220	0.2	0.2	0.2	0.6
Marshes and Swamp Areas (areas defined as MAS2-1 [1] and SWT-2 [1])	9,984		9,984	0.2	0.2	0.1	0.5
Driveway (4 metres wide by 732 metres long)	-	2,928	2,928	-	-	-	-
Total Areas	**400,872**	**2,928**	**403,800**				

FOD – 'deciduous forest areas'

MAS2-1 – 'Cattail Mineral Shallow Marsh'SWT-2 – 'Willow Mineral Thicket Swamp'

[1] Source: Figure 2 – Existing Conditions (Beacon; August, 2020). Provided in **Appendix**

Table 7. Proposed Post-Development Conditions –

Proposed Land Uses [1, 2]	**Approximate Pervious Land Area** (m²)	**Approximate Impervious Land Area** (m²)	**Sums** (m²)	**General Topography** (A)	**Soil Classification** (B)	**Cover Factor** (C)	**Infiltration Factor** (A+B+C)
	Area within FOI Catchment	Area within FOI Catchment		(for permeable fraction)			
Catchment 201	104,632	150,568	255,200	0.2	0.2	0.1	0.5
Catchment 202	21,120	1,880	23,000	0.2	0.2	0.1	0.5
Catchment 203 (Wet SWMP 1)	8,700	8,700	17,400	0.2	0.2	0.1	0.5
Catchment 204	21,318	34,782	56,100	0.2	0.2	0.1	0.5
Catchment 205 (Dry SWMP 1)	3,213	3,087	6,300	0.2	0.2	0.1	0.5
Catchment 206	371	329	700				
Catchment 207	1,590	1,410	3,000				
Catchment 208	1,007	893	1,900	0.2	0.2	0.1	0.5
Uxbridge Brook NHS	40,200	-	40,200				
Total	**202,941**	**201,649**	**403,800**				

[1] Based on information provided by SCS (December 2020).

[2] These represent the area of each catchment limited to the subject property that are interpreted to flow toward the FOI.

SWMP – storm water management pond

4.2.3 Comparison of Pre-Development and Post-Development Water Balance Conditions

The pre-development hydrologic budget and post-development hydrologic budget for the subject property was estimated based on the existing catchment conditions summarized above. The estimated pre-development conditions are compared to anticipated post-development conditions in **Table 8**, below. Table 8 summarizes the estimates included in **Appendix D**.

Table 8. Theoretical Average Annual Water Budgets

Component	Pre-Development Conditions	Post-Development Conditions	
	(m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)
(P) Precipitation	329,905	329,905	-
(ET) Evapotranspiration	292,285	150,568	-141,717
(Q_G) Infiltration	60,883	31,668	-29,215
(Q_S) Run-off	59,532	258,987	+199,455

Based on the summary of analyses provided in **Table 8**, it is noted that the proposed changes to the subject property are anticipated to result in an annual infiltration decrease of approximately 29,215 m^3, and an annual runoff increase of approximately 199,455 m^3 in comparison to existing conditions. Further details, including a monthly resolution breakdown, are provided in **Appendix D**.

Estimated decreases in infiltration volume and increases in run-off volume are interpreted to be due to relatively greater proposed impermeable area, as well as an exchange of moderately rooted crops (e.g. corn) with shallow rooted crops (e.g. urban lawns), which have a lower assigned water holding capacity (re: **Table 5**, above).

4.2.4 Low Impact Development (LID) Measures and Influence of SWMPs

Low Impact Development Measures located within the subject property area are proposed. These include Catchbasin Infiltration/Filtration Trenches and Rear Yard At-Surface Infiltration Trenches which effectively convert runoff volume from impermeable areas to infiltration volume. As well, a wet SWMP is proposed (Catchment 203) and a dry SWMP is proposed (Catchment 205). The wet SWMP contributes to evapotranspiration processes, and has an impermeable ratio of 50% (SCS, 2020). The dry SWMP contributes to evapotranspiration processes and infiltration processes. Specifications for the LID measures were provided to Beacon as part of the LID Location Plan, LID Sizing and Volume Control Calculations, and Proposed Storm Drainage Plan (SCS, 2020).

The effectiveness of the LID measures were calculated by estimating the maximum available runoff directed to each by the associated catchment areas, and determining the monthly volume of water that could be infiltrated and/or dissipated by evapotranspiration during storage by each feature during the monthly interval, based on specifications provided by SCS (2020).

Based on the specifications and the available water to be directed at each, runoff ‘converted’ to infiltration ranged from 2,932 m^3/month (September) to 31,773 m^3/month (April), for a total of 139,064 m^3/annum. These monthly values were removed from the estimated runoff, and applied to the monthly infiltration estimate. The combined monthly influence of these proposed mitigation methods are provided in **Appendix D**. As shown, the LID measures appear to be least active during winter months, June, and September (limited by available runoff), and are most effective during the freshet months and fall rains.

4.2.5 Comparison of Pre-Development and Post-Development Catchment-Based Water Balance Conditions (Including Mitigations)

The pre-development hydrologic budget for the subject property was estimated based on the existing catchment conditions summarized above, and the post-development hydrologic budgets were estimated based on the Post-Development Drainage Plan and related mitigation measures, summarized above. The estimated pre-development conditions are compared to anticipated post-development conditions in **Table 9**, below.

Table 9. Theoretical Average Catchment-Based Water Budgets

Component	Pre-Development FOI Catchment	Proposed Post-Development Conditions		Proposed Post-Development Conditions with Mitigation Measures (Ultimate Conditions)	
	(m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)
(P) Precipitation	329,905	329,905	-	329,905	-
(ET) Evapotranspiration	292,285	150,568	-141,717	150,568	-141,717
(Q_G) Infiltration	60,883	31,668	-29,215	160,246	+99,363
(Q_S) Run-off	59,532	258,987	+199,455	130,409	+70,877

A more detailed analysis of the values summarized in **Table 9** is provided at monthly resolution in **Appendix D**.

Based on the summary of analyses provided in **Table 9**, it is noted that the ultimate proposed conditions for the subject property are anticipated to result in an annual increase of infiltration by approximately 99,363 m^3, and an annual increase in runoff by approximately 70,877 m^3 in comparison to existing conditions.

As shown in **Appendix D**, LID measures convert approximately 4,262 m^3 to 18,498 m^3 of theoretical runoff volume to theoretical infiltration per month. Resulting monthly infiltration trends appear to have generally higher infiltration volumes. Controlled runoff volumes result in more extreme wet periods, a longer freshet period and a drier summer season.

It is acknowledged that the values and coefficients presented above are standardized estimates. It is important to understand that infiltration rates and water holding capacities are dependent upon the effective porosity and hydraulic conductivity of the surficial soils which may vary over several orders of magnitude. As such, the resulting run-off and infiltration estimates inherit potentially large margins of error. These margins of error are recognized, but for the purposes of this assessment, the numbers used in the water balance calculations are considered reasonable estimates based on the site-specific conditions and useful for comparison of pre- to post-development conditions.

4.3 CATCHMENT-BASED WATER BALANCE

A Catchment-Based Water Balance (CBWB) assessment was carried out for Beacon by Terrapex, limited to the catchment area belonging to the Feature of Interest (FOI). For the purposes of this report, the FOI is the portion of Uxbridge Brook located within the bounds of the subject property.

The purpose of the catchment-based water balance assessment is to compare the hydrological conditions of the proposed development conditions on the surface water reaching/'feeding' the FOI. For the purposes of this assessment, the FOI is defined as the portion of Uxbridge Brook and associated lower banks (presumed spring flood tier) located at the southeast corner of the subject property.

4.3.1 Pre-Development Constraints – FOI Catchment

The existing pre-development conditions of the subject property includes three general vegetation types, including 'moderately rooted crops' (corn), 'mature forest', and 'swamps and marshes'. A small amount of land comprised of a dirt driveway bisects the property and is characterized as impermeable, due to long term compaction. The existing area of the subject property dedicated to surface water catchment for the Feature of Interest used in the calculations was 372,452 m^2 in area, which includes approximately 2,928 m^2 of impermeable area, as summarized in **Table 10**.

Table 10. Existing Pre-Development Conditions –FOI Catchment

Existing Catchment Land Use	Approximate Pervious Land Area (m²)	Approximate Impervious Land Area (m²)	Sums (m²)
Principle Area – (corn fields)	339,468	-	339,468
Mature Forest Areas (areas defined as FOD [1])	20,345	-	20,045
Marshes and Swamp Areas (areas defined as MAS2-1 [1] and SWT-2 [1])	9,984	-	9,984
Driveway (4 metres wide by 732 metres long)	-	2,928	2,928
Total Areas	**369,497**	**2,928**	**372,425**

FOD – 'deciduous forest areas'

MAS2-1 – 'Cattail Mineral Shallow Marsh'SWT-2 – 'Willow Mineral Thicket Swamp'

[1] Source: Figure 2 – Existing Conditions (Beacon; August, 2020)

4.3.2 Post-Development Constraints – FOI Catchment

Post-development conditions in the FOI Catchment were based on drawings provided by SCS, dated December 2020 (**Figure 2.2**; **Appendix A**), and low impact development (LID) specifications provided by SCS (Dec 3, 2020). The proposed conditions of the subject property include one general vegetation type (Urban lawn/shallow rooted crops), as well as impervious lands comprised of concrete pavements, asphalt pavements, and building structures, as summarized in **Table 11**.

Table 11. Proposed Post-Development Conditions – Proposed FOI Catchment

Proposed Land Uses [1, 2]	Approximate Pervious Land Area (m²)	Approximate Impervious Land Area (m²)	Sums (m²)
	Area within FOI Catchment	Area within FOI Catchment	
Catchment 201	104,632	150,568	255,200
Catchment 202	18,405	1,880	20,285
Catchment 203 (Wet SWMP 1)	8,700	8,700	17,400
Catchment 204	15,637	25,512	41,149
Catchment 205 (Dry SWMP 1)	2,420	2,325	4,745
Catchment 208	1,007	893	1,900
Brook NHS	31,746	-	31,746
Total	**182,176**	**189,249**	**372,425**

[1] Based on information provided by SCS (December 2020).

[2] These represent the area of each catchment limited to the subject property that are interpreted to flow toward the FOI.SWMP – storm water management pond

As indicated in **Table 11**, the proposed catchment for the FOI under the proposed conditions is approximately 372,425 m^2 in area, which includes approximately 189,249 m^2 of impermeable area.

4.3.3 Comparison of Pre-Development and Post-Development Catchment-Based Water Balance Conditions

The pre-development hydrologic budget and post-development hydrologic budgets for the subject property were estimated based on the existing catchment conditions summarized above. The estimated pre-development conditions are compared to anticipated post-development conditions in **Table 12,** below. A more detailed analysis of the values summarized in **Table 12** is provided at monthly resolution in **Appendix E**.

Table 12. Theoretical Average Catchment-Based Water Budgets – FOI Catchment

Component	Pre-Development ConditionsFOI Catchment	Proposed Post-Development ConditionsFOI Catchment	
	(m^3 per annum)	(m^3 per annum)	**Relative Difference from Pre-Development** (m^3 per annum)
(P) Precipitation	304,271	304,271	-
(ET) Evapotranspiration	269,562	135,967	-133,595
(Q_G) Infiltration	55,898	28,571	-27,327
(Q_S) Run-off	55,510	243,283	+187,773

Based on the summary of analyses provided in **Table 12**, it is noted that the changes proposed for the subject property are anticipated to result in an annual decrease of infiltration in the FOI Catchment by approximately 27,327 m^3, and an annual increase in runoff reaching the FOI by approximately 187,773 m^3 in comparison to existing conditions.

Estimated decreases in infiltration volume and increases in run-off volume are interpreted to be due to relatively greater proposed impermeable area, as well as an exchange of moderately rooted crops (e.g., corn) with shallow rooted crops (e.g., urban lawns), which have a lower assigned water holding capacity (re: **Table 5**, above).

4.3.4 Catchment Low Impact Development (LID) Measures and Influence of SWMPs

Low Impact Development Measures located within the FOI Catchment area are proposed. These include Catchbasin Filtration Trenches and Rear Yard At-Surface Infiltration Trenches which effectively convert runoff volume from impermeable areas to infiltration volume. As well, a wet SWMP is proposed (Catchment 203) and a dry SWMP is proposed (Catchment 205). The wet SWMP contributes to evapotranspiration processes, and has a impermeable ratio of 50% (SCS, 2020). The dry SWMP contributes to evapotranspiration processes and infiltration processes. The dry SWMP also sources water from outside of the traditional FOI catchment, effectively converting runoff volumes located in the SWMP sub-catchment and Catchment 204 to infiltration volumes.

Specifications for the LID measures were provided to Beacon as part of the LID Location Plan, LID Sizing and Volume Control Calculations, and Proposed Storm Drainage Plan (SCS, 2020).

The effectiveness of the LID measures were calculated by estimating the maximum available runoff directed to each by the associated catchment areas, and determining the monthly volume of water that could be infiltrated and/or dissipated by evapotranspiration during storage by each feature during the monthly interval, based on specifications provided by SCS (2020). The combined monthly influence of these proposed mitigation methods are provided in **Appendix E**.

4.3.5 Catchment Comparison of Pre-Development and Post-Development Catchment-Based Water Balance Conditions (Including Mitigations)

The pre-development hydrologic budget for the subject property was estimated based on the existing catchment conditions summarized above, and the post-development hydrologic budgets were estimated based on the Post-Development Drainage Plan and related mitigation measures, summarized above. The estimated pre-development conditions are compared to anticipated post-development conditions in Table 13, below. A more detailed analysis of the values summarized in **Table 13** is provided at monthly resolution in **Appendix E**.

Table 13. Theoretical Average Catchment-Based Water Budgets; FOI Catchment

Component	Pre- Development FOI Catchment	Proposed Post-Development Conditions		Proposed Post-Development Conditions with Mitigation Measures	
	(m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)	(m^3 per annum)	Relative Difference from Pre-Development (m^3 per annum)
(P) Precipitation	304,271	304,271	-	304,271	-
(ET) Evapotranspiration	268,562	135,967	-133,595	135,967	-132,595
(Q_G) Infiltration	55,898	28,571	-27,327	167,635	+111,737
(Q_S) Run-off	55,510	243,283	+187,773	104,219	+48,709

Based on the summary of analyses provided in **Table 13**, it is noted that the ultimate proposed conditions for the subject property are anticipated to result in an annual increase of infiltration within the FOI catchment by approximately 111,737 m^3. Similarly, ultimate proposed conditions for the subject property are anticipated to result in an annual increase of runoff by approximately 48,709 m^3 in comparison to existing conditions.

As shown in **Appendix E**, LID measures convert approximately 2,932 m^3 to 31,773 m^3 of theoretical runoff volume to theoretical infiltration within the FOI Catchment per month. Resulting monthly infiltration trends appear to have generally higher infiltration volumes than existing conditions. Controlled runoff volumes result in an earlier freshet period.

It is acknowledged that the values and coefficients presented above are standardized estimates. It is important to understand that infiltration rates and water holding capacities are dependent upon the effective porosity and hydraulic conductivity of the surficial soils which may vary over several orders of magnitude. As such, the resulting run-off and infiltration estimates inherit potentially large margins of error. These margins of error are recognized, but for the purposes of this assessment, the numbers used in the water balance calculations are considered reasonable estimates based on the site-specific conditions and useful for comparison of pre- to post-development conditions.

4.4 INFLUENCE ON GROUNDWATER

As premised in the formula Thornthwaite and Mather (1955) formula, the basic water balance for a particular area can be expressed as: $P = Qs + ET + RE + \Delta S$. As such, the surface area of the subject property is anticipated to facilitate the infiltration of water, which will contribute to the groundwater character. As indicated in the Wetland Function Assessment (Terrapex, 2020), areas of the subject property are observed to have upward-vertical gradient conditions in some areas, which means that groundwater elevations beneath the ground surface are understood to be controlled by subsurface conditions at those areas, and not by the volume of infiltration received.

As shown in the Cross Sections provided in **Figure 5** through **Figure 7**, measured groundwater levels appear to generally follow the ground surface elevation. Measured groundwater levels summarized in **Table 2** indicate that groundwater depths ranged from approximately 0.2 mbgs to 8.92 mbgs in relation to the topography. Groundwater elevations were found to range from approximately 332.0 masl to 285.2 masl, with the typical saturated elevation (redox boundary) noted to be greater than approximately five meters below this.

Groundwater flow is anticipated to flow in the same generally-east direction both pre- and post-development, following the topography. Due to the high elevation of basal groundwater control (upward vertical gradient), the increased amount of anticipated infiltration due to mitigation measures, groundwater levels are anticipated to operate similarly on the eastern high areas of the site, but may increase in elevation on the lower west part of the site during seasonal high groundwater periods.

Construction of basements, if applicable, would be presumed to extend up to 4 mbg, if applicable. As indicated in the cross-sections, groundwater on the west half of the subject property exists below this depth. Basements, if constructed, would be anticipated to encounter groundwater depths on the lower east part of the subject property, where basal groundwater is presumed to have the greatest control. As such, presumed volume displacement may result in higher groundwater levels on the east part of the property, which may be to the benefit of the wetland.

5. SUMMARY

In summary, this report finds that:

Hydrogeological

- The general stratigraphic package is interpreted as alternating layers of silty clay and layers of silty sand, with some areas of sand layers;
- Depths to groundwater from ground surface measured between January of 2018 and August of 2020 ranged from approximately 0.2 mbgs to 8.92 mbgs;
- Groundwater elevations were found to range from approximately 332.0 masl to 285.2 masl;
- Groundwater is estimated to flow in a generally easterly heading at a rate of approximately 0.45 cm/day to 0.66 cm/day.

Water Balance Assessment

A Site-specific Global Water Balance Assessment was carried out for the subject property (403,800 m^2 in area). Proposed changes to the subject property during Phase Ultimate conditions are anticipated to result in an annual increase of infiltration by approximately 99,363 m^3, and an annual increase in runoff by approximately 70,877 m^3 in comparison to existing conditions.

Catchment-Based Water Balance Assessment

A Catchment-Based Water Balance Assessment (CBWB) was carried out for the hydrologic catchment belonging to the portion of Uxbridge Brook located within the subject property.

Annual Conditions

The Catchment for the Feature of Interest (FOI) is approximately 372,425 m^2 in area. Proposed changes to the Catchment for the Feature of Interest (FOI) are anticipated to result in an annual increase of infiltration within the FOI catchment by approximately 111,737 m^3. Similarly, ultimate proposed conditions for the subject property are anticipated to result in an annual increase of runoff by approximately 48,709 m^3 in comparison to existing conditions.

Monthly Conditions

Monthly infiltration volumes are generally anticipated to increase, with the largest increases occurring during the freshet periods. Monthly runoff volumes are generally similar to those seen in the existing conditions, with a slightly earlier freshet period.

6. CLOSURE

This report has been completed in accordance with the terms of reference for this project as agreed upon by Bridge Brook Corporation (the Client) and Terrapex Environmental Ltd. (Terrapex) and generally accepted hydrogeological consulting practices in this area.

The reported information is believed to provide a reasonable representation of the general hydrogeological conditions at the site; however, studies of this nature have inherent limitations. The data were collected at specific locations and conditions may vary at other locations, or with the passage of time. Where applicable, the assessment of the environmental quality of groundwater was limited to a study of those chemical parameters specifically addressed in this report.

Terrapex has relied in good faith on information and representations obtained from the Client and third parties and, except where specifically identified, has made no attempt to verify such information. Terrapex accepts no responsibility for any deficiency or inaccuracy in this report as a result of any misstatement, omission, misrepresentation, or fraudulent act of those providing information. Terrapex shall not be responsible for conditions or consequences arising from relevant facts that were concealed, withheld, or not fully disclosed at the time of the study.

This report has been prepared for the sole use of Bridge Brook Corporation. Terrapex accepts no liability for claims arising from the use of this report, or from actions taken or decisions made as a result of this report, by parties other than Phase Brook Corporation.

Respectfully submitted,

TERRAPEX ENVIRONMENTAL LTD.

Report prepared by: **Terrapex Environmental**	Report reviewed by: **Beacon Environmental**
DRAFT	**DRAFT**
Zen Keizars, P.Geo., FGC. Senior Hydrogeologist	Brian Henshaw

7. SOURCES CITED

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Soil Engineers Limited., 2018. A Letter for Groundwater Monitoring Program – Proposed Development, 7370 Centre Road, Town of Uxbridge.

Soil Engineers Limited., 2018. A Letter for Groundwater Monitoring Program – Proposed Development, 7370 Centre Road, Town of Uxbridge.

Figures

Site Location

Figure 1

7370 Centre Road Uxbridge

BEACON ENVIRONMENTAL

Project: 217431
Last Revised: September, 2020

Client: Mediterra Corp.

Prepared by: BD
Checked by: JM

N

1:8,100

Inset Map:1:50,000

Contains information licensed under the Open Government License– Ontario Orthoimagery Baselayer: 2019 (FBS)

C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2017\217431 7370 Centre Road Uxbridge EIS\MXD\2020-09-02_Figure01_SiteLocation_217431.mxd

Well Locations

Figure 2

7370 Centre Road Uxbridge

Legend

- 🟥 Subject Property
- - - 500 metre distance from Subject Property boundary
- ⊙ Wells reported in the MECP Water Well Database (accessed August, 2020)
- ◐ Groundwater Monitoring Wells

BEACON ENVIRONMENTAL

Project: 217431.2
Last Revised: August, 2020

Client: Mediterra Corp.

Prepared by: DU
Checked by: ZH

N

1:7,500

0 100 200 m

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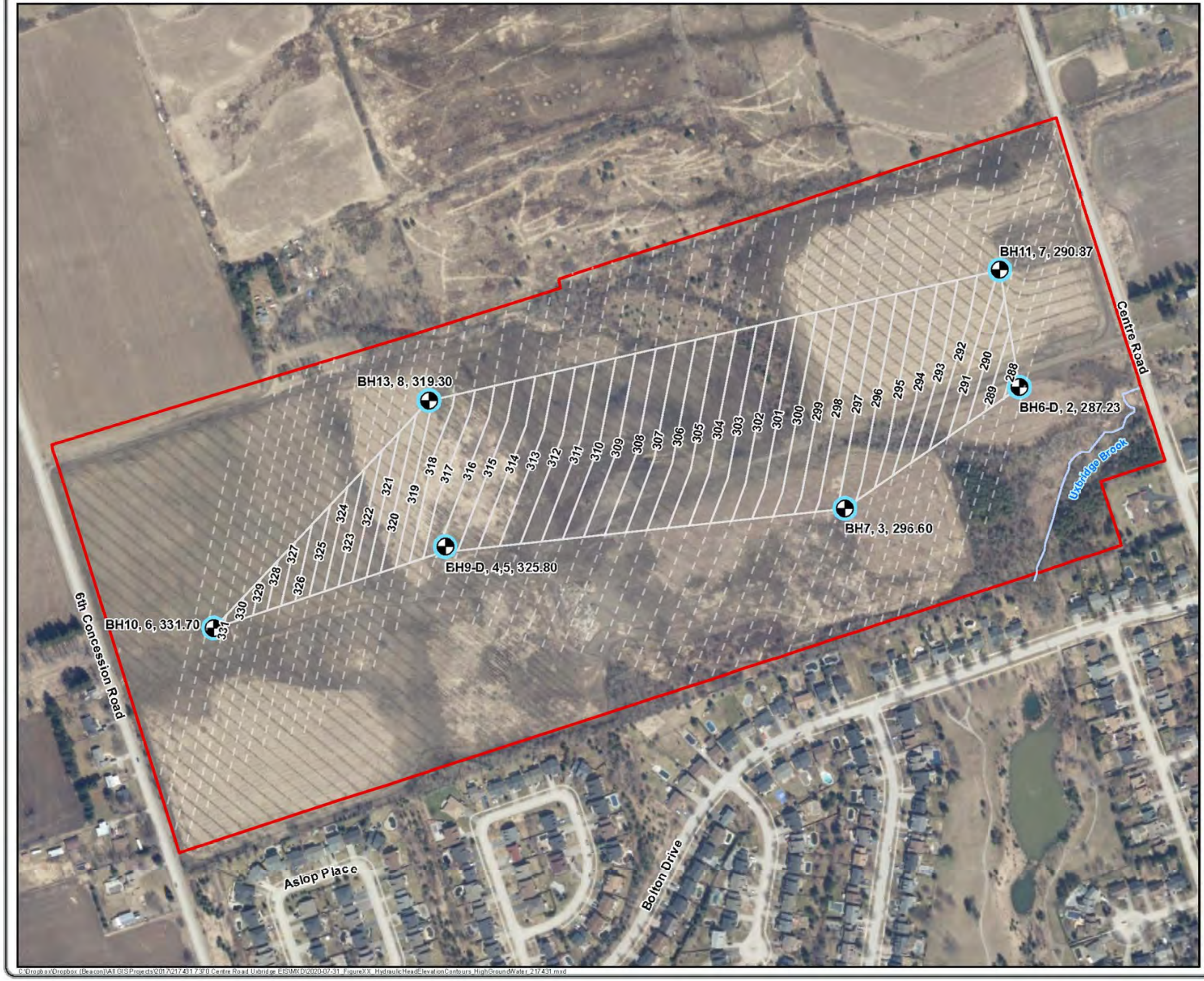
C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2017\217431 7370 Centre Road Uxbridge EIS\MXD\2020-08-26_Figure02_WellLocations_217431.mxd



C:\Dropbox\Dropbox (Beacon)\All GIS\Projects\2017\217431 7370 Centre Road Uxbridge EIS\MXD\2020-07-31_FigureXX_HydraulicHeadElevationContours_HighGroundWater_217431.mxd

Hydraulic Head Elevation Contours for the date of March 16, 2020 (High Ground Water Levels)

Figure 3

7370 Centre Road Uxbridge

Legend

● Monitoring Wells

▭ Subject Property

— Watercourse (Beacon 2020)

— Hydraulic Head Elevation Contours (metres above sea level)

- - Extrapolated Hydraulic Head Elevation Contours (metres above sea level) – reduced confidence.

DRAFT FOR DISCUSSION PURPOSES

BEACON ENVIRONMENTAL

Project: 217431.2

Last Revised: July, 2020

Client: INTERNAL USE ONLY

Prepared by: DU

Checked by: ZH

N

1:3,500

0 50 100 m

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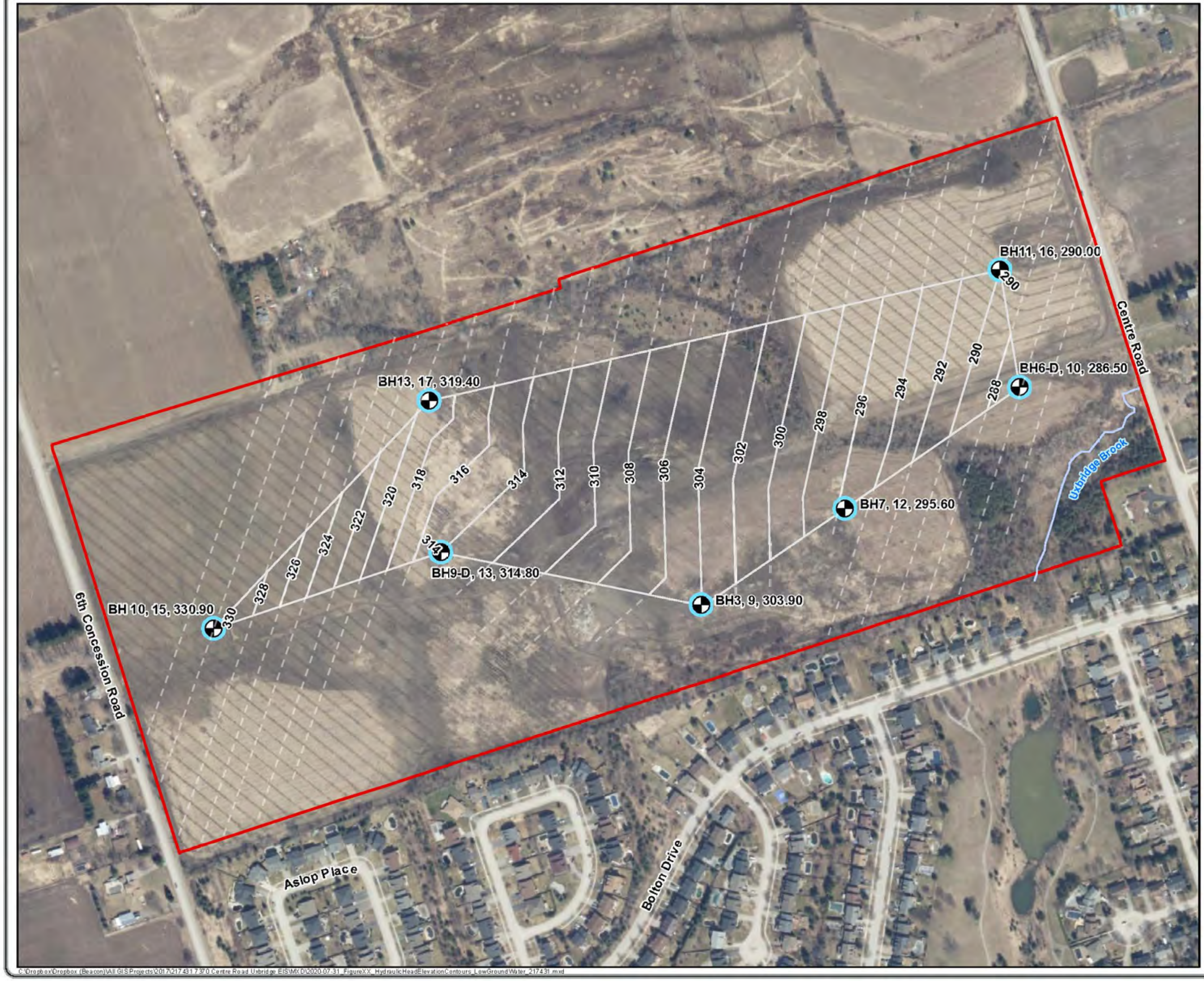


Hydraulic Head Elevation Contours for the date of June 19 + July 4, 2019 (Low Ground Water Levels)

Figure
4

7370 Centre Road Uxbridge

Legend

- 🟥 Subject Property
- Monitoring Wells
- Hydraulic Head Elevation Contours (metres above sea level), measurements by Soil Engineers (2019).
- Watercourse (Beacon 2020)
- Extrapolated Hydraulic Head Elevation Contours (metres above sea level). Reduced confidence.

DRAFT FOR DISCUSSION PURPOSES

BEACON ENVIRONMENTAL

Project: 217431.2
Last Revised: July, 2020

Client: INTERNAL USE ONLY

Prepared by: DU
Checked by: ZH

N

1:3,500

0 50 100 m

Contains information licensed under the Open Government License–Ontario Orthoimagery Baselayer: 2019 (FBS)

C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2017\217431 7370 Centre Road Uxbridge EIS\MXD\2020-07-31_FigureXX_HydraulicHeadElevationContours_LowGroundWater_217431.mxd

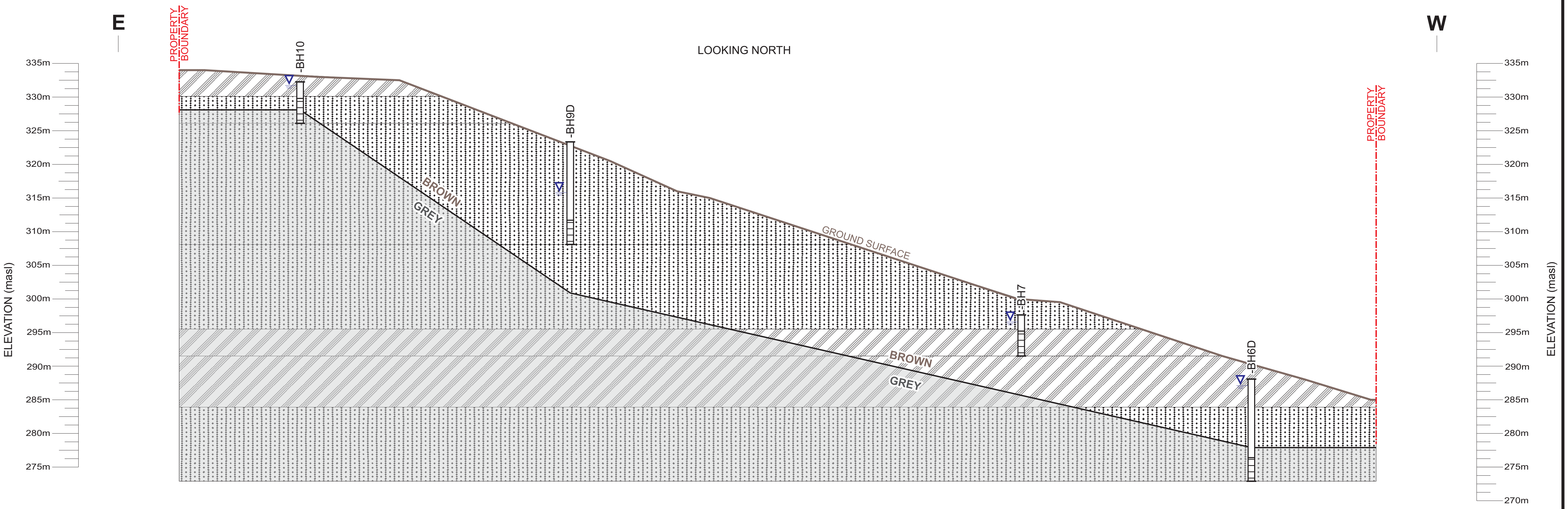
TERRAPEX

CROSS SECTION A-A' (EAST TO WEST)

7370 CENTRE ROAD
UXBRIDGE, ONTARIO

CLIENT

JOHN SPINA



LEGEND

▦ SILTY CLAY

▨ SILTY SAND

STATIC WATER LEVEL- ▽
(March 16, 2020)

-MW104 - MONITORING WELL DESIGNATION

- SCREENED ZONE

- BOREHOLE

HORIZONTAL SCALE:

0 50m 100m

(APPROXIMATE)

PROJECT #	*CT3058.00*
SCALE	*AS SHOWN*
DATE	*AUGUST 2021*
DRAWN	*SW*
CHECKED	
DRAWING #	*FIGURE 5*

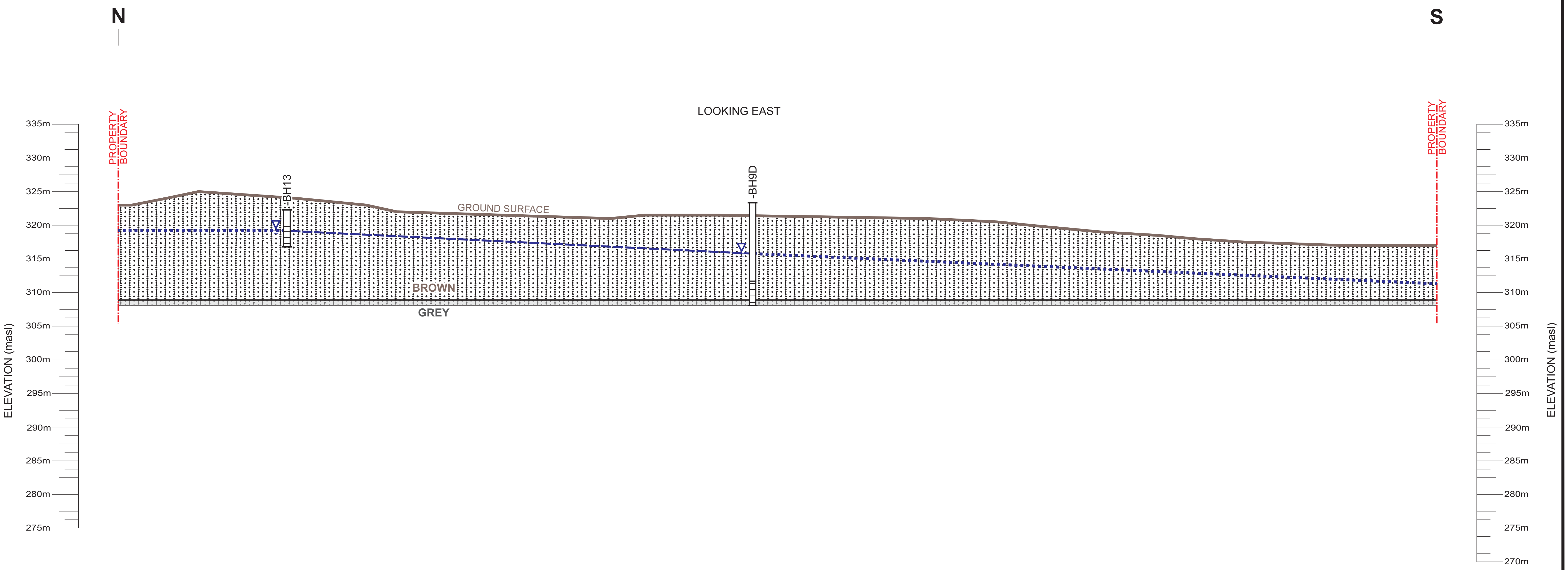
TERRAPEX

CROSS SECTION B1-B1' (NORTH TO SOUTH)

7370 CENTRE ROAD
UXBRIDGE, ONTARIO

CLIENT

JOHN SPINA



LEGEND

▦ SILTY CLAY

······ EXTRAPOLATED GROUNDWATER LEVEL

– – – INTERPOLATED GROUNDWATER LEVEL

STATIC WATER LEVEL- ▽
(March 16, 2020)

-MW104 - MONITORING WELL DESIGNATION

- SCREENED ZONE

- BOREHOLE

HORIZONTAL SCALE:

0 25m 50m

(APPROXIMATE)

PROJECT # *CT3058.00*
SCALE *AS SHOWN*
DATE *OCTOBER 2021*
DRAWN *SW*
CHECKED
DRAWING # *FIGURE 6*

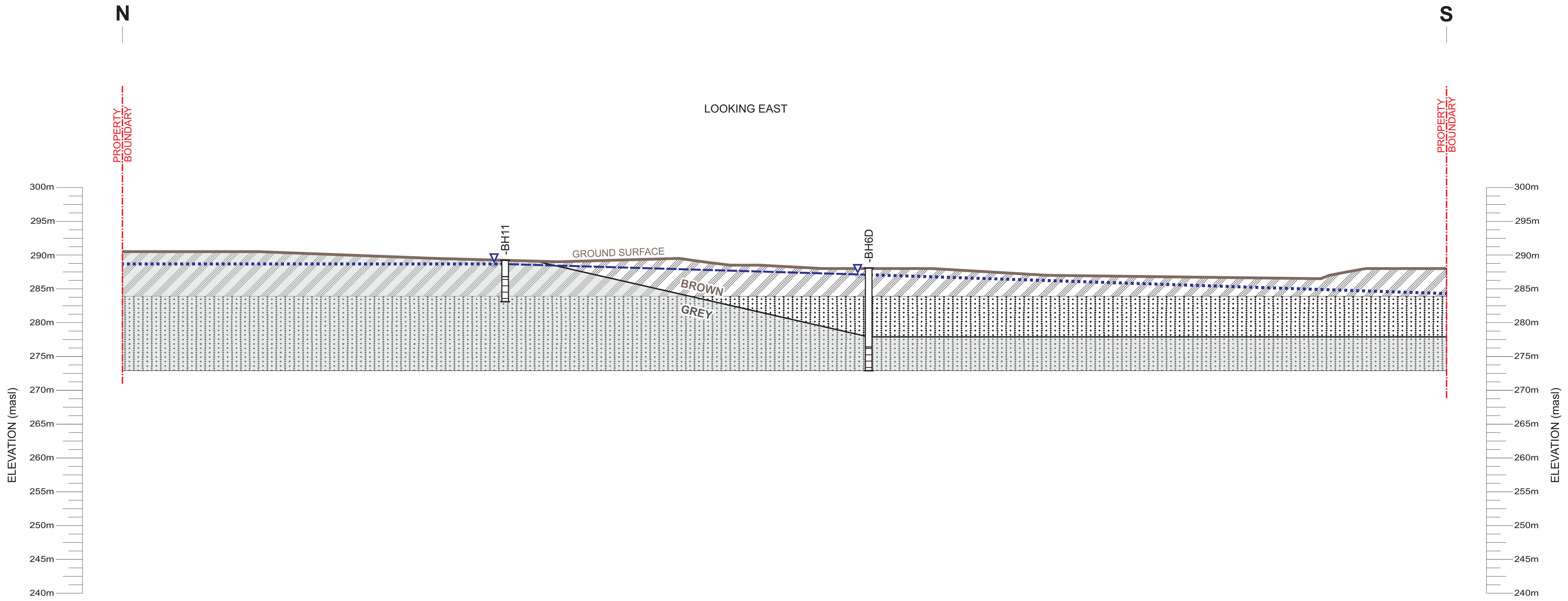
TERRAPEX

CROSS SECTION B2-B2' (NORTH TO SOUTH)

7370 CENTRE ROAD
UXBRIDGE, ONTARIO

CLIENT

JOHN SPINA



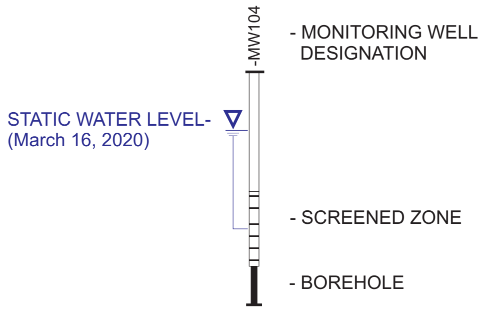
LEGEND

▦ SILTY CLAY

▨ SILTY SAND

┈┈ EXTRAPOLATED GROUNDWATER LEVEL

– – INTERPOLATED GROUNDWATER LEVEL



HORIZONTAL SCALE:

0 25m 50m

(APPROXIMATE)

PROJECT #	*CT3058.00*
SCALE	*AS SHOWN*
DATE	*OCTOBER 2021*
DRAWN	*SW*
CHECKED	
DRAWING #	*FIGURE 7*

Appendix A

Well Records (MECP)

Appendix A

Water Well Database Information

FID	BOREHOLEID	WELL_ID	COMPLETED	DEPTH	DP_BEDROCK	STATIC_LEV
0	10296870	4605554	9/20/73 0:00:00	26.2000008	0	9.1000004
1	1003924861	7182653	5/31/12 0:00:00	0	0	0
2	10073650	1904798	8/18/77 0:00:00	56.4000015	0	44.7999992
3	10083560	1914971	1/26/00 0:00:00	36	0	11.3000002
4	10296153	4604827	6/14/71 0:00:00	29	0	7.5999999
5	10295105	4603754	10/15/68 0:00:00	24.3999996	0	3
6	10296828	4605511	6/08/73 0:00:00	32	0	11.3000002
7	10297933	4606647	10/01/76 0:00:00	25	0	0.6
8	10296491	4605169	3/25/72 0:00:00	33.2000008	0	12.1999998
9	10075984	1907346	5/31/85 0:00:00	14.3000002	0	2.7
10	10076019	1907381	7/03/85 0:00:00	15.1999998	0	3.7
11	10296023	4604693	12/15/70 0:00:00	6.4000001	0	1.5
12	10082491	1913900	12/17/98 0:00:00	57.9000015	0	45.0999985
13	11173432	1917266	2008-11-04 0:00	0	0	0
14	10074334	1905496	8/17/79 0:00:00	38.0999985	0	12.1999998
15	1002477483	7124196	2006-08-09 0:00	0	0	0
16	10074997	1906216	8/26/81 0:00:00	42.7000008	0	16.7999992
17	10077253	1908623	9/21/87 0:00:00	25.6000004	0	12.1999998
18	10075909	1907270	6/28/84 0:00:00	31.3999996	0	0
19	10296210	4604884	8/17/71 0:00:00	32	0	10.6999998
20	10074386	1905550	5/11/79 0:00:00	30.2000008	0	12.1999998
21	10296511	4605189	8/03/72 0:00:00	33.5	0	13.6999998
22	10076453	1907818	7/10/86 0:00:00	26.2000008	0	14.6000004
23	10082526	1913935	1/19/99 0:00:00	74.0999985	0	50
24	10295673	4604338	3/29/69 0:00:00	7.5999999	0	3
25	10295658	4604323	9/15/69 0:00:00	8.5	0	2.4000001
26	10073956	1905105	7/24/78 0:00:00	69.8000031	0	48.7999992
27	10296244	4604920	7/05/71 0:00:00	32	0	11.3000002
28	10296158	4604832	11/12/70 0:00:00	31.7000008	0	9.1000004
29	10296277	4604953	7/19/71 0:00:00	32	0	11.8999996
30	10295996	4604666	12/30/70 0:00:00	31.3999996	0	10.6999998
31	10538025	1916454	2004-07-03 0:00	0	0	0
32	10296585	4605265	12/14/72 0:00:00	28.2999992	0	7.3000002
33	10296827	4605510	7/23/73 0:00:00	27.3999996	0	8.5

FID	BOREHOLEID	WELL_ID	COMPLETED	DEPTH	DP_BEDROCK	STATIC_LEV
34	10074068	1905219	12/18/78 0:00:00	25.2999992	0	3.7
35	10296743	4605425	4/26/73 0:00:00	18.2999992	0	4.5999999
36	10073538	1904592	4/29/77 0:00:00	18.6000004	0	6.4000001
37	10296666	4605347	10/13/72 0:00:00	33.2000008	0	7.5999999
38	10296156	4604830	5/04/71 0:00:00	28.7000008	0	9.1000004
39	10295657	4604322	9/10/69 0:00:00	34.4000015	0	11.6000004
40	10297007	4605694	10/22/73 0:00:00	33.2000008	0	13.6999998
41	10075424	1906753	10/17/83 0:00:00	22.6000004	0	7.5999999
42	1006274113	7273627		0	0	0
43	10296008	4604678	12/15/70 0:00:00	5.5	0	0.9
44	10076567	1907933	9/23/86 0:00:00	27.3999996	0	7.5999999
45	10297729	4606440	3/30/76 0:00:00	58.2000008	0	45.7000008
46	10537894	1916323	2011-12-02 0:00	23.7999992	0	0.6
47	10076070	1907433	8/28/85 0:00:00	26.2000008	0	6.0999999
48	10295248	4603898	8/29/68 0:00:00	25.2999992	0	8.5
49	10296826	4605509	7/19/73 0:00:00	35.0999985	0	12.1999998
50	10296748	4605430	5/04/73 0:00:00	29.8999996	0	10.1000004
51	10082798	1914207	9/07/99 0:00:00	30.5	0	14.6000004
52	10082492	1913901	12/09/98 0:00:00	53.9000015	0	44.7999992
53	10530664	1916126	9/25/02 0:00:00	79.1999969	52.4000015	0
54	10538024	1916453	2004-07-03 0:00	0	0	0
55	10297126	4605814	3/13/74 0:00:00	33.2000008	0	10.6999998
56	10296208	4604882	9/24/71 0:00:00	21.2999992	0	6.6999998
57	10296603	4605283	8/29/72 0:00:00	9.8000002	0	7.9000001
58	10295594	4604256	11/26/69 0:00:00	27.3999996	0	9.8000002
59	10296154	4604828	6/02/71 0:00:00	32.9000015	0	11.8999996
60	10295662	4604327	6/16/69 0:00:00	7.9000001	0	4.9000001
61	10075910	1907271	11/16/84 0:00:00	38.0999985	0	0
62	10295669	4604334	2/27/69 0:00:00	10.6999998	0	4.3000002
63	10294358	4602995	10/02/62 0:00:00	19.7999992	0	6.0999999
64	10296548	4605227	7/26/72 0:00:00	22.8999996	0	9.8000002
65	10296018	4604688	9/04/70 0:00:00	4.5999999	0	1.8
66	10073516	1904570	3/01/77 0:00:00	34.4000015	0	13.6999998
67	10295165	4603815	8/12/68 0:00:00	8.1999998	0	6.0999999
68	1003525095	7164586	2006-10-11 0:00	0	0	0
69	1004142949	7186160	2007-10-12 0:00	0	0	5.8000002
70	10080491	1911869	12/10/93 0:00:00	26.5	0	12.1999998
71	10294333	4602970	12/20/65 0:00:00	58.7999992	0	46.5999985
72	10296532	4605211	8/18/72 0:00:00	32.2999992	0	10.6999998
73	10080499	1911877	9/03/93 0:00:00	26.2000008	0	8.1999998

FID	BOREHOLEID	WELL_ID	COMPLETED	DEPTH	DP_BEDROCK	STATIC_LEV
74	10530718	1916180	9/18/02 0:00:00	0	0	0
75	10295660	4604325	2/09/70 0:00:00	7.9000001	0	2.4000001
76	10296834	4605518	7/24/73 0:00:00	36.9000015	0	11.6000004
77	10295440	4604096	3/29/69 0:00:00	7.5999999	0	1.5
78	10078942	1910316	11/29/89 0:00:00	31.7000008	0	4.5999999
79	10296640	4605321	10/18/72 0:00:00	23.2000008	0	7.5999999
80	10076569	1907935	9/18/86 0:00:00	25.6000004	21.8999996	6.0999999
81	10295998	4604668	10/22/70 0:00:00	27.1000004	0	7
82	10296795	4605478	7/23/72 0:00:00	33.5	0	12.5
83	10296490	4605168	4/20/72 0:00:00	32.2999992	0	12.1999998
84	10296586	4605266	12/12/72 0:00:00	30.7999992	0	10.1000004
85	1006342506	7279407	2011-01-16 0:00	0	0	3.7
86	10082525	1913934	1/28/99 0:00:00	0	0	0
87	10297869	4606582	6/02/76 0:00:00	29.2999992	0	8.5
88	10077152	1908519	7/08/87 0:00:00	25	0	6.0999999
89	1005373204	7241714	4/26/15 0:00:00	25.2000008	0	2.7
90	10297907	4606620	8/25/76 0:00:00	67.0999985	0	0
91	10295741	4604407	5/28/70 0:00:00	31.3999996	0	11
92	10295339	4603994	11/19/68 0:00:00	11.3000002	0	4.3000002
93	10295489	4604147	8/14/69 0:00:00	23.2000008	0	11.3000002
94	10296993	4605680	10/12/73 0:00:00	33.5	0	9.8000002
95	10296014	4604684	9/07/70 0:00:00	8.5	0	7.3000002
96	10295506	4604164	8/13/69 0:00:00	23.2000008	0	9.1000004
97	10295171	4603821	9/18/68 0:00:00	10.6999998	0	4.3000002
98	10296979	4605666	11/03/73 0:00:00	6.6999998	0	4.5999999
99	10295885	4604553	10/14/70 0:00:00	32	4.9000001	11
100	10296825	4605508	6/02/73 0:00:00	32	0	9.1000004
101	10079539	1910916	11/06/90 0:00:00	22.6000004	0	7.3000002
102	1006342509	7279408	2011-01-16 0:00	0	0	3.7
103	10296019	4604689	9/04/70 0:00:00	4.9000001	0	1.8

Appendix B

Provided Historical Work

(Soil Engineers Limited, 2018)

Existing Conditions
(Figure 2 - Beacon, August, 2020)

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (905) 881-8335	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

February 16, 2018 Reference No. 1711-S047

Bridge Brook Corp.
55 Blue Willow Drive
Woodbridge, Ontario
L4L 9E8

Attention: Mr. John Spina

Re: A Geotechnical Investigation Report for
Proposed Residential Development
7370 Centre Road
Town of Uxbridge

Dear Sir:

Enclosed, please find 3 copies of the Geotechnical Investigation Report for the captioned project.

I trust the Report will meet your present requirements as per our proposal.

Should you have any queries concerning the above, or wish to retain us for further services, please feel free to contact the undersigned at your earliest convenience.

Yours truly,
SOIL ENGINEERS LTD.

Kin Fung Li, B.Eng.
KFL:dd

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Encl.

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A REPORT TO
BRIDGE BROOK CORP.

A GEOTECHNICAL INVESTIGATION FOR PROPOSED RESIDENTIAL DEVELOPMENT

7370 CENTRE ROAD

TOWN OF UXBRIDGE

REFERENCE NO. 1711-S047

FEBRUARY 2018

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1.0 INTRODUCTION

In accordance with written authorization dated November 9, 2017, from Mr. John Spina of Bridge Brook Corp., a geotechnical investigation was carried out on a parcel of land located on 7370 Centre Road, in the Town of Uxbridge.

The purpose of the investigation was to reveal the subsurface conditions and determine the engineering properties of the disclosed soils for the design and construction of a proposed Residential Development.

The geotechnical findings and resulting recommendations are presented in this Report.

2.0 SITE AND PROJECT DESCRIPTION

The Township of Uxbridge is situated on Peterborough Drumlin Field, where the lacustrine sand, silt, clay and water-laid till (reworked) in Lake Schomberg (glacial lake) has, in places, modified the drumlinized soil stratigraphy.

The subject property, encompasses approximately 40 hectares in area, is located on the west side of Centre Road, approximately 900 m north of Brock Street West in the Town of Uxbridge. It is currently a farm field with wooded areas and some natural drainage channels through the property. The existing site gradient generally drops towards the east direction.

It is understood that the property will be developed into a residential subdivision. Detailed design of the development, however, is not available at the time this report is prepared.

3.0 FIELD WORK

The field work, consisting of fourteen (14) boreholes to various depths ranging from 6.3 to 15.7 m, was performed between November 27 and December 21, 2017. Borehole 1 was cancelled due to accessibility. Borehole 13 was advanced on January 15, 2018 to a depth of 6.6 m. The boreholes locations are shown on the Borehole Location Plan, Drawing No. 1.

The boreholes were advanced at intervals to the sampling depths by a track-mounted, continuous-flight power-auger machine equipped for soil sampling. Standard Penetration Tests, using the procedures described on the enclosed "List of Abbreviations and Terms", were performed at the sampling depths. The test results are recorded as the Standard Penetration Resistance (or 'N' values) of the subsoil. The relative density of the granular strata and the consistency of the cohesive strata are inferred from the 'N' values. Split-spoon samples were recovered for soil classification and laboratory testing. The field work was supervised and the findings were recorded by a Geotechnical Technician.

Upon the completion of drilling and sampling, nine (9) 50 mm diameter PVC monitoring wells, including two pairs of nested wells were installed in selected borehole locations to facilitate future groundwater monitoring. The boreholes were backfilled with hole plug (bentonite) and borehole cuttings to the ground level.

The ground elevation at each of the borehole and monitoring well location was interpreted from the topographic survey provided by Stantec Geomatics Ltd.

4.0 SUBSURFACE CONDITIONS

Detailed descriptions of the encountered subsurface conditions are presented on the Borehole Logs, comprising Figures 1 to 15, inclusive.

The investigation revealed that beneath a veneer of topsoil and ploughed soils, the site is generally underlain by a complex stratigraphy consisting of silty clay and tills, with deposits of sand and silts at various depths and locations. The engineering properties of the disclosed soils are discussed herein.

4.1 Topsoil/Ploughed Soils (All Boreholes)

The existing ground surface was generally covered with topsoil with variable thickness. In the farm field area, the topsoil was mixed with ploughed soils, extending to depths of 0.6 to 1.5 m from the existing ground level.

The thickness of topsoil may vary randomly across the site. Thicker topsoil layers can occur in the low-lying areas, especially in treed areas and depressed areas beside the watercourses.

The topsoil is dark brown in colour and permeated with roots. This infers that it contains appreciable amounts of roots and humus. Similarly, the ploughed soils contains a composition of topsoil that it is unstable and compressible under loads; therefore, the topsoil and the ploughed soils are considered to be void of engineering value but can be used for general landscaping purposes. A fertility analysis can be carried out to assess their suitability for use as a planting soil or sodding medium. Due to the humus content, the topsoil will generate an offensive odour under anaerobic conditions and may produce volatile gases; therefore, it must not be buried within the building envelope, or deeper than 1.2 m below the finished grade, as it may have an adverse impact on the environmental well-being of the development.

4.2 Silty Clay/Silty Clay Till (Boreholes 2, 3, 4, 6 to 10, inclusive, 13, 14 and 15)

The clay till consists of a random mixture of soils; the particle sizes range from clay to gravel, with the clay fraction exerting the dominant influence on its soil properties. Its structure is heterogeneous, showing a glacial deposit. The silty clay consists of predominantly clay and silt with occasional sand seams or layers, showing a lacustrine deposit.

Intermittent hard resistance to augering was encountered, indicating the presence of cobbles and boulders in the clay till.

The consistency of the clay and clay till and their respective 'N' values are summarized below:

	'N' Values	**Consistency**
Silty Clay	12 to 58 (median 28)	Stiff to hard, generally very stiff
Silty Clay Till	6 to over 100 (median 30)	Firm to hard, generally hard

The Atterberg Limits of representative samples of the silty clay till and silty clay, and the natural water content of all the samples were determined. The results are plotted on the Borehole Logs and summarized below:

	Silty Clay Till	Silty Clay
Liquid Limit	28%	35%
Plastic Limit	17%	19%
Natural Water Content	5% to 27% (median 12%)	14% to 26% (median 15%)

The above results show that the clay and clay till are cohesive materials with low plasticity. The natural water content generally lies below the plastic limit or between the plastic and liquid limits, confirming the consistencies of the clay and clay till as determined by the 'N' values.

Grain size analyses were performed on representative samples of silty clay till and silty clay; the results are plotted on Figures 16 and 17, respectively.

According to the above findings, the following engineering properties are deduced:

- Highly frost susceptible and low water erodibility.
- The silty clay has high soil-adfreezing potential.
- Virtually impervious, with an estimated coefficient of permeability of 10^{-7} cm/sec or less, an average percolation rate of 80 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.15
2% - 6%	0.20
6% +	0.28

- Cohesive soils, their shear strengths are primarily derived from consistency which is inversely related to its moisture content. The clay till also contains sand and gravel; therefore, its shear strength is augmented by internal friction.

- The shear strength of the silty clay and till is moisture dependent and, due to the dilatancy of the silt layers in the clay, the overall shear strength of the silty clay is susceptible to impact disturbance, i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction of shear strength.
- The clay and clay till will generally be stable in a relatively steep cut; however, prolonged exposure will allow the weathered layers and the wet sand seams to become saturated which may lead to localized sloughing.
- Very poor pavement-supportive materials, with an estimated California Bearing Ratio (CBR) of 3% to 5%.
- Moderately high corrosivity to buried metal, with an estimated electrical resistivity of 3000 ohm·cm.

4.3 Silty Sand Till (Boreholes 2, 5, 6, 7, 10, 11 and 12)

The silty sand till consists of a random mixture of particle sizes ranging from clay to gravel, with sand being the dominant fraction. They are heterogeneous and amorphous in structure showing the deposit is a glacial till, part of which has been reworked by the glacial lake.

Tactile examinations of the soil samples indicated that the till is slightly cemented.

The obtained 'N' values range from 6 to over 100, with a median of 26 blows per 30 cm of penetration. This shows that the relative density of the till is loose to very dense, being generally compact. The loose soil is encountered below the ploughed soil and has been weakened by weathering.

Intermittent hard resistance to augering was encountered, indicating the presence of cobbles and boulders in the sand till.

The natural water content values of the samples were determined; the results are plotted on the Borehole Logs. The values range from 7% to 13%, with a median of 9%, confirming the generally moist condition disclosed by the sample examinations.

Grain size analyses were performed on two representative samples; the results are plotted on Figure 18.

According to the above findings, the following engineering properties are deduced:

- Highly frost susceptible and moderately water erodible.
- Low soil-adfreezing potential.
- Low permeability, with an estimated coefficient of permeability of 10^{-5} cm/sec, an average percolation rate of 40 min/cm, and runoff coefficients of:

Slope	
0% - 2%	0.11
2% - 6%	0.16
6% +	0.23

- A frictional soil, its shear strength is primarily derived from internal friction, and is augmented by cementation. Therefore, the strength is density dependent.
- It will be stable in steep cuts; however, under prolonged exposure, localized sheet collapse will likely occur.
- A fair pavement-supportive material, with an estimated CBR of 10%.

- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 5000 ohm·cm.

4.4 **Sandy Silt/Silt** (Boreholes 2, 4, 9, 11, 12 and 15)

The sandy silt and silt deposit was encountered in various depths and locations. It is fine grained, with traces to some sand and clay. The natural water content of the samples range from 10% to 23%, with a median of 17%, indicating a moist to wet condition, being generally wet and likely saturated. The wet silt dilates when shaken by hand. The wet soils are water-bearing.

The obtained 'N' values range from 14 to 72 blows, with a median of 30 blows per 30 cm of penetration, indicating that the relative density of the sandy silt and silt is compact to very dense, being generally compact.

According to the above findings, the engineering properties relating to the project are given below:

- Highly frost susceptible, with high soil-adfreezing potential.
- Highly water erodible; it is susceptible to migration through small openings under seepage pressure.
- It has a high capillarity and water retention capacity.
- Low permeability, with an estimated coefficient of permeability of 10^{-5} cm/sec, an average percolation rate of 40 min/cm and runoff coefficients of:

Slope	
0% - 2%	0.11
2% - 6%	0.16
6% +	0.23

- Frictional soils, their shear strength is density dependent. Due to their dilatancy, the strength of the wet silts is susceptible to impact disturbance, i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and a reduction in shear strength.
- In excavation, the wet silts will slough and run slowly with seepage bleeding from the cut face. It will boil with a piezometric head of 0.3 m.
- Poor pavement-supportive materials, with an estimated CBR value of 5%.
- Moderately corrosive to buried metal, with an estimated electrical resistivity of 4500 ohm.cm.

4.5 Sand (Boreholes 4, 5, 13 and 15)

The sand deposit is generally fine to medium grained with some silt. Sample examinations show that the deposit is in a very moist to wet condition and is water bearing. This is confirmed by the natural water content of the soil samples, in the range of 5% to 22%, with a median of 17%. Due to the pervious nature of the deposit, some water could have been drained from the samples after they were retrieved or during the packing process. Hence, the actual water content of the deposit can be higher. The wet sand is water-bearing.

The obtained 'N' values of the sand deposit ranged from 9 to over 100, with a median of 27 blows per 30 cm of penetration, indicating the relative density of the sand is loose to very dense, being generally compact.

A grain size analysis was performed on one representative sample of the sand deposit; the result is plotted on Figure 19.

According to the above findings, the following engineering properties are deduced:

- Low frost susceptibility.
- Highly water erodible.
- Susceptible to migration through small openings under seepage pressure.
- Pervious, with an estimated coefficient of permeability of 10^{-3} cm/sec, an average percolation rate of 10 min/cm and runoff coefficients of:

Slope	
0% - 2%	0.04
2% - 6%	0.09
6% +	0.13

- A frictional soil, its shear strength is dependent on its internal friction angle and soil density. Due to its dilatancy, its shear strength is susceptible to impact disturbance, i.e., the disturbance will induce a build-up of pore pressure within the soil mantle, resulting in soil dilation and reduction of shear strength.
- In excavation, the wet sand will slough and run slowly with seepage bleeding from the cut face. It will boil with a piezometric head of 0.3 m.
- A good pavement-supportive material, with an estimated CBR value of 21%.
- Moderately low corrosivity to buried metal, with an estimated electrical resistivity of 6000 ohm·cm.

4.6 Compaction Characteristics of the Revealed Soils

The obtainable degree of compaction is primarily dependent on the soil moisture and, to a lesser extent, on the type of compactor used and the effort applied.

As a general guide, the typical water content values of the revealed soils for Standard Proctor compaction are presented in Table 1.

Table 1 - Estimated Water Content for Compaction

Soil Type	Determined Natural Water Content (%)	Water Content (%) for Standard Proctor Compaction	
		100% (optimum)	Range for 95% or +
Silty Clay and Silty Clay Till	5 to 27 (median 13)	18	14 to 24
Silty Sand Till	7 to 13 (median 9)	13	8 to 16
Sandy Silt and Silt	10 to 23 (median 17)	10	7 to 14
Sand	5 to 22 (median 17)	8	5 to 11

Based on the above findings, the clay and tills are generally suitable for 95% or + Standard Proctor compaction. However, some of the clays, sand and silts are generally too wet and will require aeration prior to compaction. Aeration can be achieved by spreading them thinly on the ground during the dry and warm weather.

The clay and tills should be compacted using a heavy-weight kneading-type roller. The sand and silts can be compacted by a smooth drum roller, with or without vibration, depending on the water content of the soil being compacted. The lifts for compaction should be limited to 20 cm, or to a suitable thickness as assessed by test strips performed by the equipment which will be used at the time of construction.

When compacting the clay or tills on the dry side of the optimum, the compactive energy will frequently bridge over the chunks in the soil and be transmitted laterally into the soil mantle. Therefore, the lifts of these soils must be limited to 20 cm or less (before compaction). It is difficult to monitor the lifts of backfill placed in deep trenches; therefore, it is preferable that the compaction of backfill at depths over 1.0 m below the road subgrade be carried out on the wet side of the optimum. This would allow a wider latitude of lift thickness.

One should be aware that with considerable effort, a 90%± Standard Proctor compaction of the wet sand and silts is achievable. Further densification is prevented by the pore pressure induced by the compactive effort; however, large random voids will have been expelled, and with time, the pore pressure will dissipate and the percentage of compaction will increase. There are many cases on record where after a few months of rest, the density of the compacted mantle has increased to over 95% of its maximum Standard Proctor dry density.

If the compaction of the soils is carried out with the water content within the range for 95% Standard Proctor dry density but on the wet side of the optimum, the surface of the compacted soil mantle will roll under the dynamic compactive load. This is unsuitable for road construction since each component of the pavement structure is to be placed under dynamic conditions which will induce the rolling action of the subgrade surface and cause structural failure of the new pavement. The foundations or bedding of the sewer and slab-on-grade will be placed on a subgrade which will not be subjected to impact loads. Therefore, the structurally compacted soil mantle, with the water content on the wet side or dry side of the optimum, will provide an adequate subgrade for the construction.

The presence of boulders in the tills will prevent transmission of the compactive energy into the underlying material to be compacted. If an appreciable amount of boulders over 15 cm in size is mixed with the material, it must either be sorted or must not be used for construction of engineered fill and/or structural backfill.

5.0 GROUNDWATER CONDITIONS

The boreholes were checked for the presence of groundwater or the occurrence of cave-in upon completion of the field work. In addition, the groundwater level in monitoring wells was recorded on January 31, 2018. The records are summarized in Table 2.

Table 2 - Groundwater Level

Borehole No.	Ground El. (m)	Groundwater in Boreholes/Monitoring Wells			
		Upon Completion		On January 31, 2018	
		Depth (m)	El. (m)	Depth (m)	El. (m)
2	295.8	1.2	294.6	No Well	
3	305.0	2.7	302.3	0.4	304.6
4	318.6	0.6	318.0	No Well	
5	332.2	4.8	327.4	No Well	
6	287.9	14.9	273.0	1.3	286.6
7	297.8	4.8	293.0	0.9	296.9
8	307.0	5.4	301.6	No Well	
9	321.9	14.6	307.3	7.4	314.5
10	332.6	3.6	329.0	0.2	332.4
11	291.4	1.2	290.2	1.1	290.3
12	303.0	4.8	298.2	No Well	
13	322.6	3.6	319.0	3.5	319.1
14	322.9	3.6	319.3	No Well	
15	333.6	2.7	330.9	No Well	

Upon the completion of borehole drilling, groundwater was recorded in the boreholes between El. 273.0 m and El. 330.9 m, dropping in the east southeast direction. The stabilized groundwater in the monitoring wells was recorded between El. 286.6 m and El. 332.4 m.

Groundwater within the saturated sand and silts generally represents the permanent groundwater regime at the site. Perched water also exists in certain areas at shallower depths. The groundwater level will fluctuate with seasons.

In excavations, groundwater yield from the tills and clay will be slow and limited in quantity, whereas the groundwater yield from the saturated sand and silt deposits will be appreciable and persistent.

Where groundwater seepage is encountered in the tills and clay, the groundwater can be controlled by pumping from sumps. However, where the excavation extends into the saturated/water bearing soils, dewatering from closely spaced sumps and/or a well-point system will be required.

6.0 DISCUSSION AND RECOMMENDATIONS

The investigation revealed that beneath a veneer of topsoil and ploughed soils, the site is generally underlain by a complex stratigraphy consisting of stiff to hard, generally very stiff silty clay; firm to hard, generally hard silty clay till and loose to very dense, generally compact silty sand till, with layers of loose to very dense, generally compact sand and compact to very dense, generally compact silt deposits at various depths and locations. The wet sand and silts are water-bearing.

Upon the completion of borehole drilling, groundwater was recorded in the boreholes between El. 273.0 m and El. 330.9 m, dropping in the east southeast direction. The stabilized groundwater in the monitoring wells was recorded between El. 286.6 m and El. 332.4 m. The groundwater within the saturated sand and silt generally represents the permanent groundwater regime at the site. Perched water also exists in certain areas at shallower depths. The groundwater level will fluctuate with seasons.

In excavation, groundwater yield from the clay and tills will be slow and limited in quantity, whereas the groundwater yield from the saturated sand and silts below the water level will be appreciable and persistent.

It is understood that the property will be developed into a residential subdivision. Detailed design of the development, however, is not available at the time this report is prepared. The geotechnical findings which warrant special consideration are presented below:

1. The topsoil and ploughed soil must be removed for the development. The thickness of topsoil and ploughed soil may vary or becomes thicker in some areas, especially in the treed areas and depressed areas. In order to prevent

overstripping, a diligent control of the stripping operation will be required. A test pit programme can be carried out prior to or during construction to determine the thickness of the topsoil and ploughed soils.

2. The topsoil is void of engineering value. It must not be buried within the building envelope or deeper than 1.2 m below the exterior finished grade of the development. It can only be used for landscaping and landscape contouring purposes.
3. The weathered soils are not suitable to support any structure sensitive to movement. They must be subexcavated and sorted free of topsoil inclusions or deleterious materials before it is reused as engineered fill or structural backfill.
4. The sound natural soils below the topsoil, ploughed soil, and weathered soils, are suitable for normal spread and strip footing construction for the proposed buildings. The footings must be designed in accordance with the recommended bearing pressures in Section 6.1 and the footing subgrade must be inspected by a geotechnical engineer to ensure that its condition is compatible with the design of the foundations.
5. The footings must be maintained at least 0.5 m above the groundwater levels. If groundwater seepage is encountered during excavation, or where the subgrade of the normal foundations is found to be wet, the subgrade should be protected by a concrete mud-slab immediately after exposure. Dewatering may be required prior to and during construction.
6. Where earth fill is required to raise the site, or where extended footings are necessary, it is generally more economical to place engineered fill for normal footing, sewer and road construction.
7. A Class ‘B’ bedding, consisting of compacted 20-mm Crusher-Run Limestone, or equivalent, is recommended for the construction of the underground services. The pipe joints should be leak proof or wrapped with a

waterproof membrane. Where saturated soils are present or extensive dewatering is required, a Class 'A' bedding will be required.

8. All excavation should be carried out in accordance with Ontario Regulation 213/91.

The recommendations appropriate for the project described in Section 2.0 are presented herein. One must be aware that the subsurface conditions may vary between boreholes. Should this become apparent during construction, a geotechnical engineer must be consulted to determine whether the following recommendations require revision.

6.1 **Foundations**

It is assumed that the site will be regraded for the proposed development. It is generally more economical to place engineered fill for normal footing, sewer and pavement construction. Soil bearing pressures of 150 kPa (SLS) and 250 kPa (ULS) are recommended for the design of building foundations, consisting of normal spread and strip footings founded on the engineered fill or on the sound native soil stratum. The requirements for engineered fill construction are discussed in Section 6.2.

The appropriate founding levels in the natural soils range from 1.0± to 2.5± m from the prevailing ground surface, depending on the location.

The recommended soil pressures (SLS) incorporate a safety factor of 3. The total and differential settlements of the footings are estimated to be 25 mm and 15 mm, respectively.

One must be aware that the recommended bearing pressures are given as a guide for foundation design and the soils at the bearing level must be confirmed by inspection performed by a geotechnical engineer at the footing locations, at the time of construction.

If groundwater seepage is encountered during excavations, or where the subgrade of the normal foundations is found to be wet, the subgrade should be protected by a concrete mud-slab immediately after exposure. This will prevent construction disturbance and costly rectification.

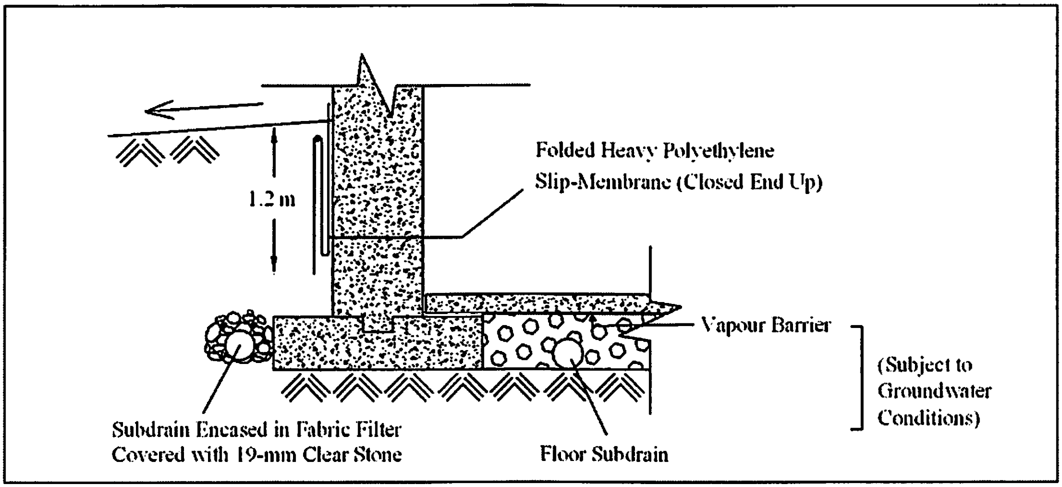
Footings exposed to weathering, or in unheated areas, should have at least 1.2 m of earth cover for protection against frost action.

The building foundation must meet the requirements specified in the latest Ontario Building Code. As a guide, the structure should be designed to resist an earthquake force using Site Classification 'D' (stiff soil).

Higher design bearing pressures of 200 to 300 kPa (SLS) and 320 to 480 kPa (ULS) are available in some locations, having the footings extending into the undisturbed sound native soil stratum at deeper levels. The allowable soil bearing pressures can be provided for individual structures, if necessary, at the time the design of the development and the site grading plan are finalized.

Most of the in situ soils have high soil-adfreezing potential. In order to alleviate the risk of frost damage, the foundation walls of the proposed buildings must be constructed of concrete and either the backfill must consist of non-frost-susceptible granular material or the foundation walls must be shielded with a polyethylene slip-membrane between the concrete wall and the backfill. The recommended measures are schematically illustrated in Diagram 1.

Diagram 1 - Frost Protection Measures



Perimeter subdrains and dampproofing of the foundation walls will be required for the project construction. If wet silt or sand is encountered at the basement subgrade, under-floor subdrains and vapour barrier will be required. All subdrains must be encased in a fabric filter to protect them against blockage by silting.

6.2 Engineered Fill

Where earth fill is required to raise the site, or where extended footings are necessary, it is generally more economical to place engineered fill for normal footing, sewer and road construction. The engineering requirements for a certifiable fill for road construction, municipal services, and footings designed with a Maximum Allowable Soil Pressure (SLS) of 150 kPa and a Factored Ultimate Soil Bearing Pressure (ULS) of 250 kPa are presented below:

1. All of the topsoil and the ploughed soils must be removed, and the subgrade must be inspected and proof-rolled prior to any fill placement.

2. The weathered soils must be subexcavated, inspected, aerated and properly compacted in layers.
3. Inorganic soils must be used for filling, and they must be uniformly compacted in lifts 20 cm thick to 98% or + of their maximum Standard Proctor dry density up to the proposed finished lot grade and/or road subgrade. The soil moisture must be properly controlled between 1% drier than optimum and 2% wetter than optimum. This is to prevent the development of excess pore-water pressures in the earth fill, which results in longer duration for pore-water pressure dissipation and ground settlement. If the site services or house foundations are to be built soon after the fill placement, the densification process for the engineered fill must be increased to 100% of the maximum Standard Proctor compaction.
4. If imported fill is to be used, it should be inorganic soils, free of deleterious or any material with environmental issue (contamination). Any potential imported earth fill from off site must be reviewed for geotechnical and environmental quality by the appropriate personnel as authorized by the developer or agency, before being hauled to the site.
5. In areas where significant engineered fill (fill more than 3.0 m) is to be placed, settlement plates must be installed and monitored on a weekly basis to assess any consolidation progress in the fill and the underlying strata. No construction of site services or house foundations can commence in these areas until the settlement records have confirmed that the settlement is reduced to a tolerable level and there is no risk of long term settlement. Where the readings remain the same for a period of 3 consecutive months, no further monitoring will be required and there is no risk for long-term settlement. The settlement of the engineered fill is anticipated to be reduced to a tolerable limit of 25 mm.
6. If the engineered fill is to be left over the winter months, adequate earth cover, or equivalent, must be provided for protection against frost action.

7. The engineered fill must extend over the entire graded area; the engineered fill envelope and the finished elevations must be clearly and accurately defined in the field, and must be precisely documented by qualified surveyors.
8. The engineered fill must not be placed during the period from late November to early April, when freezing ambient temperatures occur either persistently or intermittently. This is to ensure that the fill is free of frozen soils, ice and snow.
9. Where the ground is wet due to subsurface water seepage, an appropriate subdrain scheme must be implemented prior to the fill placement, particularly if it is to be carried out on sloping ground.
10. Where the fill is to be placed on a bank steeper than 1 vertical (V): 3 horizontal (H), the face of the bank must be flattened to 3+ so that it is suitable for safe operation of the compactor and the required compaction can be obtained.
11. The fill operation must be inspected on a full-time basis by a technician under the direction of a geotechnical engineer. In this case, the effect of long-term settlement is expected to be negligible as the fill material will be compacted to achieve an appropriate strength and capacity for structural support.
12. The footing and underground services subgrade must be inspected by the geotechnical consulting firm that inspected the engineered fill placement. This is to ensure that the foundations are placed within the engineered fill envelope, and the integrity of the fill has not been compromised by interim construction, environmental degradation and/or disturbance by the footing excavation.
13. Once the engineered fill is certified, any excavation carried out in the certified fill area must be reported to the geotechnical consultant who inspected the fill placement, in order to document the locations of excavation and/or to inspect reinstatement of the excavated areas to engineered fill status. If construction

on the engineered fill does not commence within a period of 2 years from the date of certification, the status must be assessed for re-certification.

14. Despite stringent control in the placement of engineered fill, variations in soil type and density may occur in the engineered fill. Therefore, the strip footings and the upper section of the foundation walls constructed on the engineered fill may require continuous reinforcement with steel bars, depending on the uniformity of the soils in the engineered fill and the thickness of the engineered fill underlying the foundations. Should the footings and/or walls require reinforcement, the required number and size of reinforcing bars must be assessed by considering the uniformity as well as the thickness of the engineered fill beneath the foundations. In sewer construction, the engineered fill is considered to have the same structural proficiency as a natural inorganic soil.

6.3 Underground Services

The subgrade for the underground services should consist of natural soils or engineered fill. In areas where the subgrade consists of ploughed and/or weathered soil, these soils should be subexcavated and replaced with properly compacted inorganic soil and/or bedding material compacted to at least 95% or + of their Standard Proctor compaction.

Where the sewers are to be constructed using the open-cut method, the construction must be carried out in accordance with Ontario Regulation 213/91. In areas where a vertical cut is necessary, the use of a trench box is considered to be appropriate. In the design of the trench box and/or shoring structure, the recommended lateral earth pressure coefficients presented in Table 4, Section 6.7, can be used.

A Class ‘B’ bedding is recommended for construction of the underground services. The bedding material should consist of compacted 20-mm Crusher-Run Limestone, or equivalent, as approved by a geotechnical engineer. Where saturated soils are present or extensive dewatering is required, a Class ‘A’ bedding will likely be required, and the pipe joints should be leak proof or wrapped with a waterproof membrane.

In order to prevent pipe floatation when the sewer trench is deluged with water, a soil cover with a thickness equal to the diameter of the pipe should be in place at all times after completion of the pipe installation.

Openings to subdrains and catch basins should be shielded with a fabric filter to prevent blockage by silting.

The subgrade soils of the underground services have an electrical resistivity ranging from 3000 to 6000 ohm·cm. These soils are considered corrosive to ductile iron pipes and metal fittings; therefore, the underground services should be protected against soil corrosion. For estimation of anode weight requirements, the estimated electrical resistivity of 3000 ohm·cm can be used. This, however, should be confirmed by testing the soil along the water main alignment at the time of sewer construction.

6.4 Backfilling in Trenches and Excavated Areas

The backfill in service trenches should be compacted to at least 95% of its maximum Standard Proctor dry density and increased to 98% or + below the floor slab. In the zone within 1.0 m below the road subgrade, the material should be compacted with the water content 2% to 3% drier than the optimum; and the compaction should be increased to 98% of the respective maximum Standard Proctor dry density to provide the required stiffness for pavement construction.

The tills and clay are suitable for 95% or + Standard Proctor compaction. The sands and silts are too wet for a 95% or + Standard Proctor compaction, it can be aerated by spreading it thinly on the ground for drying prior to structural compaction or it can be mixed with drier soils.

In normal construction practice, the problem areas of settlement largely occur adjacent to foundation walls, columns, manholes, catch basins and services crossings. In areas which are inaccessible to a heavy compactor, sand backfill should be used. Unless compaction of the backfill is carefully performed, settlement will occur. Often, the interface of the native soils and sand backfill will have to be flooded for a period of several days.

Narrow trenches for services crossings should be cut at 1V:2H, so that the backfill in the trenches can be effectively compacted. Otherwise, soil arching in the trenches will prevent the achievement of proper compaction. The lift of each backfill layer should be limited to a thickness of 20 cm.

One must be aware of possible consequences during trench backfilling and exercise caution as described below:

- When construction is carried out in freezing winter weather, allowance should be made for these following conditions. Despite stringent backfill monitoring, frozen soil layers may inadvertently be mixed with the structural trench backfill. Should the in situ soil have a water content on the dry side of the optimum, it would be impossible to wet the soil due to the freezing condition, rendering difficulties in obtaining uniform and proper compaction. Furthermore, the freezing condition will prevent flooding of the backfill when it is required, such as when the trench box is removed. The above will invariably cause backfill settlement that may become evident within 1 to several years, depending on the depth of the trench which has been backfilled.

- In areas where the underground services construction is carried out during winter months, prolonged exposure of the trench walls will result in frost heave within the soil mantle of the walls. This may result in some settlement as the frost recedes, and repair costs will be incurred prior to final surfacing of the new pavement.
- To backfill a deep trench, one must be aware that future settlement is to be expected, unless the side of the cut is flattened to at least 1V:1.5+H, and the lifts of the fill and its moisture content are stringently controlled; i.e., lifts should be no more than 20 cm (or less if the backfilling conditions dictate) and uniformly compacted to achieve at least 95% of the maximum Standard Proctor dry density, with the moisture content on the wet side of the optimum.
- It is often difficult to achieve uniform compaction of the backfill in the lower vertical section of a trench which is an open cut or is stabilized by a trench box, particularly in the sector close to the trench walls or the sides of the box. These sectors must be backfilled with sand. In a trench stabilized by a trench box, the void left after the removal of the box will be filled by the backfill. It is necessary to backfill this sector with sand, and the compacted backfill must be flooded for 1 day, prior to the placement of the backfill above this sector, i.e., in the upper sloped trench section. This measure is necessary in order to prevent consolidation of inadvertent voids and loose backfill which will compromise the compaction of the backfill in the upper section. In areas

where groundwater movement is expected in the sand fill mantle, anti-seepage collars should be provided.

6.5 Garages, Driveways and Landscaping

Due to high frost susceptibility of the subgrade soils, heaving of the pavement is expected to occur during the cold weather.

The driveways at the entrances to the garages must be backfilled with non-frost-susceptible granular material, with a frost taper at a slope flatter than 1V:3H.

The slab-on-grade in open areas should be designed to tolerate frost heave, and the grading around the slab-on-grade must be such that it directs runoff away from the surface.

Interlocking stone pavement and slab-on-grade to be constructed in areas susceptible to ground movement must be constructed on a free-draining granular base at least 1.0 m thick, with proper drainage, which will prevent water from ponding in the granular base.

6.6 Pavement Design

The recommended pavement design for local and collector roads is presented in Table 3.

Table 3 - Pavement Design

Course	Thickness (mm)	OPS Specifications
Asphalt Surface	40	HL-3
Asphalt Binder	50	HL-8
Granular Base	150	Granular 'A' or equivalent
Granular Sub-base		Granular 'B' or equivalent
Local	350	
Collector	450	

In preparation of the subgrade, the topsoil, weathered soils and ploughed soils must be removed. Any new fill should consist of organic free material, compacted to 95% or + of its maximum Standard Proctor dry density. In the zone within 1.0 m below the pavement subgrade, the backfill should be compacted to at least 98% of its maximum Standard Proctor dry density, with the water content 2% to 3% drier than the optimum. The final subgrade should be inspected and proof-rolled. Any soft spots should be subexcavated, and replaced by properly compacted inorganic earth fill.

All the granular bases should be compacted to their maximum Standard Proctor dry density.

The pavement subgrade will suffer a strength regression if water is allowed to infiltrate prior to paving. The following measures should therefore be incorporated into the construction and road design:

- If the pavement construction does not immediately follow the trench backfilling, the subgrade should be properly crowned and smooth-rolled to allow interim precipitation to be properly drained.

- Lot areas adjacent to the pavement should be properly graded to prevent the ponding of large amounts of water during the interim construction period.
- If the pavement is to be constructed during the wet seasons and extremely soft subgrade occurs, the granular sub-base may require thickening. This can be further assessed during construction.
- Fabric filter-encased curb subdrains are required to meet the Town's requirements.

6.7 Soil Parameters

The recommended soil parameters for the project design are given in Table 4.

Table 4 - Soil Parameters

Unit Weight and Bulk Factor

	Unit Weight (kN/m^3)		Estimated Bulk Factor	
	Bulk	**Submerged**	**Loose**	**Compacted**
Silty Clay	20.0	10.0	1.33	0.98
Silty Clay Till	22.0	12.0	1.30	1.00
Silty Sand Till	22.5	12.5	1.20	1.00
Sand and Silts	21.0	11.0	1.20	1.00

Lateral Earth Pressure Coefficients

	Active K_a	At Rest K_o	Passive K_p
Silty Clay and Silty Clay Till	0.40	0.55	2.50
Silty Sand Till, Sand and Silts	0.33	0.45	3.00

Coefficients of Friction

Between Concrete and Granular Base	0.5
Between Concrete and Sound Native Soils	0.4

6.8 Excavation

Excavation should be carried out in accordance with Ontario Regulation 213/91. For excavation purposes, the types of soils are classified in Table 5.

Table 5 - Classification of Soils for Excavation

Material	Type
Sound Silty Clay and Tills	2
Weathered Soils, drained Sand and Silts	3
Ploughed soils and saturated Sand and Silts	4

In excavations, groundwater yield from the tills and clay will be slow and limited in quantity, whereas the groundwater yield from the saturated sand and silts layers will be appreciable and likely persistent.

Where groundwater seepage is encountered in the tills and clay, the groundwater can be removed by pumping from sumps. However, where the excavation extends into the saturated/water-bearing soils, dewatering from closely spaced sumps and/or a well-point system will be required.

Prospective contractors must be asked to assess the in situ subsurface conditions for soil cuts by digging test pits to at least 0.5 m below the sewer subgrade. These test pits should be allowed to remain open for a period of at least 4 hours to assess the trenching conditions.

7.0 LIMITATIONS OF REPORT

This report was prepared by Soil Engineers Ltd. for the account of Bridge Brook Corp., for review by its designated consultants, financial institutions, and government agencies. Use of this report is subject to the conditions and limitations of the contractual agreement. The material in the report reflects the judgement of Kin Fung Li, B.Eng., and Daniel Man, P.Eng., in light of the information available to it at the time of preparation. Any use which a Third Party makes of this report, or any reliance on decisions to be made based on it, are the responsibility of such Third Parties. Soil Engineers Ltd. accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

SOIL ENGINEERS LTD.

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LICENSED PROFESSIONAL ENGINEER
D.S.C. MAN
28853117
Feb 8/18
PROVINCE OF ONTARIO

LIST OF ABBREVIATIONS AND DESCRIPTION OF TERMS

The abbreviations and terms commonly employed on the borehole logs and figures, and in the text of the report, are as follows:

SAMPLE TYPES

AS	Auger sample
CS	Chunk sample
DO	Drive open (split spoon)
DS	Denison type sample
FS	Foil sample
RC	Rock core (with size and percentage recovery)
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

PENETRATION RESISTANCE

Dynamic Cone Penetration Resistance:

A continuous profile showing the number of blows for each foot of penetration of a 2-inch diameter, 90° point cone driven by a 140-pound hammer falling 30 inches.

Plotted as '—•—'

Standard Penetration Resistance or 'N' Value:

The number of blows of a 140-pound hammer falling 30 inches required to advance a 2-inch O.D. drive open sampler one foot into undisturbed soil.

Plotted as '○'

WH	Sampler advanced by static weight
PH	Sampler advanced by hydraulic pressure
PM	Sampler advanced by manual pressure
NP	No penetration

SOIL DESCRIPTION

Cohesionless Soils:

'N' (blows/ft)	Relative Density
0 to 4	very loose
4 to 10	loose
10 to 30	compact
30 to 50	dense
over 50	very dense

Cohesive Soils:

Undrained Shear Strength (ksf)	'N' (blows/ft)	Consistency
less than 0.25	0 to 2	very soft
0.25 to 0.50	2 to 4	soft
0.50 to 1.0	4 to 8	firm
1.0 to 2.0	8 to 16	stiff
2.0 to 4.0	16 to 32	very stiff
over 4.0	over 32	hard

Method of Determination of Undrained Shear Strength of Cohesive Soils:

x 0.0	Field vane test in borehole; the number denotes the sensitivity to remoulding
△	Laboratory vane test
□	Compression test in laboratory

For a saturated cohesive soil, the undrained shear strength is taken as one half of the undrained compressive strength

METRIC CONVERSION FACTORS

1 ft = 0.3048 metres

1 inch = 25.4 mm

1lb = 0.454 kg

1ksf = 47.88 kPa

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CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE

JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 1

FIGURE NO.: 1

PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING:

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE:

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES			Depth Scale (m)	● Dynamic Cone (blows/30 cm) 10 30 50 70 90 × Shear Strength (kN/m²) 50 100 150 200 ○ Penetration Resistance (blows/30 cm) 10 30 50 70 90	Atterberg Limits PL ├──┤ LL ● Moisture Content (%) 10 20 30 40	WATER LEVEL
		Number	Type	N-Value				
0.0								
	CANCELLED DUE TO ACCESS ISSUE				0 1 2 3 4 5 6 7 8 9 10			

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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 2

FIGURE NO.: 2

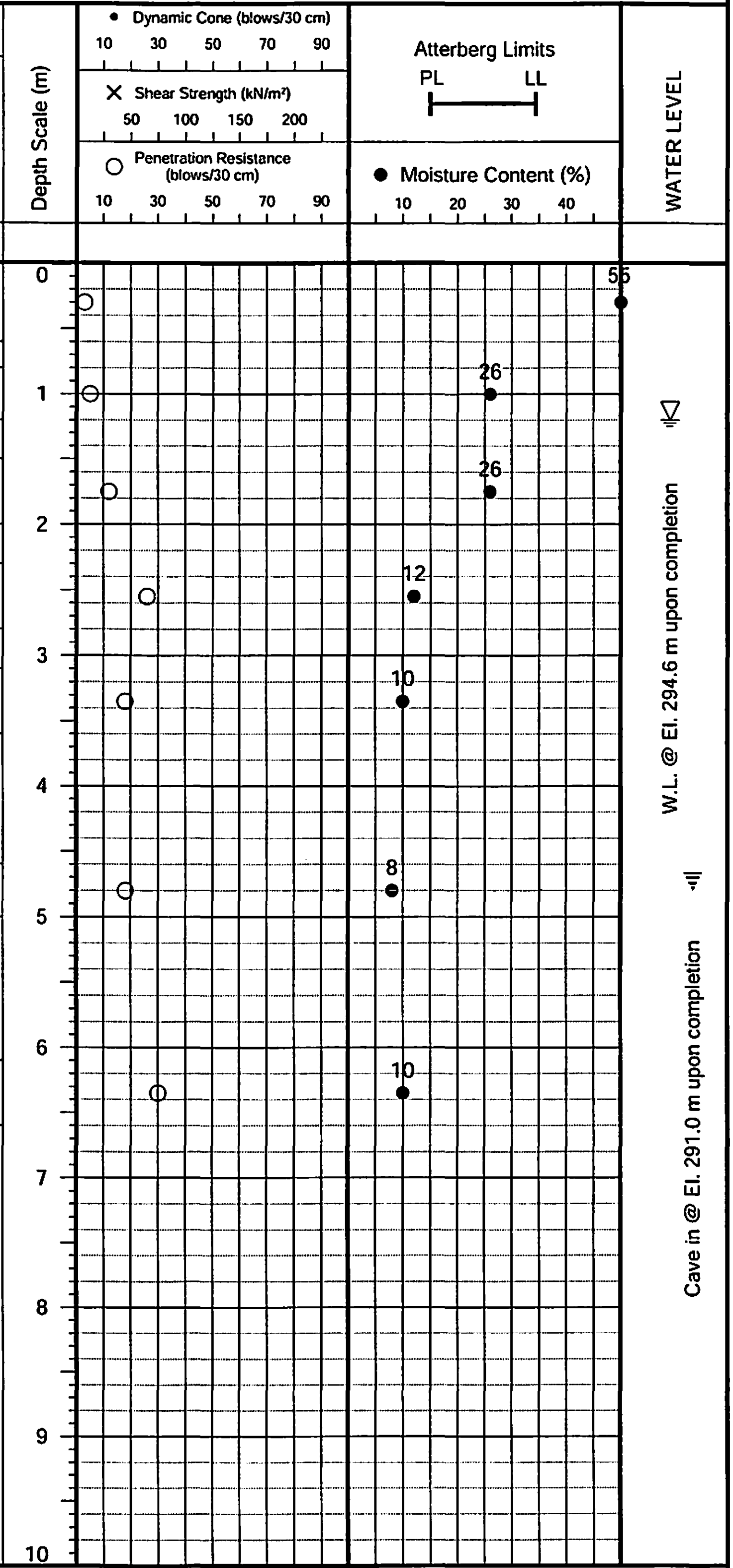
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 20, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
295.8	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	3
		2	DO	5
294.6 1.2	Brown, stiff **SILTY CLAY**	3	DO	12
293.5 2.3	Compact **SILTY SAND TILL** some gravel a trace of clay	4	DO	26
		5	DO	18
	brown grey	6	DO	18
290.3 5.5	Grey, dense **SILT** some sand a trace of clay	7	DO	30
289.2 6.6	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 3

FIGURE NO.: 3

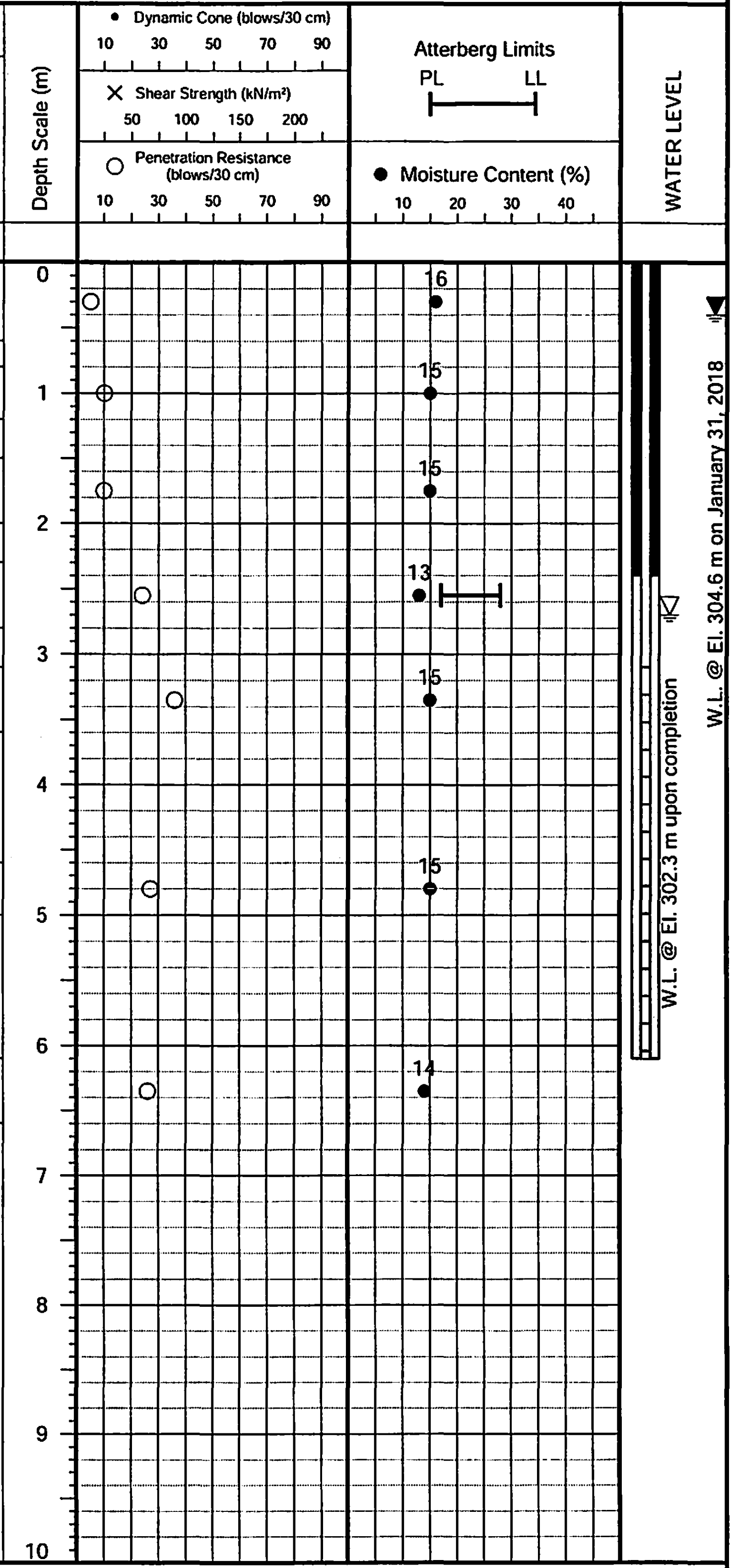
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 15, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
305.0	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	5
		2	DO	10
304.0 1.0	Stiff to hard **SILTY CLAY TILL** sandy a trace of gravel	3	DO	10
		4	DO	24
		5	DO	36
	brown grey	6	DO	27
		7	DO	26
298.4 6.6	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 4

FIGURE NO.: 4

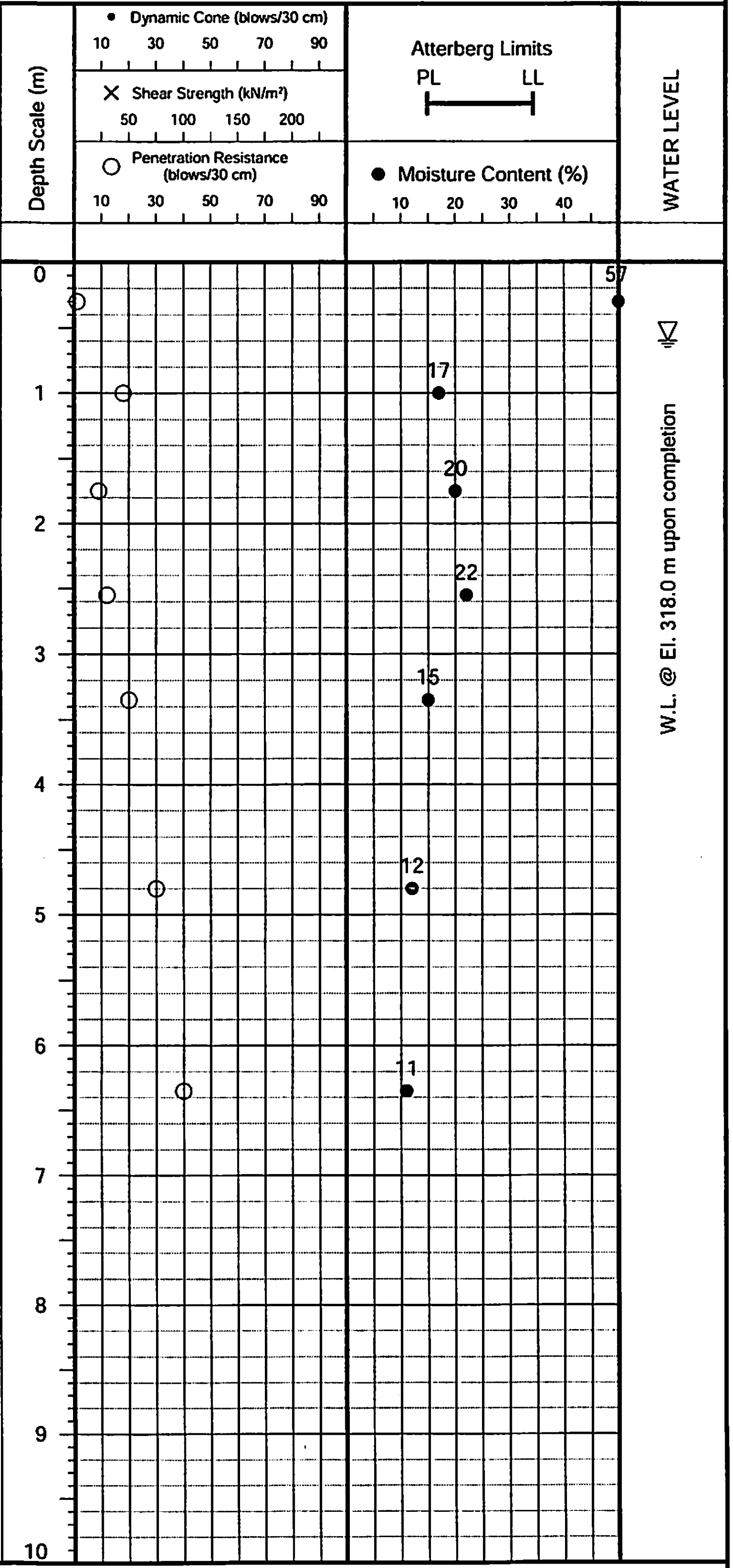
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 21, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
318.6	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	1
317.8 0.8	Brown, compact **SANDY SILT**	2	DO	18
317.1 1.5	occ. topsoil inclusion Brown, loose to compact **SAND** fine to medium grained	3	DO	9
		4	DO	12
315.5 3.1	Very stiff to hard **SILTY CLAY TILL** some sand a trace of gravel	5	DO	20
	brown grey	6	DO	30
		7	DO	40
312.0 6.6	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 5

FIGURE NO.: 5

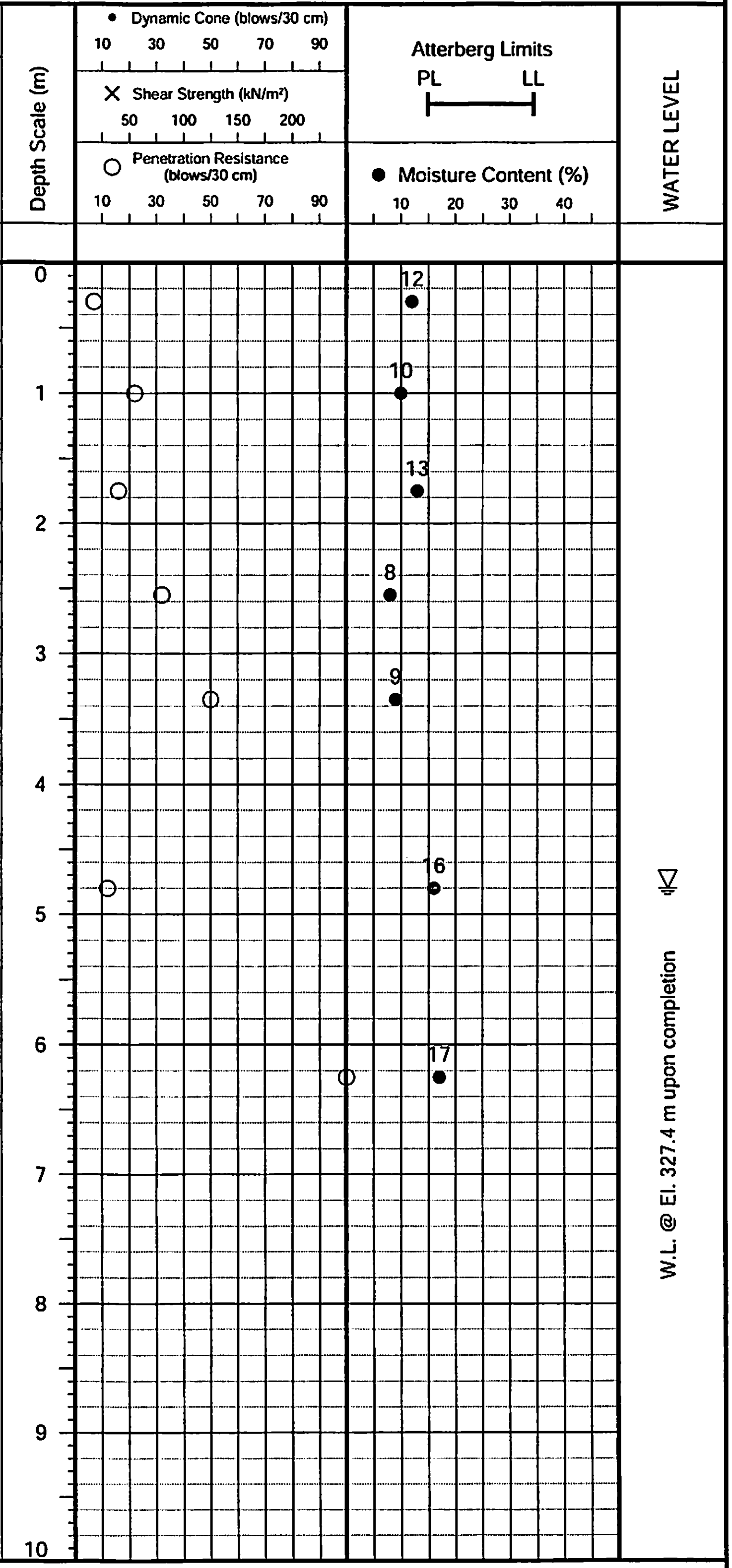
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 21, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
332.2	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	7
331.4 0.8	Brown, compact to very dense **SILTY SAND TILL** some clay a trace of gravel sandy silt layer	2	DO	22
		3	DO	16
		4	DO	32
		5	DO	50
328.2 4.0	Brown, compact to very dense **SAND** fine to medium grained	6	DO	12
		7	DO	50/15
325.8 6.4	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 6

FIGURE NO.: 6

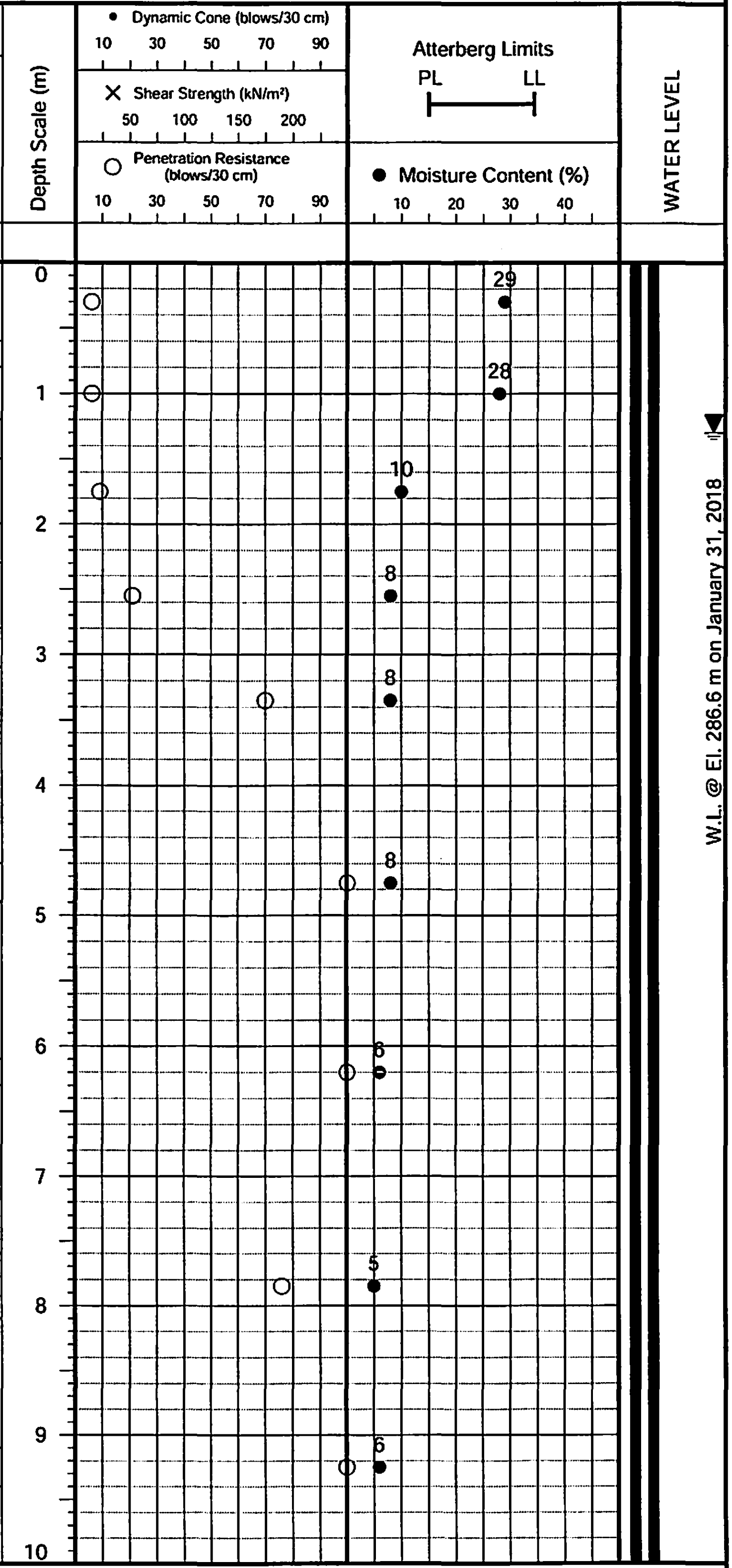
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 12, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
287.9	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	6
		2	DO	6
286.4 1.5	Brown, loose to very dense **SILTY SAND TILL** some gravel a trace of clay occ. cobbles and boulders	3	DO	9
		4	DO	21
		5	DO	70
283.9 4.0	Grey, hard **SILTY CLAY TILL** sandy some gravel occ. cobbles and boulders	6	DO	50/15
		7	DO	50/15
		8	DO	76
		9	DO	50/10
277.9				



W.L. @ El. 286.6 m on January 31, 2018

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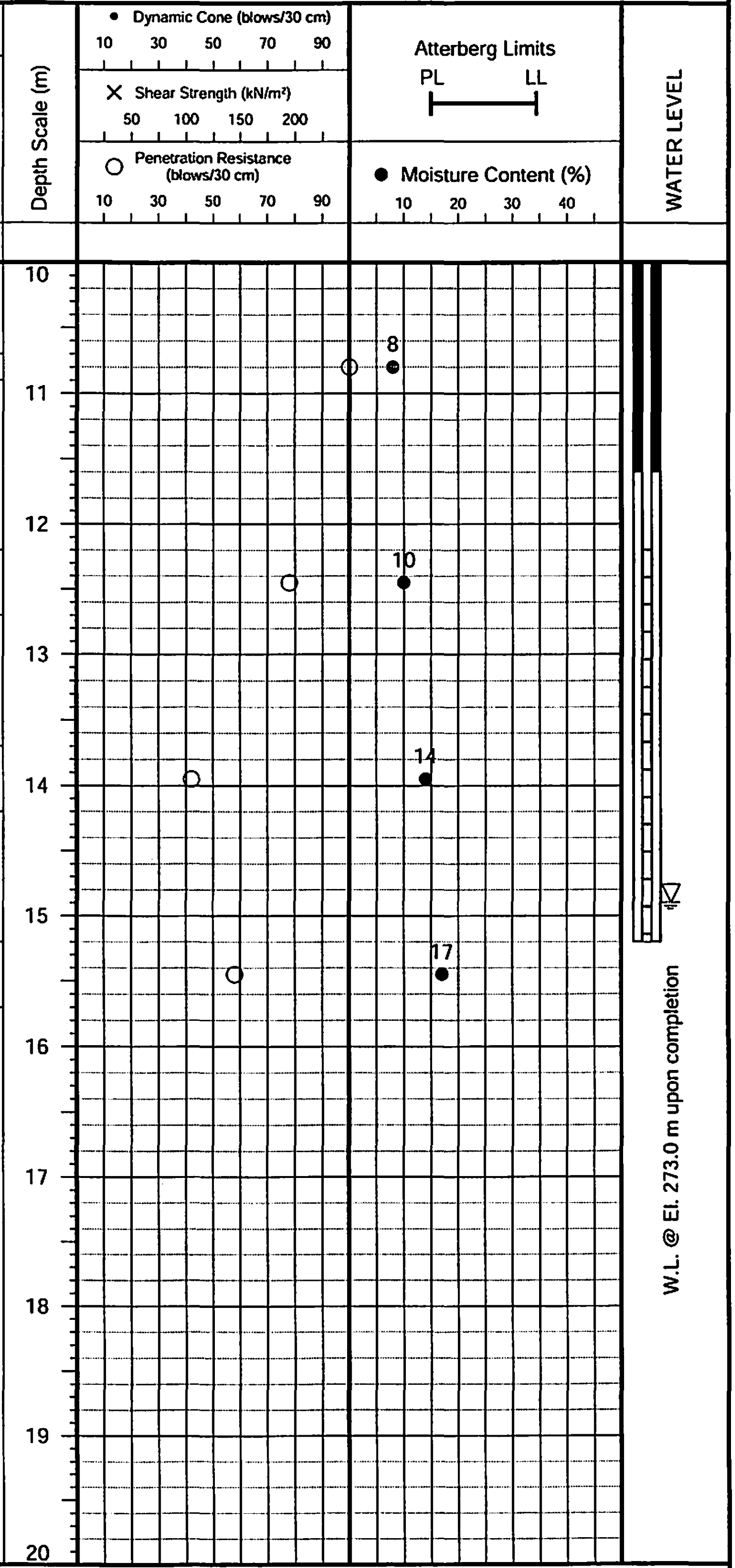
JOB NO.: 1711-S047 **LOG OF BOREHOLE NO.: 6** **FIGURE NO.:** 6

PROJECT DESCRIPTION: Proposed Residential Development **METHOD OF BORING:** Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge **DRILLING DATE:** December 12, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
10.0	Grey, hard **SILTY CLAY TILL** sandy some gravel occ. cobbles and boulders			
		10	DO	50/15
		11	DO	78
		12	DO	42
		13	DO	58
272.2 15.7	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 7

FIGURE NO.: 7

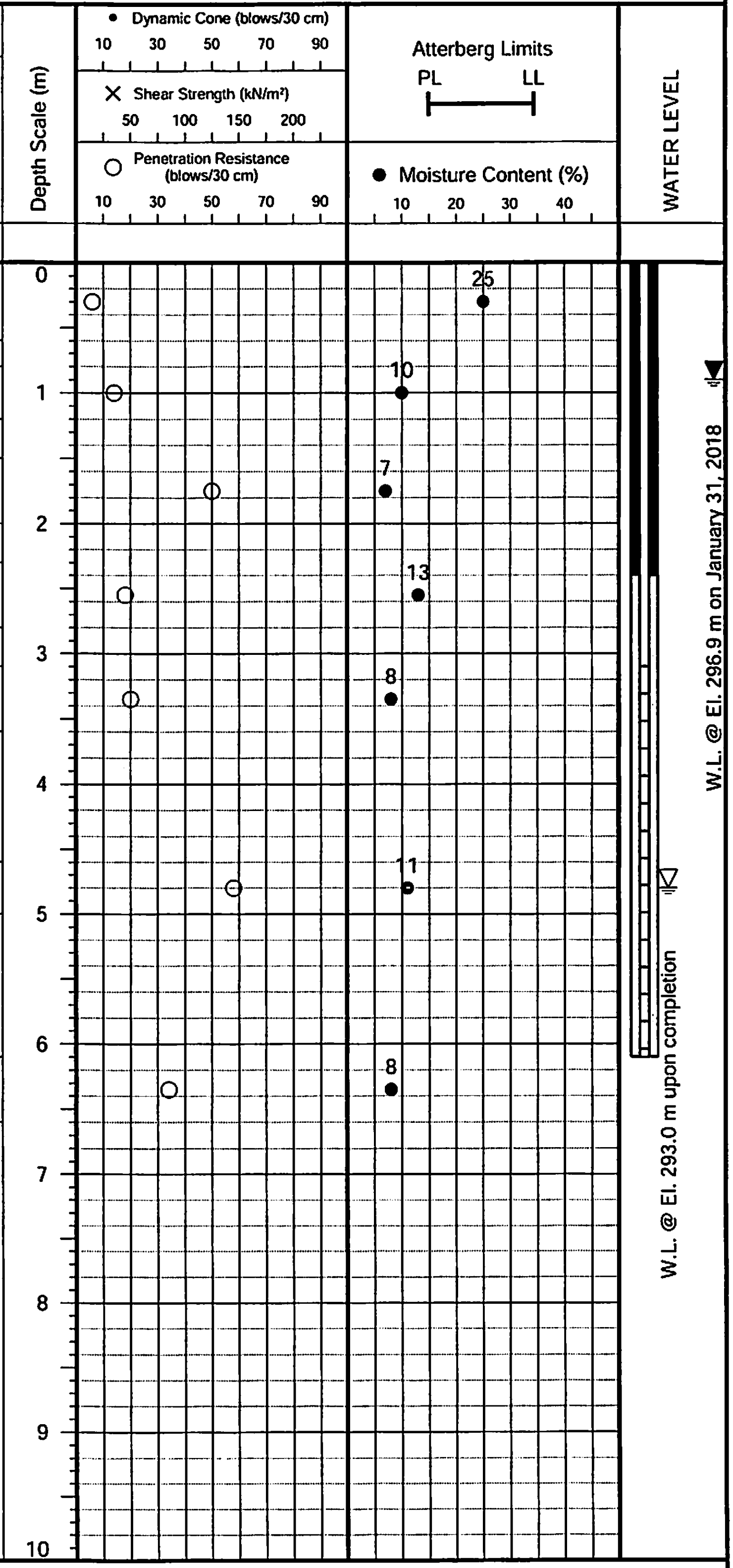
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 15, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
297.8	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	6
297.0 0.8	Brown, stiff to hard **SILTY CLAY TILL** sandy some gravel occ. cobbles and sand layer	2	DO	14
		3	DO	50
295.5 2.3	Brown, compact to very dense **SILTY SAND TILL** some gravel a trace of clay	4	DO	18
		5	DO	20
		6	DO	58
		7	DO	34
291.2 6.6	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 8

FIGURE NO.: 8

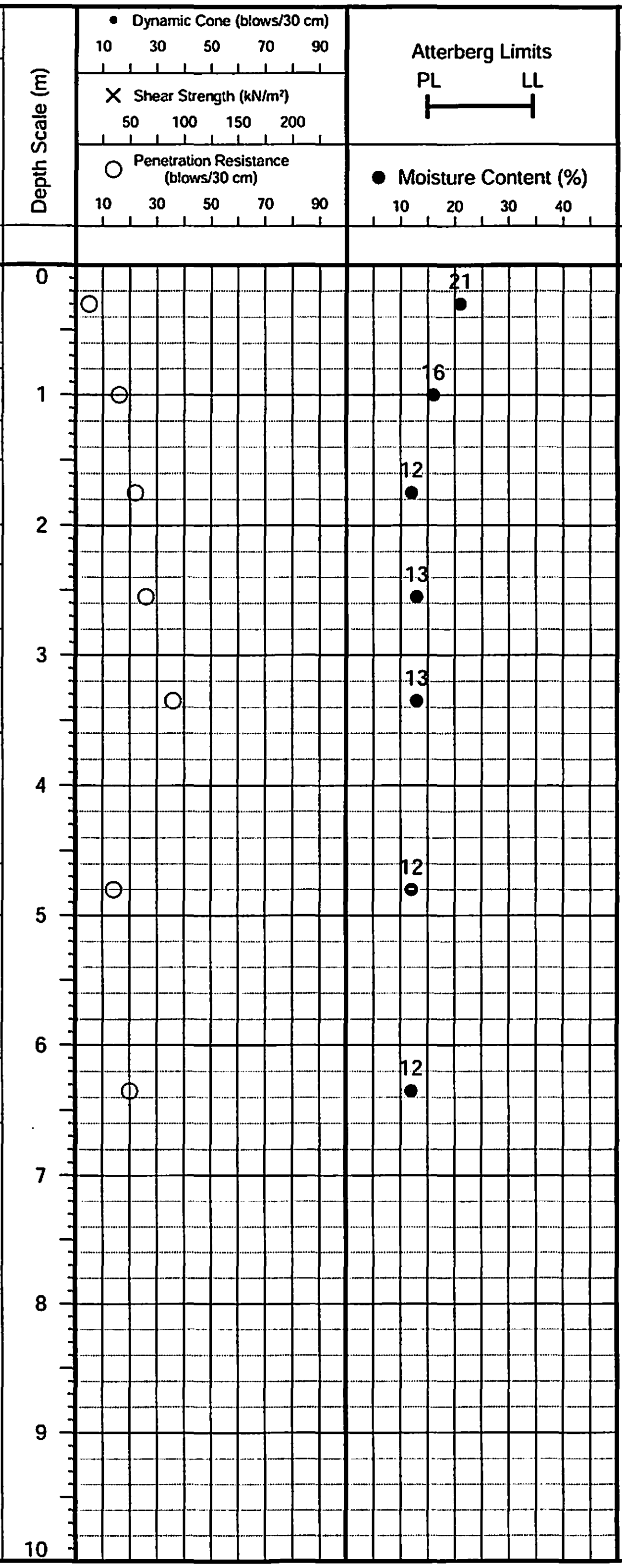
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 15, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
307.0	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	5
306.0 1.0	Stiff to hard **SILTY CLAY TILL** sandy a trace of gravel	2	DO	16
		3	DO	22
		4	DO	26
		5	DO	36
	brown grey	6	DO	14
		7	DO	20
300.4 6.6	**END OF BOREHOLE**			



WATER LEVEL

∇ W.L. @ El. 301.6 m upon completion

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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 9

FIGURE NO.: 9

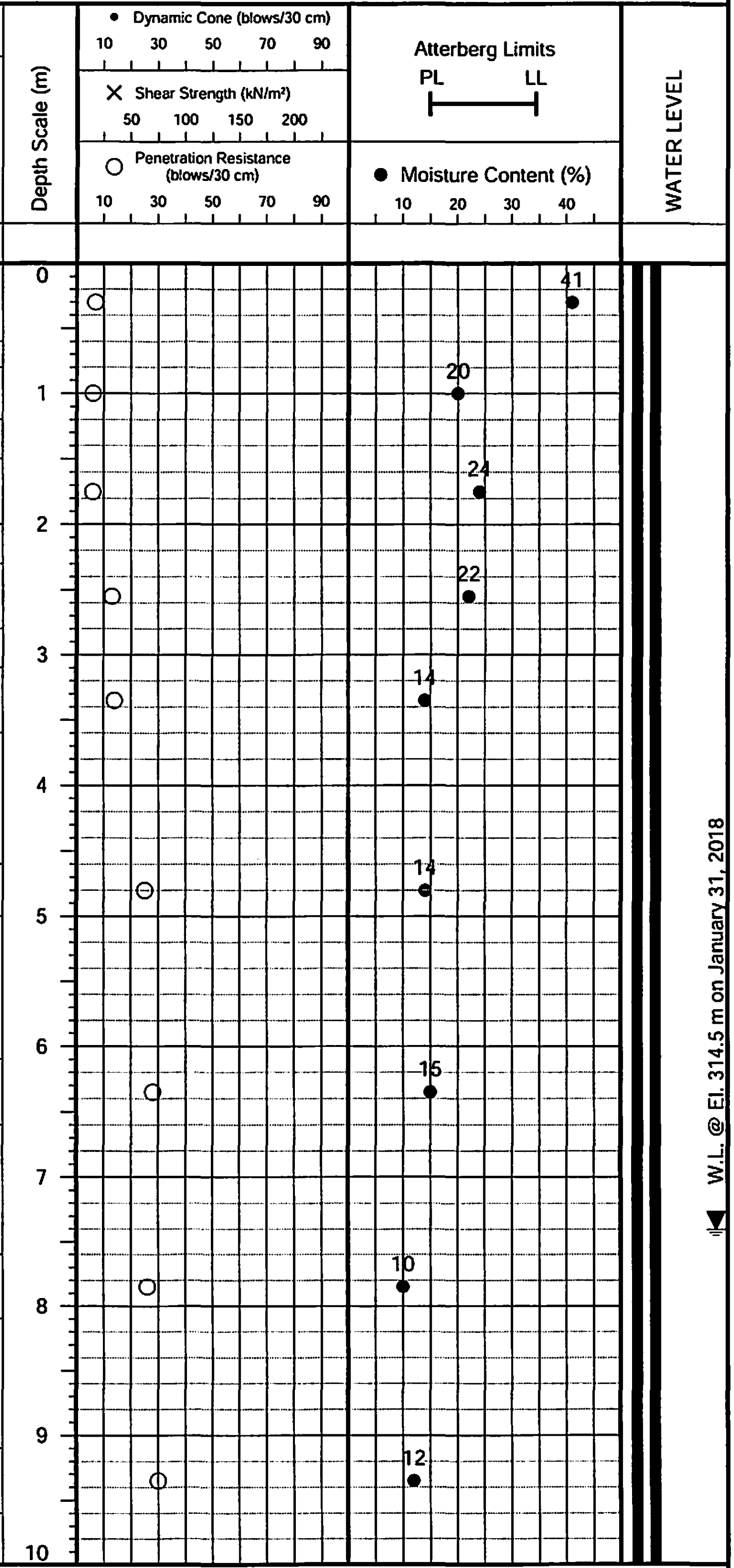
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 20, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
321.9	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	7
321.3 0.6	Brown, firm to stiff **SILTY CLAY TILL** traces of sand and gravel	2	DO	6
		3	DO	6
	weathered	4	DO	13
318.8 3.1	Stiff to very stiff **SILTY CLAY**	5	DO	14
		6	DO	25
	brown grey	7	DO	28
314.3 7.6	Grey, very stiff to hard **SILTY CLAY TILL** some sand a trace of gravel occ. cobbles and boulders	8	DO	26
		9	DO	30
311.9				



W.L. @ El. 314.5 m on January 31, 2018

Soil Engineers Ltd.

JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 9

FIGURE NO.: 9

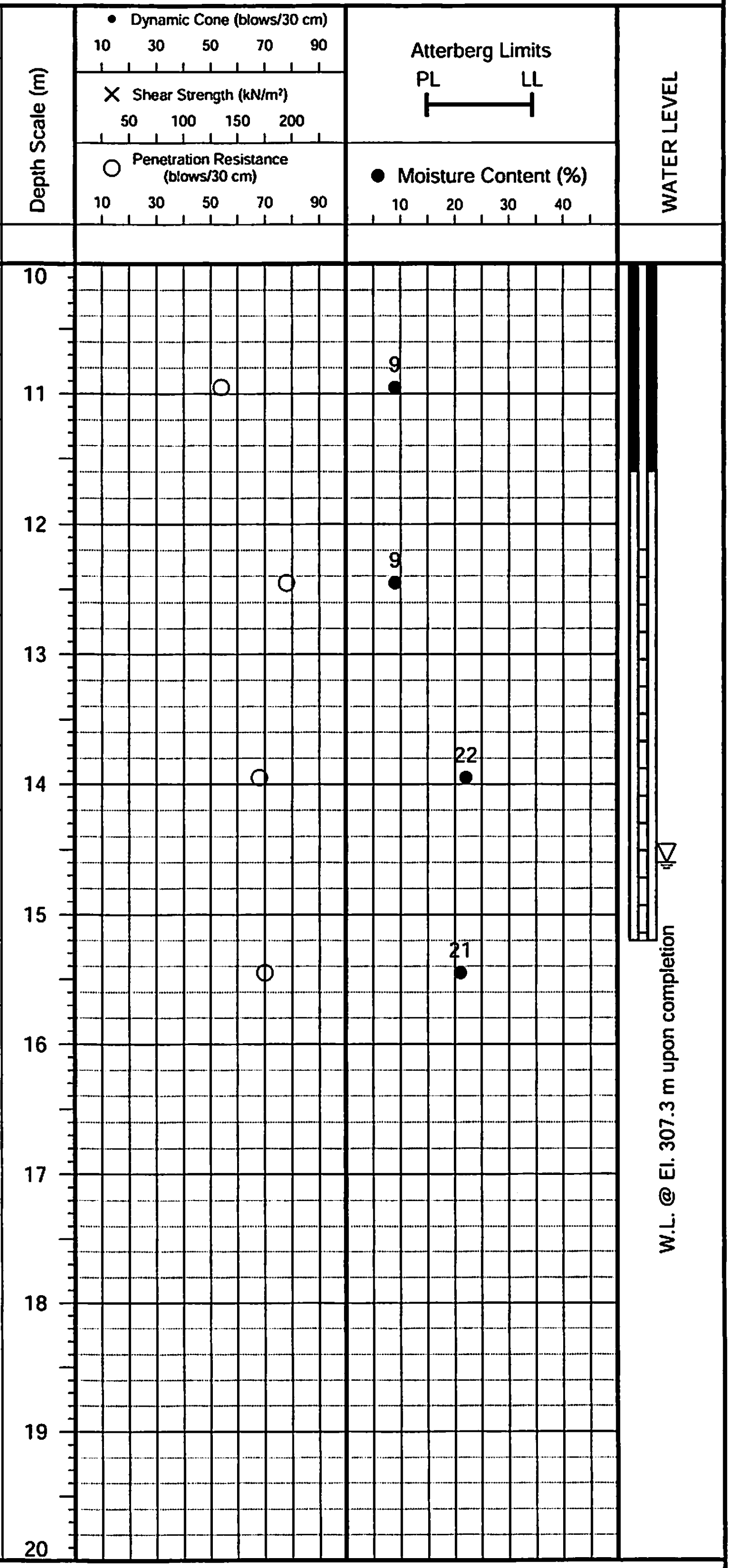
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 20, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
10.0	Grey, very stiff to hard **SILTY CLAY TILL** some sand a trace of gravel occ. cobbles and boulders	10	DO	54
		11	DO	78
308.9 13.0	Grey, very dense **SILT**	12	DO	68
		13	DO	70
306.2 15.7	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 10

FIGURE NO.: 10

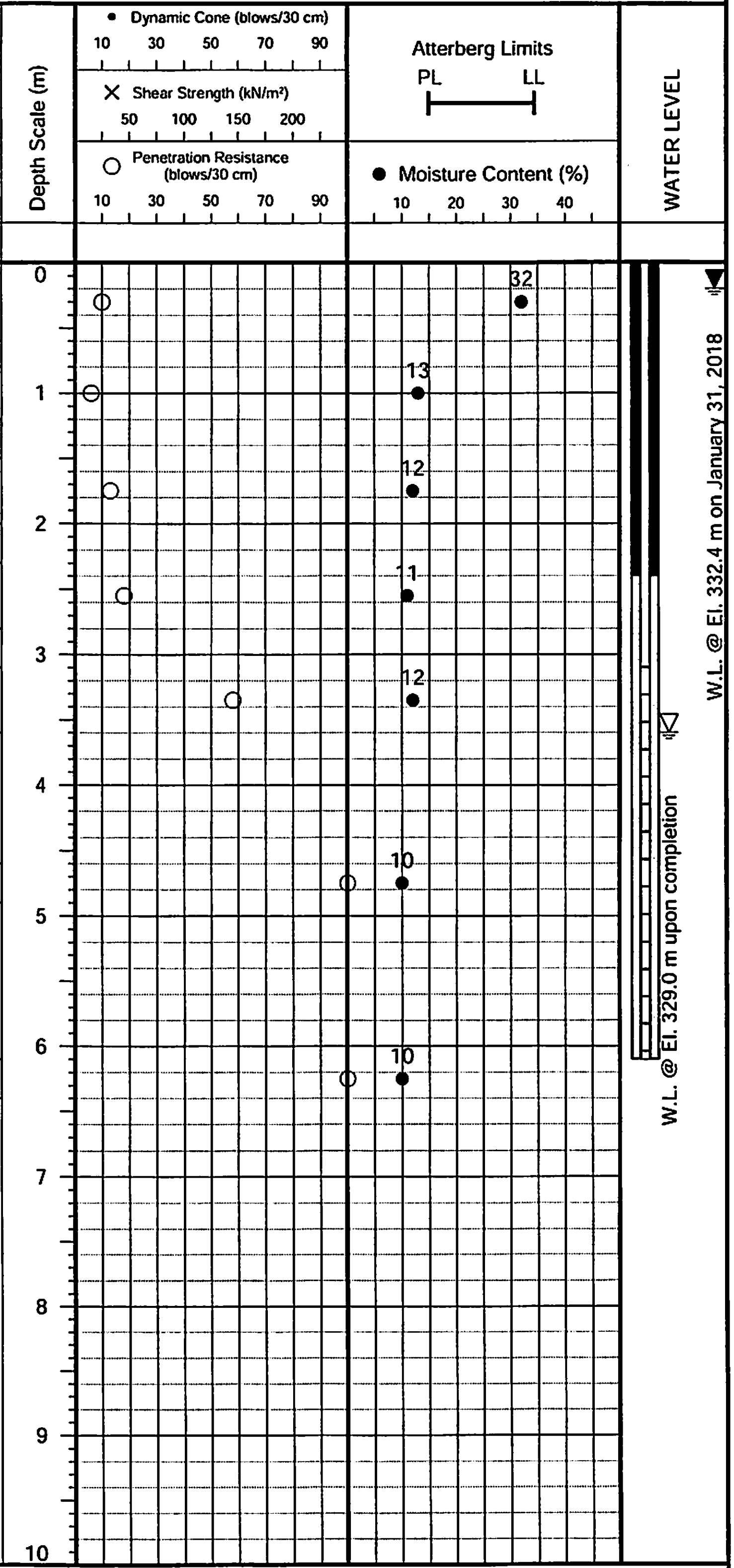
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 21, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
332.6	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	10
331.8 0.8	Brown, loose to compact **SILTY SAND TILL** weathered some gravel a trace of clay	2	DO	6
		3	DO	13
330.1 2.5	Hard **SILTY CLAY TILL** some sand a trace of gravel occ. cobbles and boulders	4	DO	18
		5	DO	58
	brown grey	6	DO	50/15
		7	DO	50/15
326.2 6.4	**END OF BOREHOLE**			



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JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 11

FIGURE NO.: 11

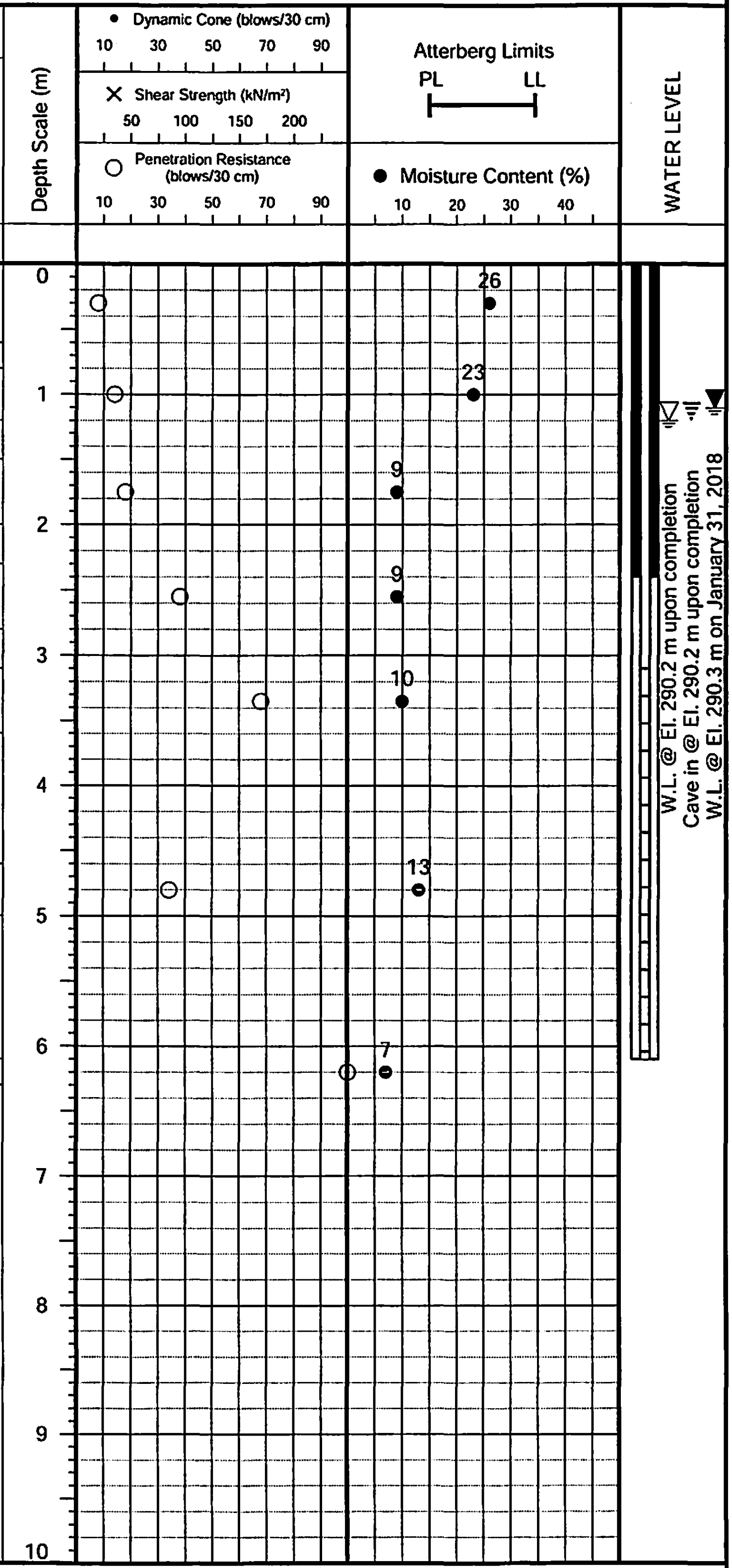
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: November 27, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
291.4	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	8
290.6 0.8	Brown, compact **SILT**	2	DO	14
289.9 1.5	Brown, compact to very dense **SILTY SAND TILL** some gravel a trace of clay occ. cobbles	3	DO	18
		4	DO	38
		5	DO	68
		6	DO	34
		7	DO	50/5
285.1 6.3	**END OF BOREHOLE**			



W.L. @ El. 290.2 m upon completion

Cave in @ El. 290.2 m upon completion

W.L. @ El. 290.3 m on January 31, 2018

JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 12

FIGURE NO.: 12

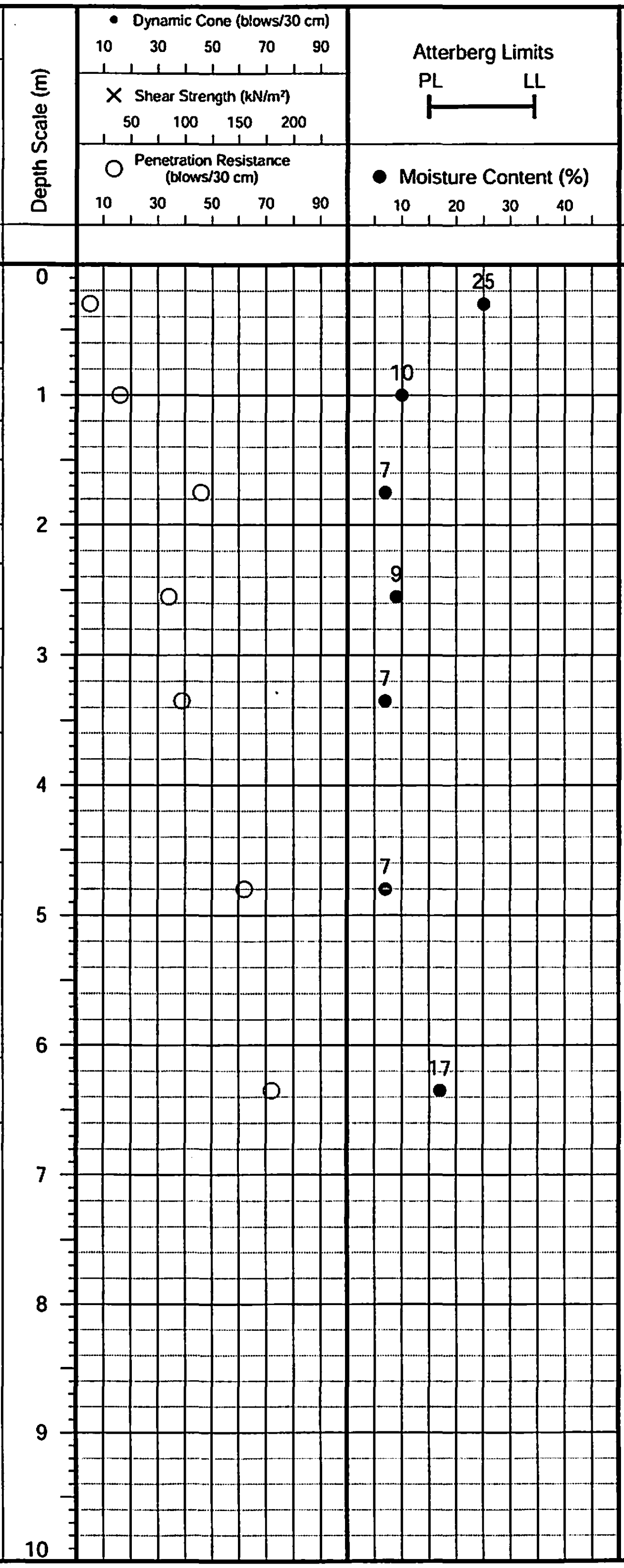
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: November 27, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
303.0	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	5
302.0 1.0	Brown, compact to very dense **SILTY SAND TILL** some gravel a trace of clay occ. cobbles	2	DO	16
		3	DO	46
		4	DO	34
		5	DO	39
		6	DO	62
297.5 5.5	Brown, very dense **SILT**	7	DO	72
296.4 6.6	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 298.2 m upon completion

Soil Engineers Ltd.

JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 13

FIGURE NO.: 13

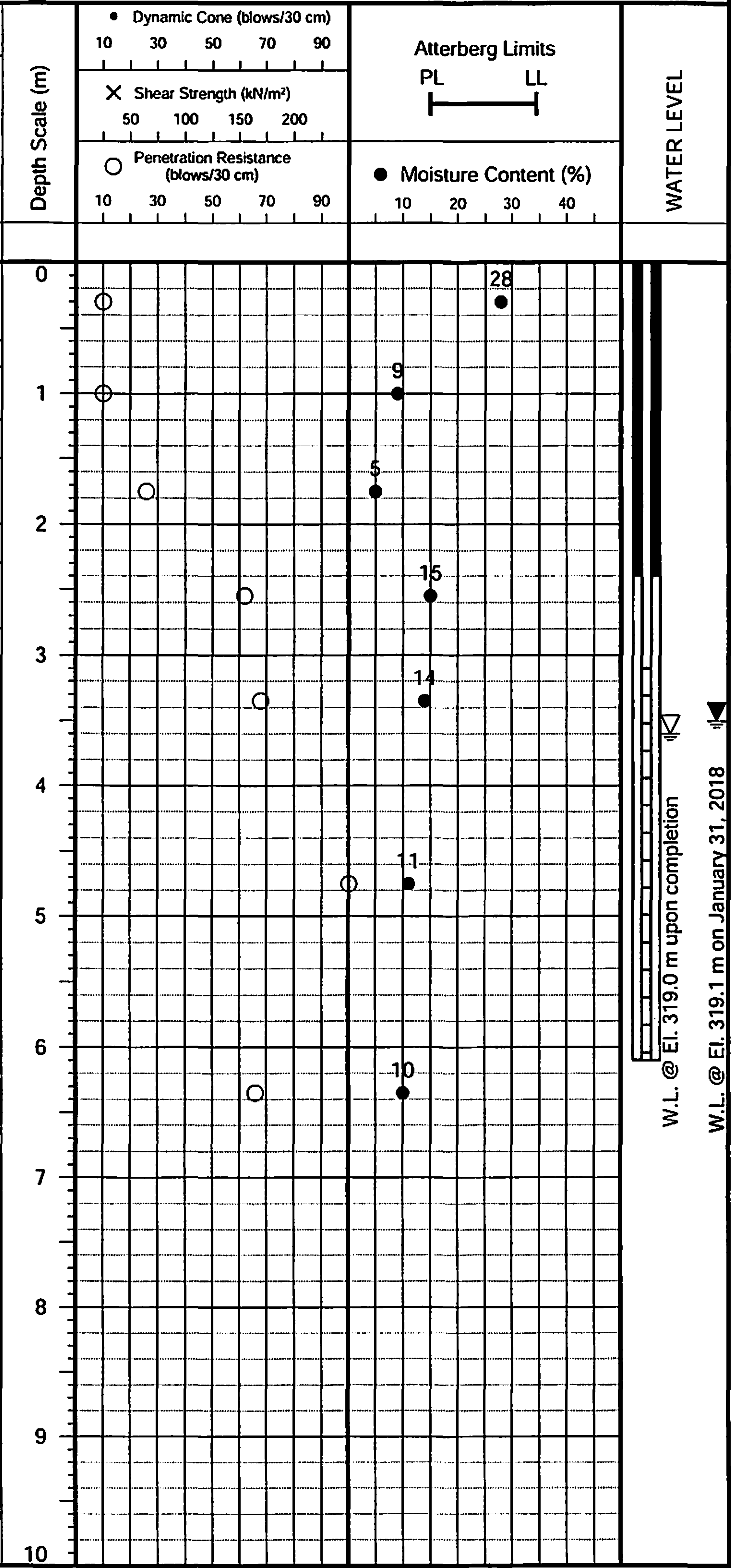
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: January 15, 2018

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	Type	N-Value
322.6	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	10
321.8 0.8	Brown, compact to very dense — — silty **SAND** fine to coarse grained a trace to some silt a trace of gravel	2	DO	10
		3	DO	26
		4	DO	62
		5	DO	68
318.0 4.6	Brown, hard **SILTY CLAY TILL** sandy some gravel — brown/grey	6	DO	50/15
		7	DO	66
316.0 6.6				



Soil Engineers Ltd.

JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 14

FIGURE NO.: 14

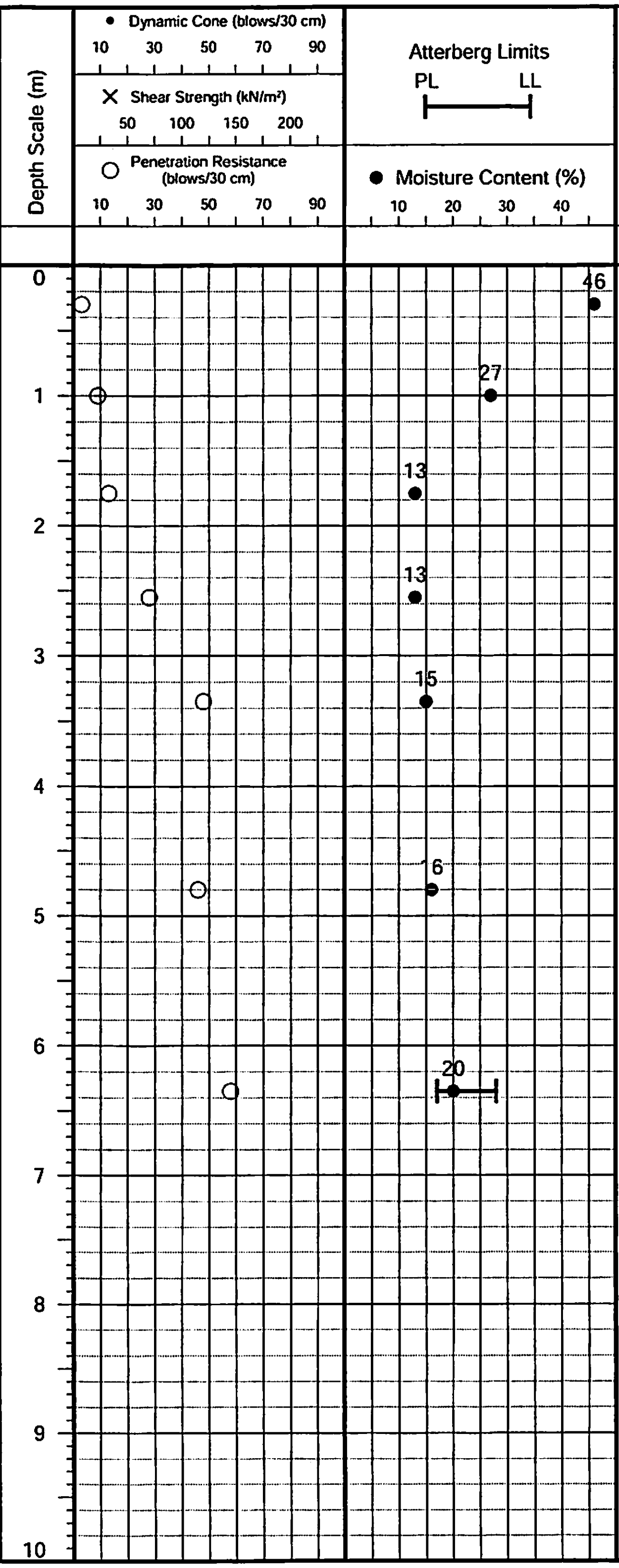
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 21, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES Number	SAMPLES Type	SAMPLES N-Value
322.9	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	3
322.1 0.8	Brown, stiff to very stiff **SILTY CLAY TILL** traces of sand and gravel	2	DO	9
	weathered			
		3	DO	13
		4	DO	28
319.8 3.1	Hard **SILTY CLAY**	5	DO	48
	brown grey	6	DO	46
		7	DO	58
316.3 6.6	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 319.3 m upon completion

Soil Engineers Ltd.

JOB NO.: 1711-S047

LOG OF BOREHOLE NO.: 15

FIGURE NO.: 15

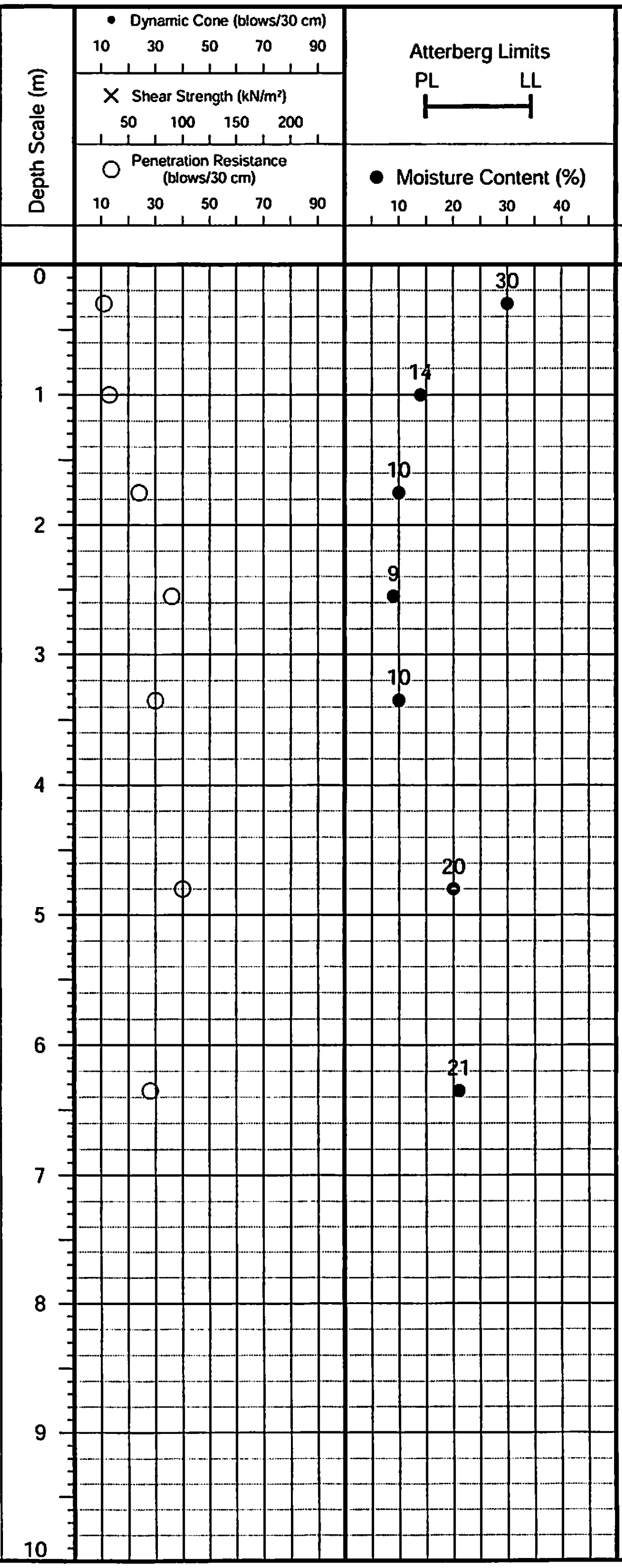
PROJECT DESCRIPTION: Proposed Residential Development

METHOD OF BORING: Flight Auger

PROJECT LOCATION: 7370 Centre Road, Town of Uxbridge

DRILLING DATE: December 21, 2017

El. (m) Depth (m)	SOIL DESCRIPTION	SAMPLES		
		Number	Type	N-Value
333.6	Ground Surface			
0.0	**TOPSOIL/PLOUGHED SOIL**	1	DO	11
332.8 0.8	Brown, stiff to hard **SILTY CLAY TILL** sandy some gravel	2	DO	13
		3	DO	24
		4	DO	36
330.5 3.1	Brown, dense **SANDY SILT** a trace of clay	5	DO	30
329.6 4.0	Brown, compact to dense **SAND** fine grained some silt	6	DO	40
		7	DO	28
327.0 6.6	**END OF BOREHOLE**			



WATER LEVEL

W.L. @ El. 330.9 m upon completion

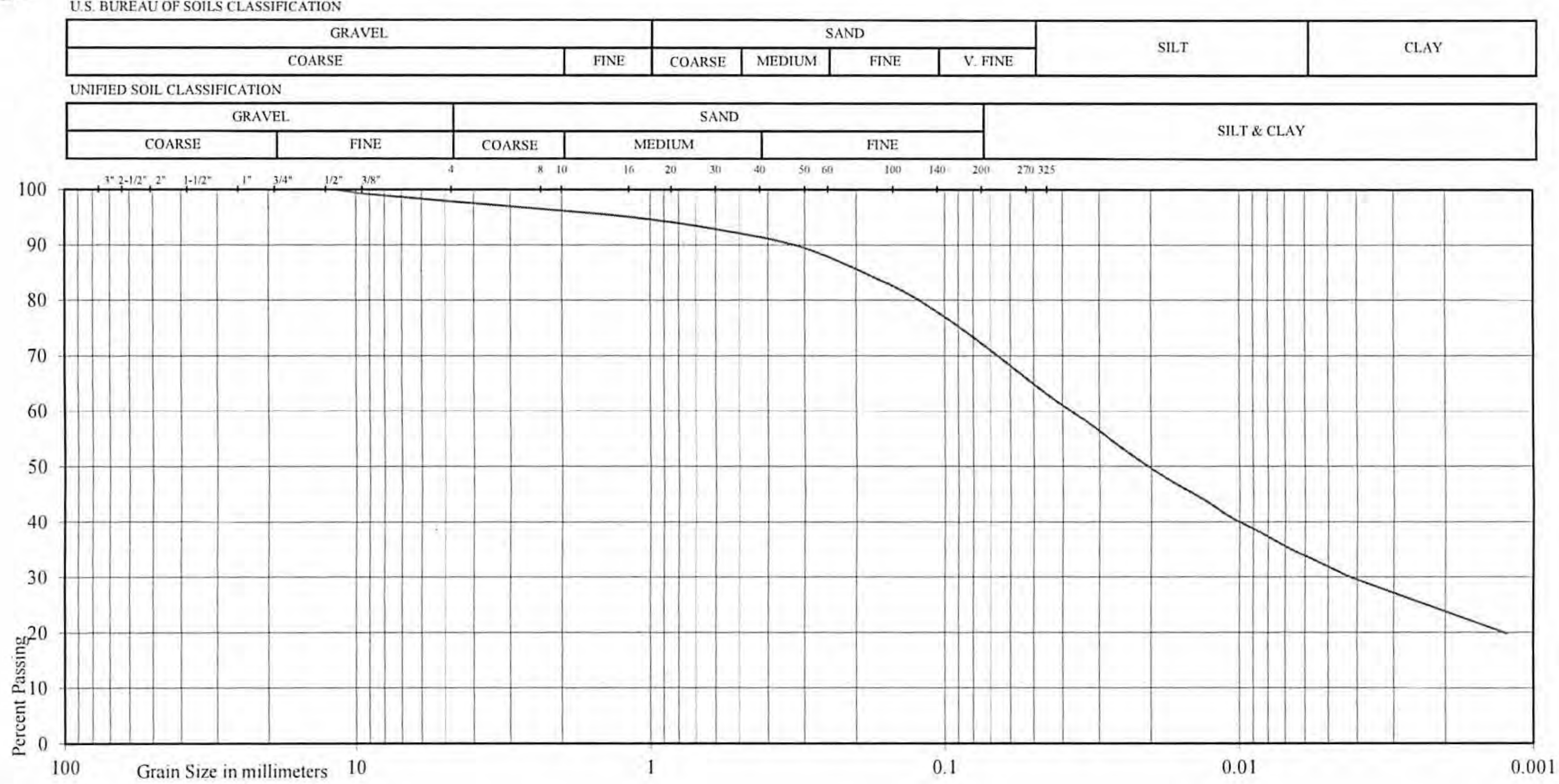
Cave in @ El. 329.4 m upon completion

Soil Engineers Ltd.

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1711-S047



Project: Proposed Residential Development

Location: 7370 Centre Road, Town of Uxbridge

Liquid Limit (%) = 28

Plastic Limit (%) = 17

Borehole No: 3

Plasticity Index (%) = 11

Sample No: 4

Moisture Content (%) = 13

Depth (m): 2.5

Estimated Permeability

Elevation (m): 302.5

(cm./sec.) = 10^{-7}

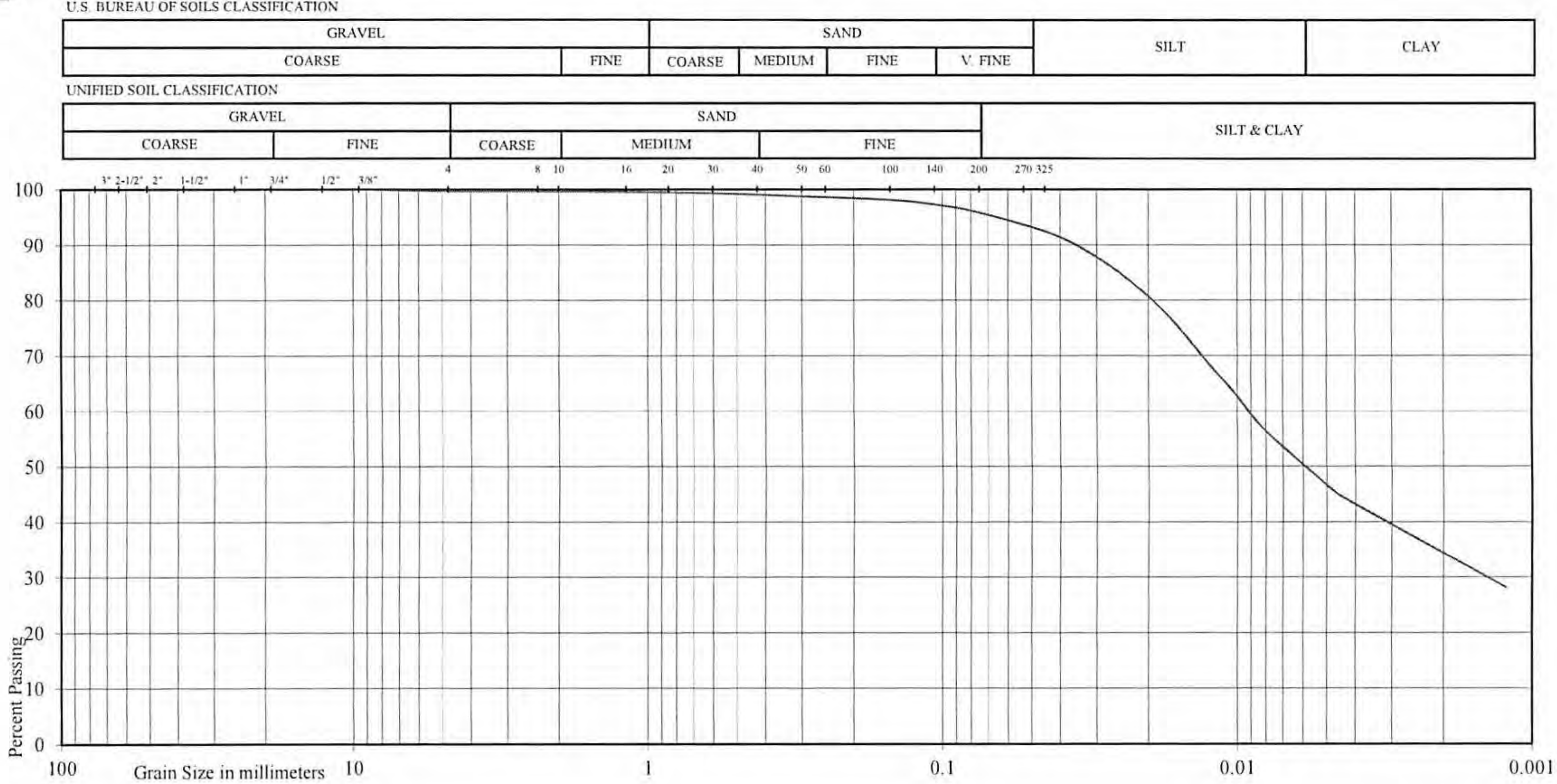
Classification of Sample [& Group Symbol]: SILTY CLAY TILL, sandy, a trace of gravel

Figure: 16

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1711-S047



Project: Proposed Residential Development

Location: 7370 Centre Road, Town of Uxbridge

Borehole No: 14

Sample No: 7

Depth (m): 6.3

Elevation (m): 316.6

Liquid Limit (%) = 35

Plastic Limit (%) = 19

Plasticity Index (%) = 16

Moisture Content (%) = 20

Estimated Permeability (cm./sec.) = 10^{-7}

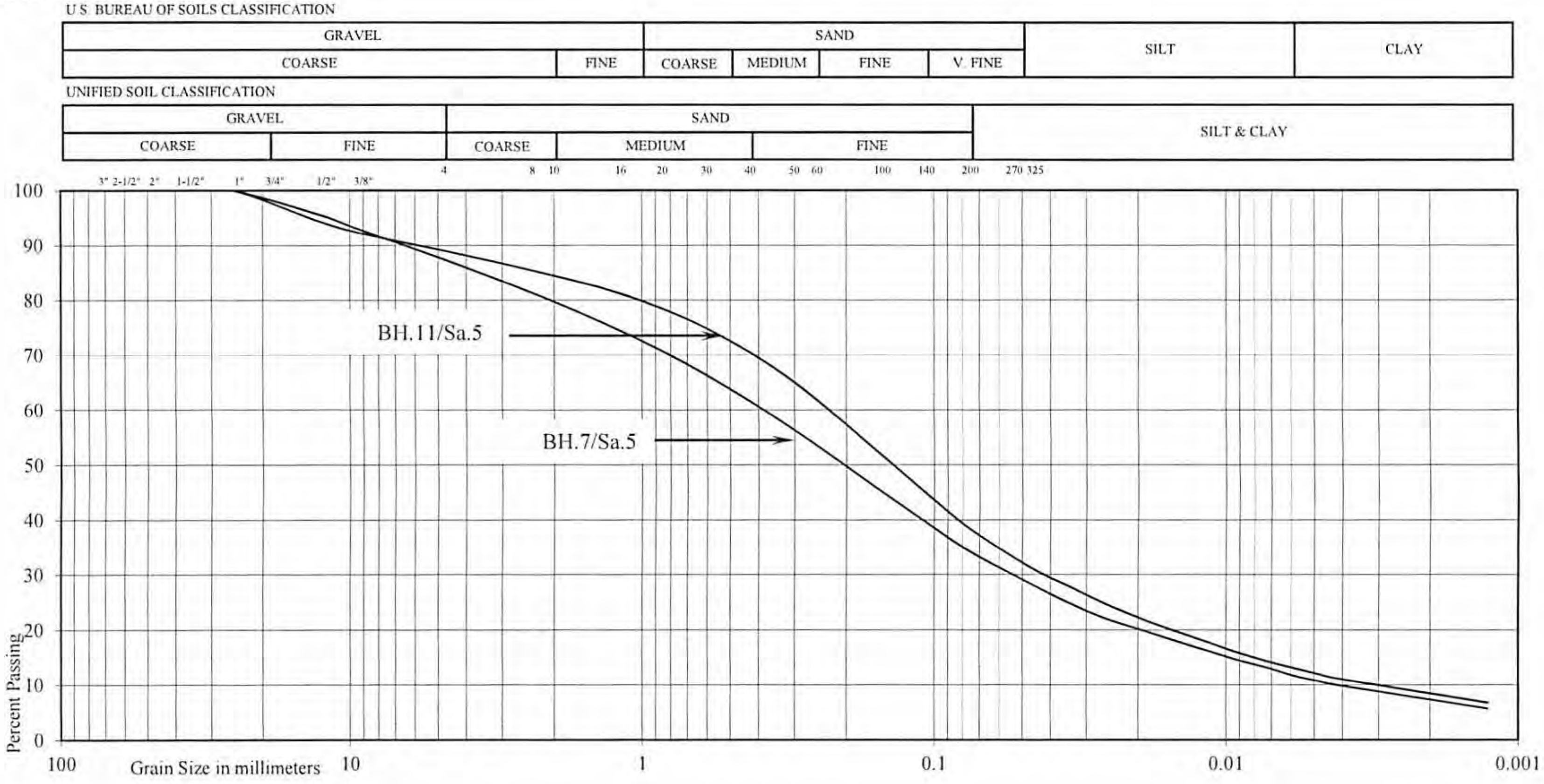
Classification of Sample [& Group Symbol]: SILTY CLAY, a trace of fine sand

Figure: 17

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1711-S047



Project:	Proposed Residential Development	
Location:	7370 Centre Road, Town of Uxbridge	
Borehole No:	7	11
Sample No:	5	5
Depth (m):	3.3	3.3
Elevation (m):	294.5	288.1

BH./Sa.	7/5	1/5
Liquid Limit (%) =	-	-
Plastic Limit (%) =	-	-
Plasticity Index (%) =	-	-
Moisture Content (%) =	8	10
Estimated Permeability (cm./sec.) =	10^{-5}	10^{-5}

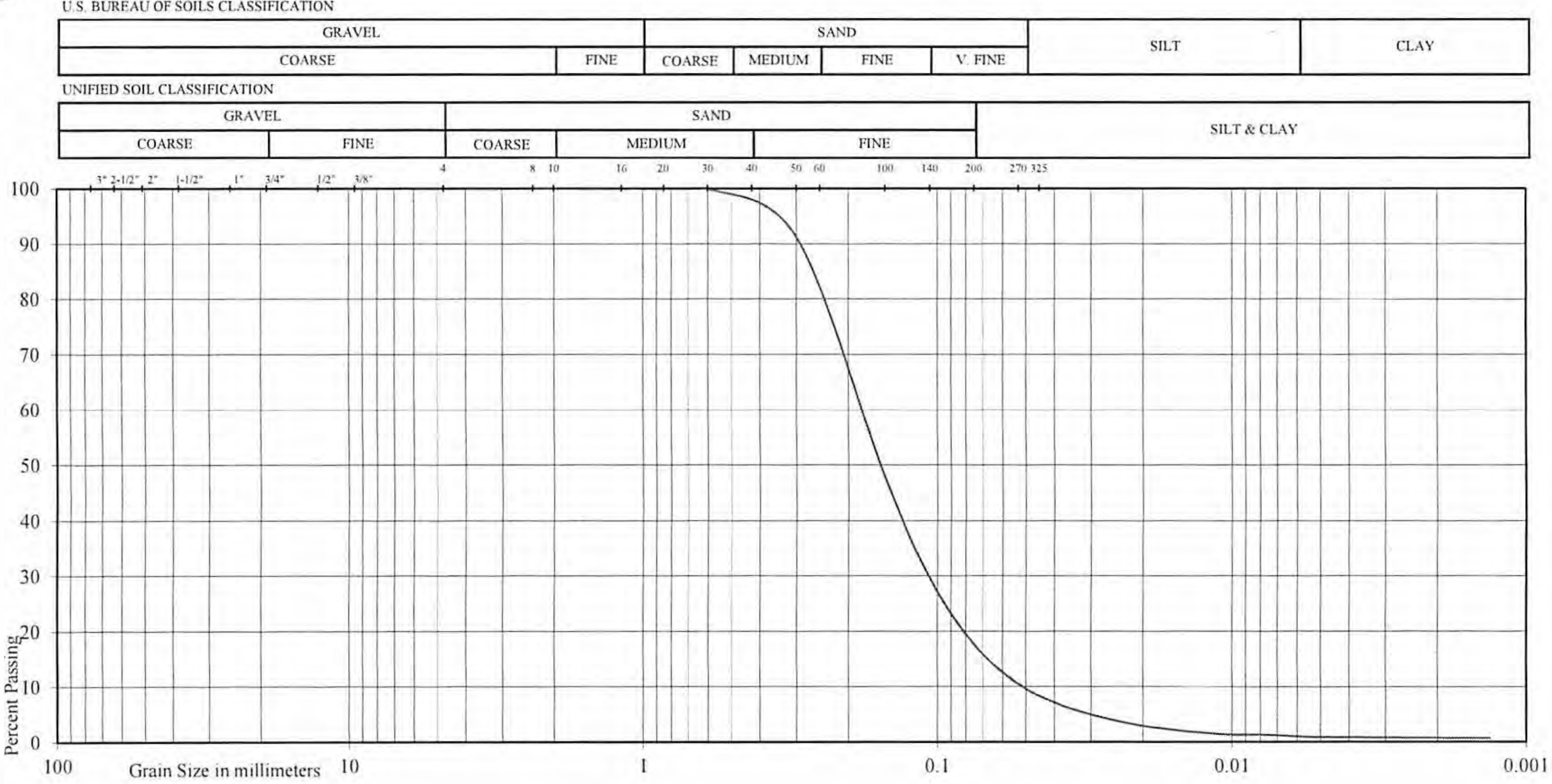
Classification of Sample [& Group Symbol]: SILTY SAND TILL
some gravel, a trace of clay

Figure: 18

Soil Engineers Ltd.

GRAIN SIZE DISTRIBUTION

Reference No: 1711-S047



Project: Proposed Residential Development

Location: 7370 Centre Road, Town of Uxbridge

Borehole No: 15

Sample No: 7

Depth (m): 6.3

Elevation (m): 327.3

Liquid Limit (%) = -

Plastic Limit (%) = -

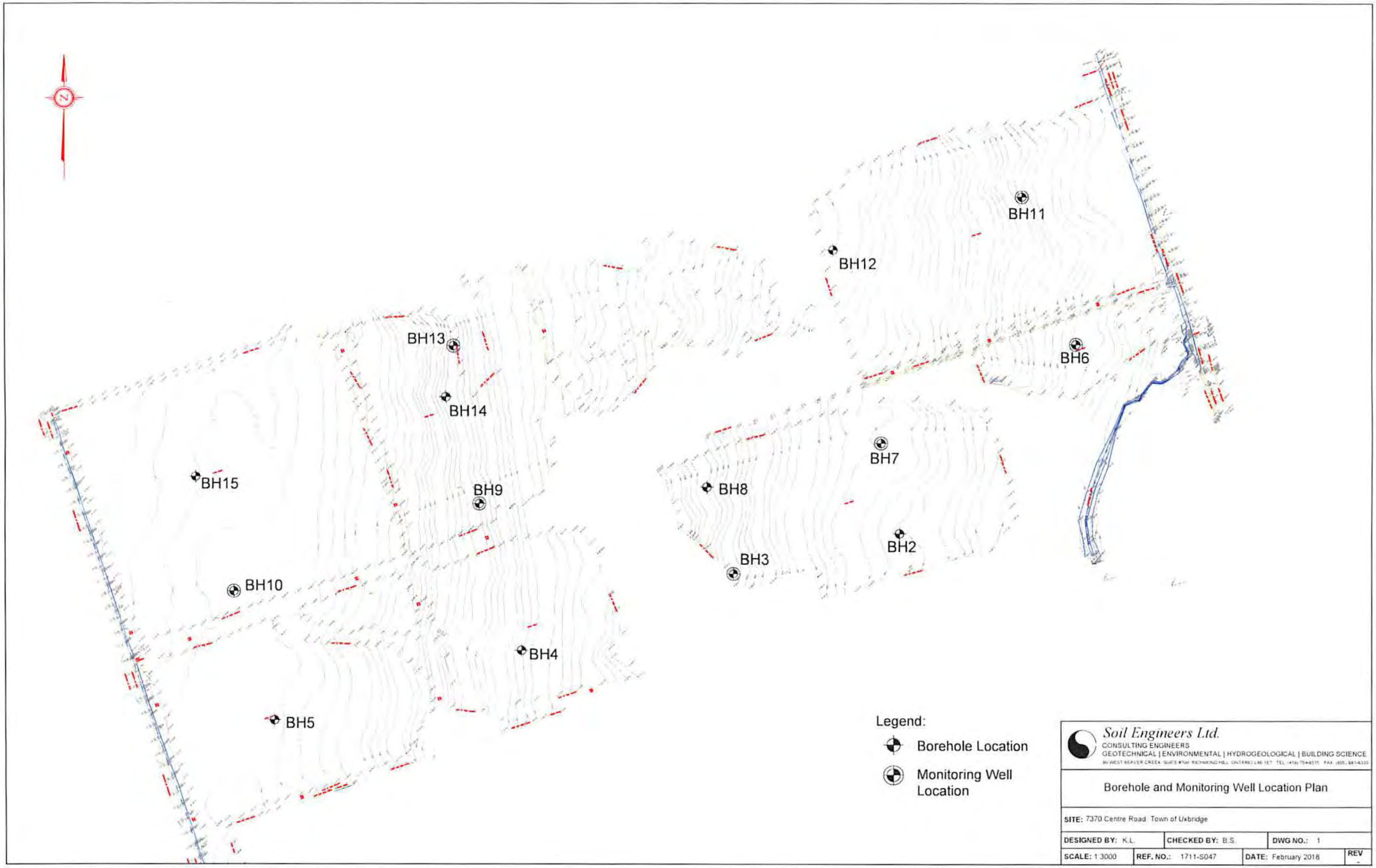
Plasticity Index (%) = -

Moisture Content (%) = 21

Estimated Permeability (cm./sec.) = 10^{-3}

Classification of Sample [& Group Symbol]: FINE SAND, some silt, a trace of clay

Figure: 19



Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL | ENVIRONMENTAL | HYDROGEOLOGICAL | BUILDING SCIENCE

Borehole and Monitoring Well Location Plan

SITE: 7370 Centre Road Town of Uxbridge

DESIGNED BY: K.L. **CHECKED BY:** B.S. **DWG NO.:** 1

SCALE: 1:3000 **REF. NO.:** 1711-S047 **DATE:** February 2018 **REV** -

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO, L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (416) 754-8516	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

March 26, 2018

Reference No. 1711-S047
Page 1 of 2

Bridgebrook Corp.
55 Blue Willow Drive
Woodbridge, Ontario
L4L 9E8

RECEIVED APR 0 9 2018

Attention: Mr. John Spina

Re: A Letter for Groundwater Monitoring Program
Proposed Development
7370 Centre Road
Town of Uxbridge

Dear Sir:

As requested, Soil Engineers Ltd. conducted a periodic groundwater monitoring for the subject site at 7370 Centre Road in Uxbridge. The groundwater monitoring was conducted on March 22, 2018 at the monitoring wells installed during the geotechnical investigation (Reference No. 1711-S047) prepared in January 2018 and the results are summarized in the below table:

Borehole No.	Ground Elevation (m)	Measured Groundwater Level	
		Depth (m)	Elevation (m)
3	305.0	0.5	304.5
6S	287.9	1.2	286.7
6D	287.9	1.4	286.5
7	297.8	1.1	296.7
9S	321.9	1.0	320.9
9D	321.9	7.5	314.4
10	332.6	0.9	331.7
11	291.4	1.1	290.3
13	322.6	3.3	319.3

We trust this letter satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Kin Fung Li, B.Eng.

Bernard Lee, P.Eng.
KFL/BL

LICENSED PROFESSIONAL ENGINEER
Mar 26, 2018
B. P. Y. LEE
100104568
PROVINCE OF ONTARIO

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO, L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (416) 754-8516	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

July 9, 2018

Reference No. 1711-S047
Page 1 of 2

Bridgebrook Corp.
55 Blue Willow Drive
Woodbridge, Ontario
L4L 9E8

Attention: Mr. John Spina

RECEIVED JUL 2 0 2018

Re: A Letter for Groundwater Monitoring Program
Proposed Development
7370 Centre Road
Town of Uxbridge

Dear Sir:

As requested, Soil Engineers Ltd. conducted a periodic groundwater monitoring for the subject site at 7370 Centre Road in Uxbridge. The groundwater monitoring was conducted on June 19 and July 4, 2018 at the monitoring wells installed during the geotechnical investigation (Reference No. 1711-S047) prepared in January 2018 and the results are summarized in the below table:

Borehole No.	Ground Elevation (m)	Measured Groundwater Level	
		Depth (m)	Elevation (m)
3	305.0	1.1	303.9
6S	287.9	1.4	286.5
6D	287.9	1.6	286.3
7	297.8	2.2	295.6
9S	321.9	2.1	219.8
9D	321.9	7.9	314.0
10	332.6	1.7	330.9
11	291.4	1.4	290.0
13	322.6	3.2	319.4

We trust this letter satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Kin Fung Li, B.Eng.

Bernard Lee, P.Eng.
KFL/BL

LICENSED PROFESSIONAL ENGINEER
July 9 2018
B. P. Y. LEE
100104568
PROVINCE OF ONTARIO

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO, L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (416) 754-8516	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

October 15, 2018

Reference No. 1711-S047
Page 1 of 2

Bridgebrook Corp.
55 Blue Willow Drive
Woodbridge, Ontario
L4L 9E8

RECEIVED OCT 19 2018

Attention: Mr. John Spina

Re: A Letter for Groundwater Monitoring Program
Proposed Development
7370 Centre Road
Town of Uxbridge

Dear Sir:

As requested, Soil Engineers Ltd. conducted a periodic groundwater monitoring for the subject site at 7370 Centre Road in Uxbridge. The groundwater monitoring was conducted on September 6, 2018 at the monitoring wells installed during the geotechnical investigation (Reference No. 1711-S047) prepared in January 2018 and the results are summarized in the below table:

Borehole No.	Ground Elevation (m)	Measured Groundwater Level	
		Depth (m)	Elevation (m)
3	305.0	0.7	304.3
6S	287.9	1.8	286.1
6D	287.9	2.0	285.9
7	297.8	2.5	295.3
9S	321.9	2.3	319.6
9D	321.9	8.1	313.8
10	332.6	1.4	331.2
11	291.4	1.8	289.6
13	322.6	3.7	318.9

We trust this letter satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Kin Fung Li, P.Eng.

LICENSED PROFESSIONAL ENGINEER
K. F. LI
100169280
Oct 15 2018
PROVINCE OF ONTARIO

Bernard Lee, P.Eng.
KFL/BL

LICENSED PROFESSIONAL ENGINEER
Oct 15, 2018
B. P. Y. LEE
100104568
PROVINCE OF ONTARIO

Soil Engineers Ltd.
CONSULTING ENGINEERS
GEOTECHNICAL • ENVIRONMENTAL • HYDROGEOLOGICAL • BUILDING SCIENCE
90 WEST BEAVER CREEK ROAD, SUITE #100, RICHMOND HILL, ONTARIO, L4B 1E7 · TEL (416) 754-8515 · FAX (905) 881-8335

BARRIE	MISSISSAUGA	OSHAWA	NEWMARKET	GRAVENHURST	PETERBOROUGH	HAMILTON
TEL: (705) 721-7863	TEL: (905) 542-7605	TEL: (905) 440-2040	TEL: (905) 853-0647	TEL: (705) 684-4242	TEL: (905) 440-2040	TEL: (905) 777-7956
FAX: (705) 721-7864	FAX: (905) 542-2769	FAX: (905) 725-1315	FAX: (416) 754-8516	FAX: (705) 684-8522	FAX: (905) 725-1315	FAX: (905) 542-2769

December 4, 2018

Reference No. 1711-S047
Page 1 of 2

Bridgebrook Corp.
55 Blue Willow Drive
Woodbridge, Ontario
L4L 9E8

Attention: Mr. John Spina

Re: A Letter for Groundwater Monitoring Program
Proposed Development
7370 Centre Road
Town of Uxbridge

Dear Sir:

As requested, Soil Engineers Ltd. conducted a periodic groundwater monitoring for the subject site at 7370 Centre Road in Uxbridge. The groundwater monitoring was conducted on December 4, 2018 at the monitoring wells installed during the geotechnical investigation (Reference No. 1711-S047) prepared in January 2018 and the results are summarized in the below table:

Borehole No.	Ground Elevation (m)	Measured Groundwater Level	
		Depth (m)	Elevation (m)
3	305.0	0.2	304.8
6S	287.9	0.9	287.0
6D	287.9	1.1	286.8
7	297.8	0.5	297.3
9S	321.9	0.7	321.2
9D	321.9	7.4	314.5
10	332.6	0.3	332.3
11	291.4	0.7	290.7
13	322.6	3.7	318.9

We trust this letter satisfies your present requirements; however, should any queries arise, please feel free to contact this office.

Yours truly,
SOIL ENGINEERS LTD.

Kin Fung Li, P.Eng.

Bernard Lee, P.Eng.
KFL/BL

LICENSED PROFESSIONAL ENGINEER
K. F. LI
100169280
Dec 4, 2018
PROVINCE OF ONTARIO

LICENSED PROFESSIONAL ENGINEER
Dec 4, 2018
B. P. Y. LEE
100104568
PROVINCE OF ONTARIO

Existing Conditions

Figure 2

7370 Centre Road Uxbridge

Legend

- 🟥 Subject Property
- ▭ ELC Communities
- — Staked Dripline (LSRCA July 24, 2020)
- — Staked Wetland (LSRCA July 24, 2020)
- — Staked Top of Bank (LSRCA July 24, 2020)
- — Section Divide
- ▨ Wetlands (Beacon 2020)
- — Watercourse (Beacon 2020)

Headwater Drainage Feature

- - - Intermittent
- ····· Ephemeral

Code	Community Description
	Wetland Communities
SWD3-4	Manitoba Maple Mineral Deciduous Swamp
SWD4-3	White Birch - Poplar Mineral Deciduous Swamp
MAS2-1	Cattail Mineral Shallow Marsh
SWT2-2	Willow Mineral Thicket Swamp
	Forest Communities
CUW1	Mineral Cultural Woodland
FOD3-1	Dry - Fresh Aspen Deciduous Forest
FOD4-2	Dry - Fresh White Ash Deciduous Forest
FOD7	Fresh - Moist Lowland Deciduous Forest
FOD7-2	Fresh - Moist Ash Lowland Deciduous Forest
FOD7-4	Fresh - Moist Black Walnut Lowland Deciduous Forest
	Cultural Communities
CUM1	Mineral Cultural Meadow
CUM1-1	Dry - Moist Old Field Meadow
CUP3-3	Scotch Pine Coniferous Plantation
CUT1	Mineral Cultural Thicket
	Other Communities
AG	Agricultural
ANT	Anthropogenic

BEACON ENVIRONMENTAL

Project: 217431
Last Revised: August 2020

Client: Mediterra Corp.

Prepared by: BD
Checked by: TDH

DRAFT

N

1:4,100

0 80 160 m

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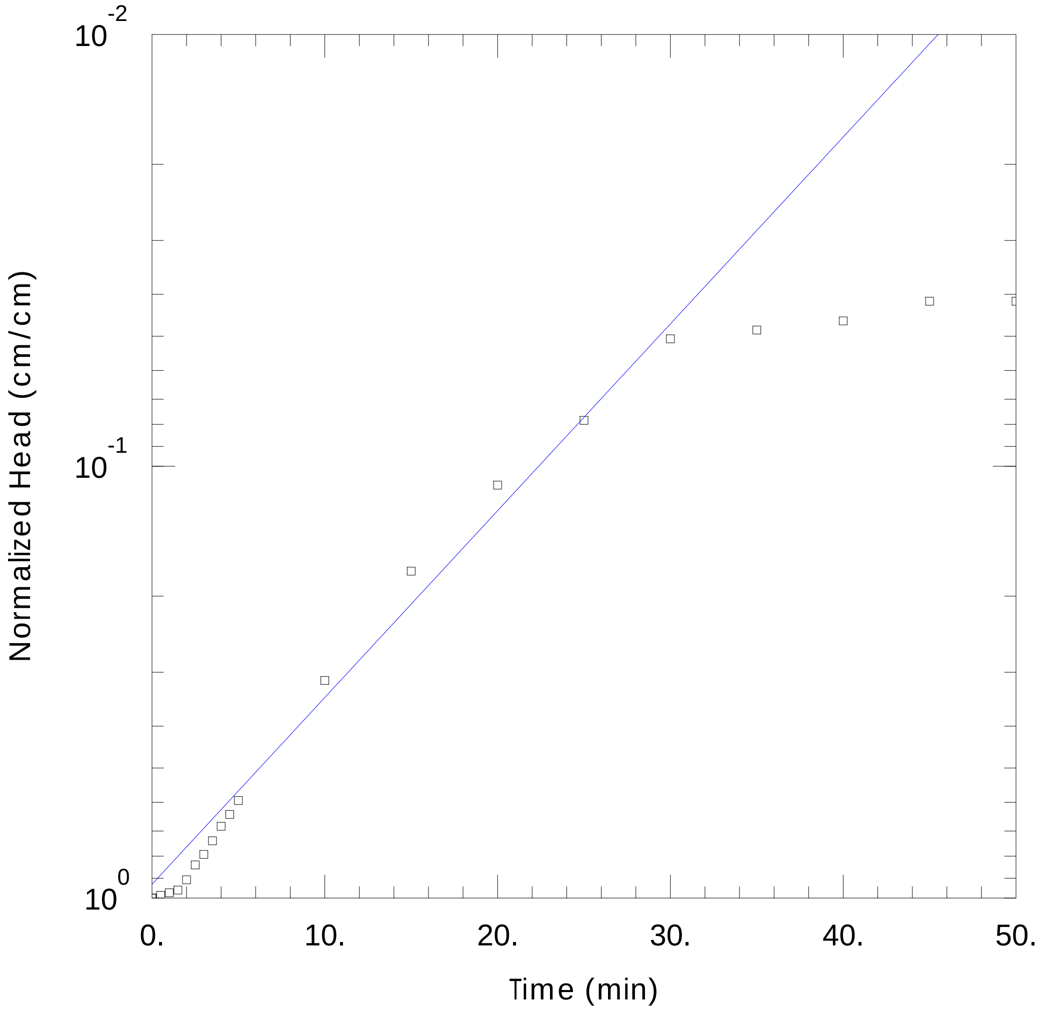
C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2017\217431 7370 Centre Road Uxbridge EIS\MXD\2020-08-12_Figure02_ExistingConditions_217431.mxd

Appendix C

Hydrogeological Analyses



RISING HEAD TEST REPORT

Data Set: D:\CentreRd Uxbridge\AqtwBH6.aqt
Date: 08/28/20 Time: 11:30:13

PROJECT INFORMATION

Company: Beacon Environmental
Project: 217431.2
Location: 7370 Centre Road, Uxbridge
Test Well: BH6
Test Date: 28 April 2020

AQUIFER DATA

Saturated Thickness: 1317. cm Anisotropy Ratio (Kz/Kr): 1.

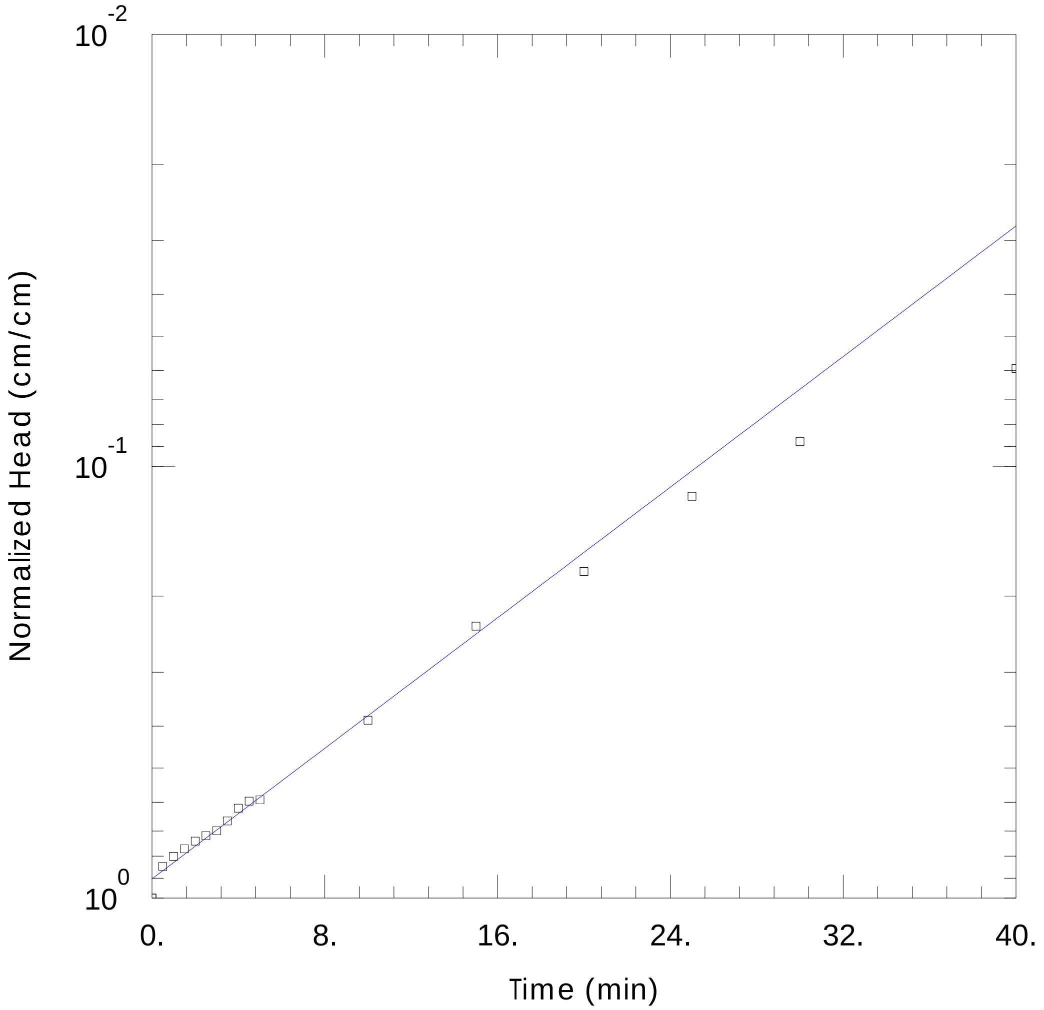
WELL DATA (BH4)

Initial Displacement: 217. cm Static Water Column Height: 2000. cm
Total Well Penetration Depth: 1520. cm Screen Length: 360. cm
Casing Radius: 4.42 cm Well Radius: 15.24 cm

SOLUTION

Aquifer Model: Unconfined Solution Method: Bouwer-Rice

K = 0.0001435 cm/sec y0 = 201.7 cm



RISING HEAD TEST REPORT

Data Set: D:\CentreRd Uxbridge\AqtwBH7.aqt
Date: 08/28/20
Time: 11:36:39

PROJECT INFORMATION

Company: Beacon Environmental
Project: 217431.2
Location: 7370 Centre Road, Uxbridge
Test Well: BH7
Test Date: 28 April 2020

AQUIFER DATA

Saturated Thickness: 359. cm
Anisotropy Ratio (Kz/Kr): 1.

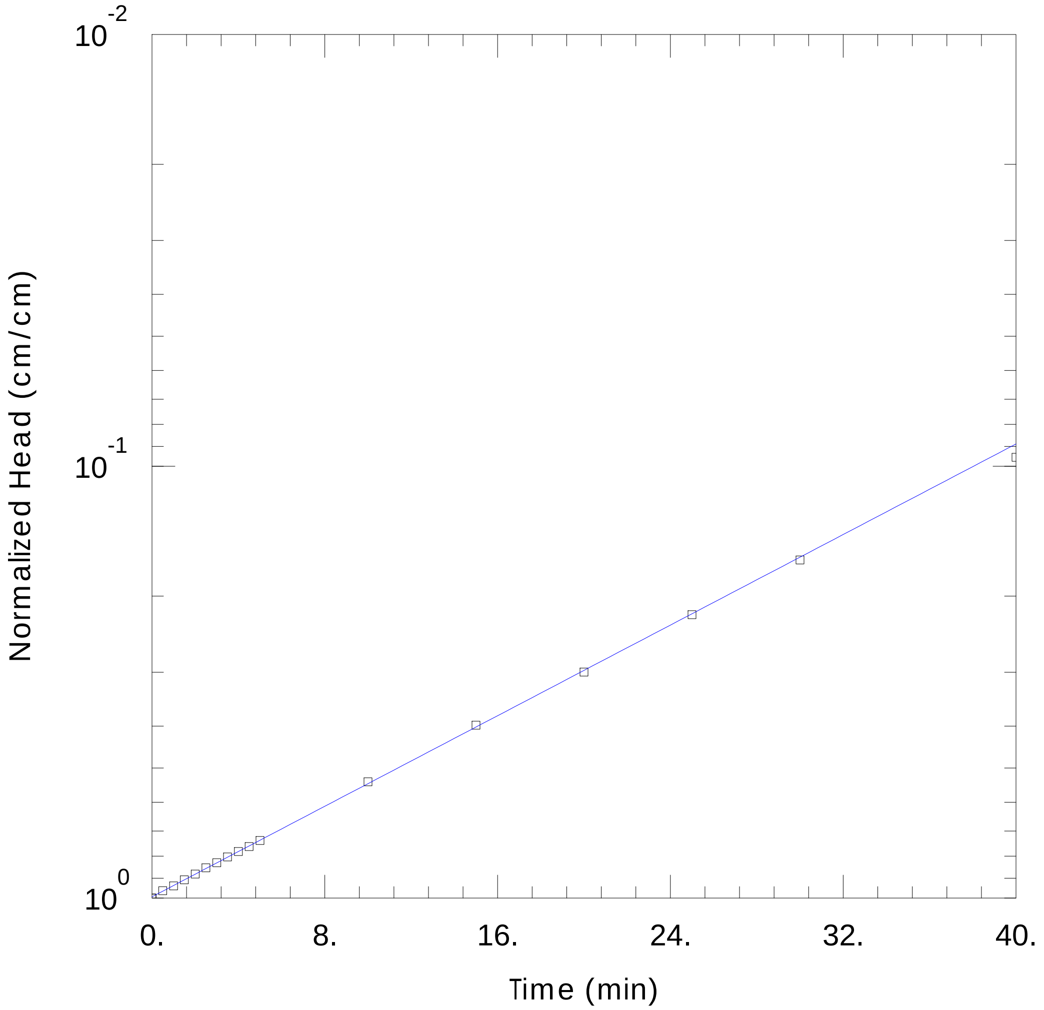
WELL DATA (BH4)

Initial Displacement: 353.5 cm
Static Water Column Height: 1000. cm
Total Well Penetration Depth: 2760. cm
Screen Length: 360. cm
Casing Radius: 4.42 cm
Well Radius: 15.24 cm

SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice

K = 0.0001377 cm/sec
y0 = 319.3 cm



RISING HEAD TEST REPORT

Data Set: D:\CentreRd Uxbridge\AqtwBH11.aqt
Date: 08/28/20 Time: 11:43:42

PROJECT INFORMATION

Company: Beacon Environmental
Project: 217431.2
Location: 7370 Centre Road, Uxbridge
Test Well: BH11
Test Date: 28 April 2020

AQUIFER DATA

Saturated Thickness: 412. cm
Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH4)

Initial Displacement: 367. cm
Static Water Column Height: 1000. cm
Total Well Penetration Depth: 2760. cm
Screen Length: 360. cm
Casing Radius: 4.42 cm
Well Radius: 15.24 cm

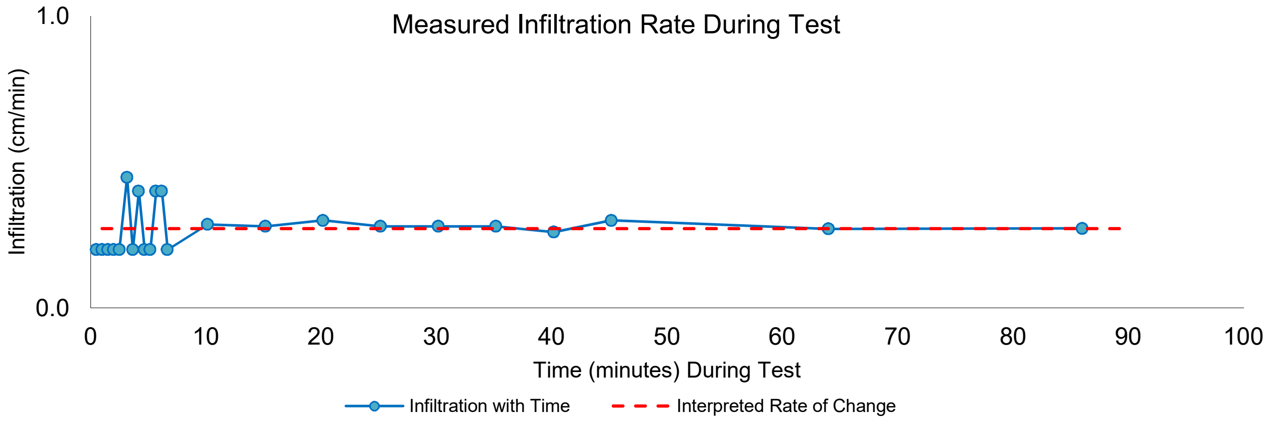
SOLUTION

Aquifer Model: Unconfined
Solution Method: Bouwer-Rice
K = 9.526E-5 cm/sec
y0 = 364.8 cm

Constant Head Well Permeameter Test Report

BEACON ENVIRONMENTAL

Project:	7370 Centre Road, Uxbridge
Project Number:	217431.2
Location Name	PT20-01
Approximate Location:	44.1140 degrees -79.1378 degrees
Approximate Depth Tested:	0.42 mbgl



Field Measurements:

Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0	43.5	-	-
0.5	43.4	0.10	0.20
1	43.3	0.10	0.20
1.5	43.2	0.10	0.20
2	43.1	0.10	0.20
2.5	43	0.10	0.20
3.17	42.7	0.30	0.45
3.67	42.6	0.10	0.20
4.17	42.4	0.20	0.40
4.67	42.3	0.10	0.20
5.17	42.2	0.10	0.20
5.67	42	0.20	0.40
6.17	41.8	0.20	0.40
6.67	41.7	0.10	0.20
10.16	40.7	1.00	0.29
15.16	39.3	1.40	0.28
20.16	37.8	1.50	0.30
25.16	36.4	1.40	0.28
30.16	35	1.40	0.28
35.16	33.6	1.40	0.28
40.16	32.3	1.30	0.26
45.16	30.8	1.50	0.30
64	25.7	5.10	0.27
86	19.7	6.00	0.27

Soil Description

0 cm to 42 cm	Brown silty sand, rootlets, moist

Test Conditions:

Instrument: ETC Pask (Constant Head Well) Permeameter

hole radius (a) =	8.3 cm
Water column height in hole (H_1) =	15 cm
Ambient Air Temperature at Testing =	10 ^{o}C

Interpretations:

Soil Type =	0
Soil Type Coefficient (α*) =	0.12 cm^{-1}
Average Water Level Change (R_1) =	0.00 cm/s
Steady Intake Water Rate (Q_1) =	0.24 cm^3/s
Shape factor for H_1/a = (C_1) =	0.89 -

Field Saturated Hydraulic Conductivity (K_{fs}):

K_{fs} =	9E-05 cm/s
'Freshet' K_a (K_{fs} corrected to 4^{o}C) ^{1}=	8E-05 cm/s
'Summer' K_a (K_{fs} corrected to 24^{o}C) ^{1}=	1E-04 cm/s

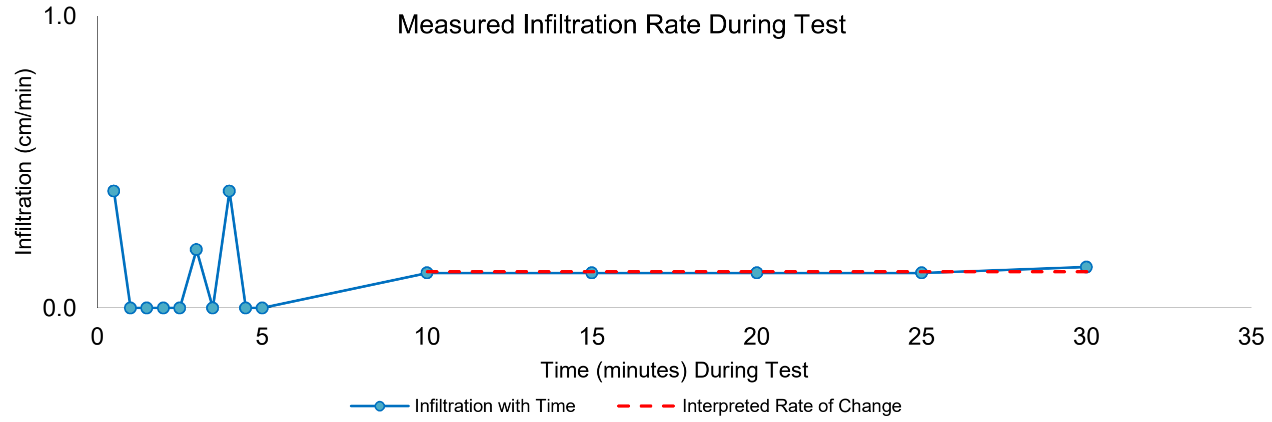
Date of Field Measurements:	28-Apr-20
Field Representative:	HB
Reviewed:	ZK

[1] (Streeter and Wylie, 1975)

Constant Head Well Permeameter Test Report

BEACON ENVIRONMENTAL

Project:	7370 Centre Road, Uxbridge
Project Number:	217431.2
Location Name	PT20-02
Approximate Location:	44.1138 degrees -79.1399 degrees
Approximate Depth Tested:	0.26 mbgl



Field Measurements:

Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0	37.7	-	-
0.5	37.5	0.20	0.40
1	37.5	0.00	0.00
1.5	37.5	0.00	0.00
2	37.5	0.00	0.00
2.5	37.5	0.00	0.00
3	37.4	0.10	0.20
3.5	37.4	0.00	0.00
4	37.2	0.20	0.40
4.5	37.2	0.00	0.00
5	37.2	0.00	0.00
10	36.6	0.60	0.12
15	36	0.60	0.12
20	35.4	0.60	0.12
25	34.8	0.60	0.12
30	34.1	0.70	0.14

Soil Description	
0 cm to 26 cm	Brown silty sand, rootlets, moist

Test Conditions:

Instrument: ETC Pask (Constant Head Well) Permeameter

hole radius (a) = 8.3 cm

Water column height in hole (H_1) = 15 cm

Ambient Air Temperature at Testing = 10 ^{o}C

Interpretations:

Soil Type = Moderate

Soil Type Coefficient (α*) = 0.12 cm^{-1}

Average Water Level Change (R_1) = 0.00 cm/s

Steady Intake Water Rate (Q_1) = 0.11 cm^3/s

Shape factor for H_1/a = (C_1) = 0.89 -

Field Saturated Hydraulic Conductivity (K_{fs}):

K_{fs} = 4E-05 cm/s

'Freshet' K_a (K_{fs} corrected to 4^{o}C) [1]= 3E-05 cm/s

'Summer' K_a (K_{fs} corrected to 24^{o}C) [1]= 6E-05 cm/s

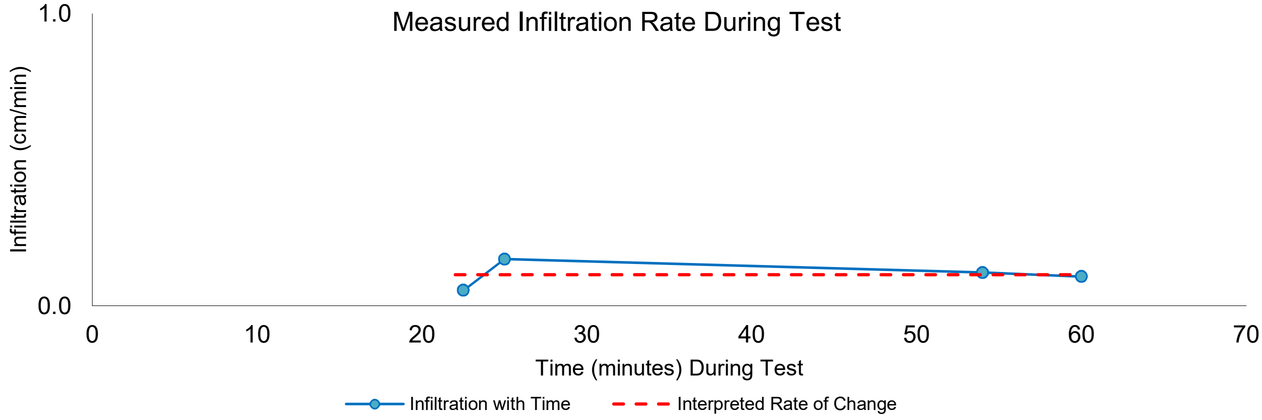
Date of Field Measurements: 28-Apr-20
Field Representative: HB
Reviewed: ZK

[1] (Streeter and Wylie, 1975)

Constant Head Well Permeameter Test Report

BEACON ENVIRONMENTAL

Project:	7370 Centre Road, Uxbridge
Project Number:	217431.2
Location Name	PT20-03
Approximate Location:	44.1158 degrees -79.1380 degrees
Approximate Depth Tested:	0.62 mbgl



Field Measurements:

Elapsed Time (min)	Water Level in Reservoir (cm)	Water Level Change (cm)	Infiltration (cm/min)
0	43.7	-	-
22.5	42.5	1.20	0.05
25	42.1	0.40	0.16
54	38.8	3.30	0.11
60	38.2	0.60	0.10

Soil Description

0 cm to 62 cm	Brown silty sand, rootlets, moist

Test Conditions:

Instrument: ETC Pask (Constant Head Well) Permeameter

hole radius (a) = 8.3 cm

Water column height in hole (H_1) = 15 cm

Ambient Air Temperature at Testing = 10 °C

Interpretations:

Soil Type = Moderate

Soil Type Coefficient (α*) = 0.12 cm^{-1}

Average Water Level Change (R_1) = 0.00 cm/s

Steady Intake Water Rate (Q_1) = 0.10 cm^3/s

Shape factor for H_1/a = (C_1) = 0.89 -

Field Saturated Hydraulic Conductivity (K_{fs}):

K_{fs} = 4E-05 cm/s

'Freshet' K_a (K_{fs} corrected to 4°C) [1]= 3E-05 cm/s

'Summer' K_a (K_{fs} corrected to 24°C) [1]= 5E-05 cm/s

Date of Field Measurements: 28-Apr-20
Field Representative: HB
Reviewed: ZK

[1] (Streeter and Wylie, 1975)

Appendix D

Theoretical Global Site Water Balance Analyses

THEORETICAL SITE WATER BALANCE ASSESSMENT

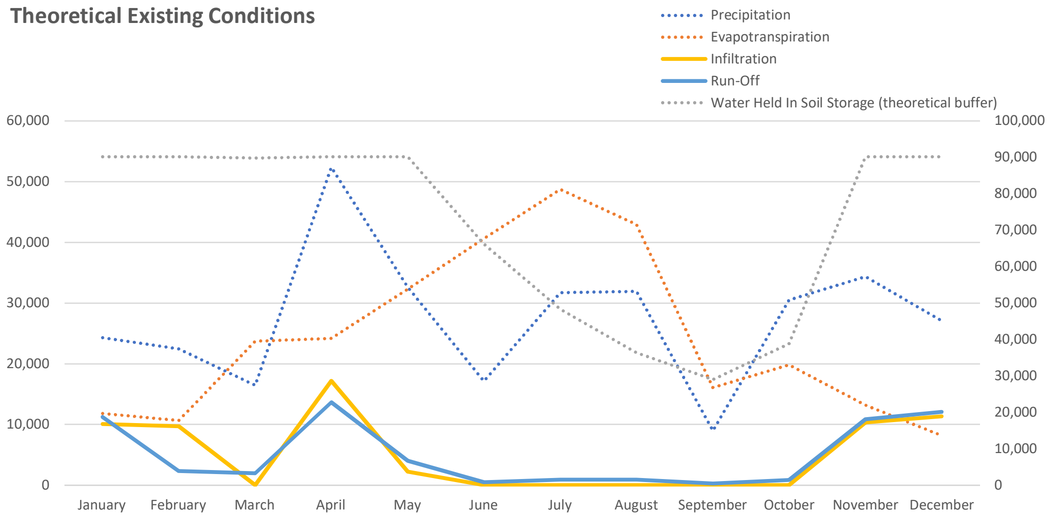
Project: Hydrogeological Investigation and CBWB
7370 Centre Road, Uxbridge, Ontario

Project Number: CT3058 (BE-217431.2)
For: Bridge Brook Corporation

Date: February, 2021
Reviewed By: ZK

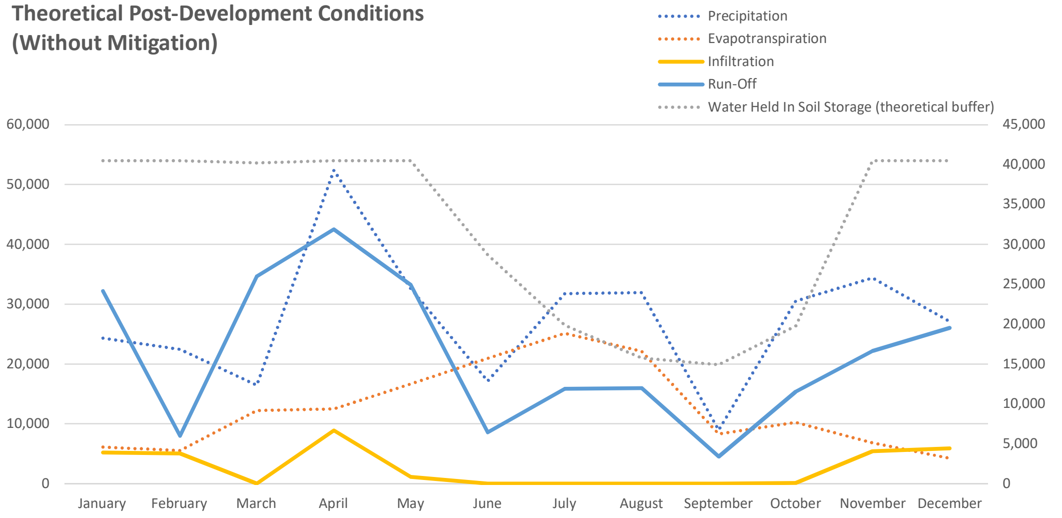
Theoretical Existing Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	24,309	11,842	90,174	10,065	11,233
February	22,451	10,655	90,174	9,705	2,355
March	16,435	23,712	89,828	0	1,955
April	52,373	24,191	90,174	17,183	13,634
May	32,627	32,284	90,174	2,247	4,001
June	17,121	40,618	66,194	0	483
July	31,752	48,732	48,319	0	895
August	31,927	42,976	36,371	0	900
September	8,964	16,105	28,977	0	253
October	30,507	19,811	38,813	0	860
November	34,363	13,165	90,174	10,323	10,876
December	27,075	8,195	90,174	11,360	12,088
	0	0	0	0	0
Minimum (Monthly)	8,964	8,195	28,977	0	253
Maximum (Monthly)	52,373	48,732	90,174	17,183	13,634
Average Monthly	27,492	24,357	70,795	5,074	4,961
Per Annum	329,905	292,285	-	60,883	59,532



Theoretical Post-Development Conditions (Without Mitigation)

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	24,309	6,100	40,484	5,216	32,177
February	22,451	5,489	40,484	5,020	7,994
March	16,435	12,215	40,229	0	34,638
April	52,373	12,462	40,484	8,880	42,520
May	32,627	16,631	40,484	1,140	33,272
June	17,121	20,924	28,663	0	8,550
July	31,752	25,104	19,851	0	15,856
August	31,927	22,138	15,760	0	15,944
September	8,964	8,296	14,917	0	4,477
October	30,507	10,206	19,766	109	15,344
November	34,363	6,782	40,484	5,390	22,192
December	27,075	4,221	40,484	5,914	26,023
Minimum (Monthly)	8,964	4,221	14,917	0	4,477
Maximum (Monthly)	52,373	25,104	40,484	8,880	42,520
Average Monthly	27,492	12,547	31,841	2,639	21,582
Per Annum	329,905	150,568	-	31,668	258,987



TERRAPEX

THEORETICAL SITE WATER BALANCE ASSESSMENT

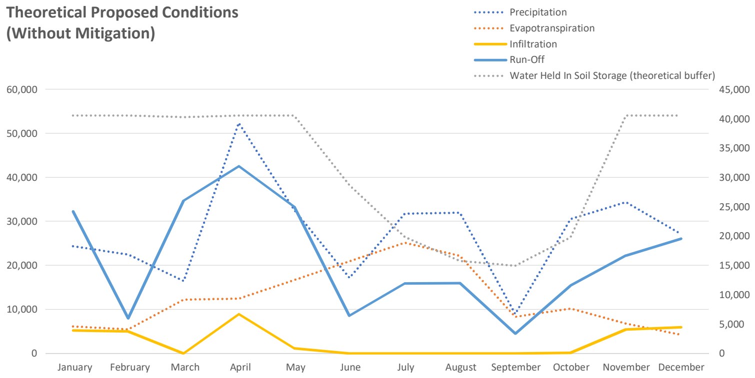
Project: Hydrogeological Investigation and CBWB
7370 Centre Road, Uxbridge, Ontario

Project Number: CT3058 (BE-217431.2)
For: Bridge Brook Corporation

Date: February, 2021
Reviewed By: ZK

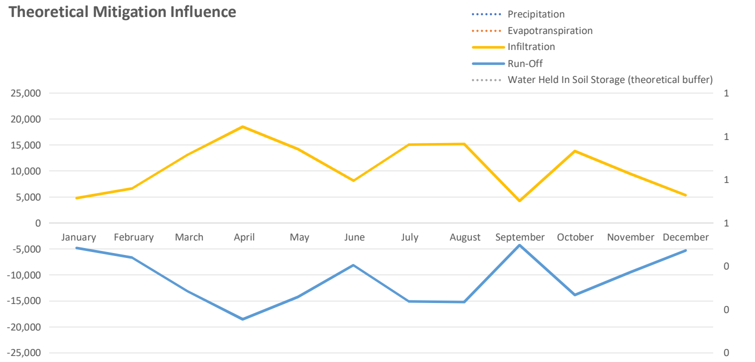
Theoretical Proposed Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	24,309	6,100	40,484	5,216	32,177
February	22,451	5,489	40,484	5,020	7,994
March	16,435	12,215	40,229	0	34,638
April	52,373	12,462	40,484	8,880	42,520
May	32,627	16,631	40,484	1,140	33,272
June	17,121	20,924	28,663	0	8,550
July	31,752	25,104	19,851	0	15,856
August	31,927	22,138	15,760	0	15,944
September	8,964	8,296	14,917	0	4,477
October	30,507	10,206	19,766	109	15,344
November	34,363	6,782	40,484	5,390	22,192
December	27,075	4,221	40,484	5,914	26,023
Minimum (Monthly)	8,964	4,221	14,917	0	4,477
Maximum (Monthly)	52,373	25,104	40,484	8,880	42,520
Average Monthly	27,492	12,547	31,841	2,639	21,582
Per Annum	329,905	150,568 -		31,668	258,987


Theoretical Proposed Conditions (Without Mitigation)

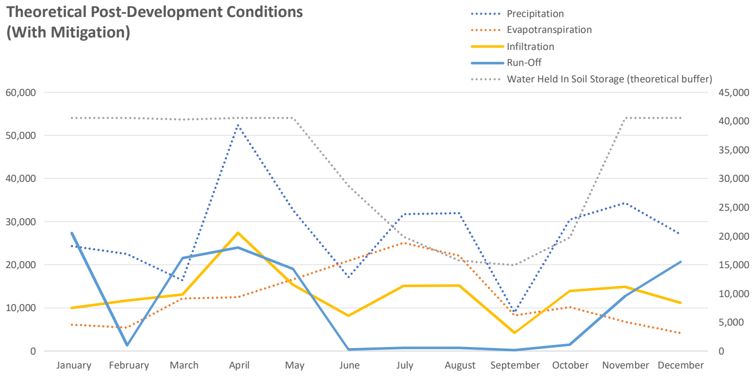
Theoretical Mitigation Influence

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January				4,815	-4,815
February				6,669	-6,669
March				13,098	-13,098
April				18,498	-18,498
May				14,207	-14,207
June				8,139	-8,139
July				15,095	-15,095
August				15,178	-15,178
September				4,262	-4,262
October				13,825	-13,825
November				9,475	-9,475
December				5,317	-5,317
Minimum (Monthly)				4,262	-18,498
Maximum (Monthly)				18,498	-4,262
Average Monthly				10,715	-10,715
Per Annum					


Theoretical Mitigation Influence

Resulting Theoretical Proposed Post-Development Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
Jan	24,309	6,100	40,484	10,030	27,363
Feb	22,451	5,489	40,484	11,690	1,325
Mar	16,435	12,215	40,229	13,098	21,540
Apr	52,373	12,462	40,484	27,377	24,022
May	32,627	16,631	40,484	15,348	19,065
Jun	17,121	20,924	28,663	8,139	411
Jul	31,752	25,104	19,851	15,095	761
Aug	31,927	22,138	15,760	15,178	766
Sep	8,964	8,296	14,917	4,262	215
Oct	30,507	10,206	19,766	13,934	1,519
Nov	34,363	6,782	40,484	14,865	12,717
Dec	27,075	4,221	40,484	11,231	20,706
Minimum (Monthly)	8,964	4,221	14,917	4,262	215
Maximum (Monthly)	52,373	25,104	40,484	27,377	27,363
Average Monthly	27,492	12,547	31,841	13,354	10,867
Per Annum	329,905	150,568	-	160,246	130,409


Theoretical Post-Development Conditions (With Mitigation)

TERRAPEX

THEORETICAL SITE WATER BALANCE ASSESSMENT

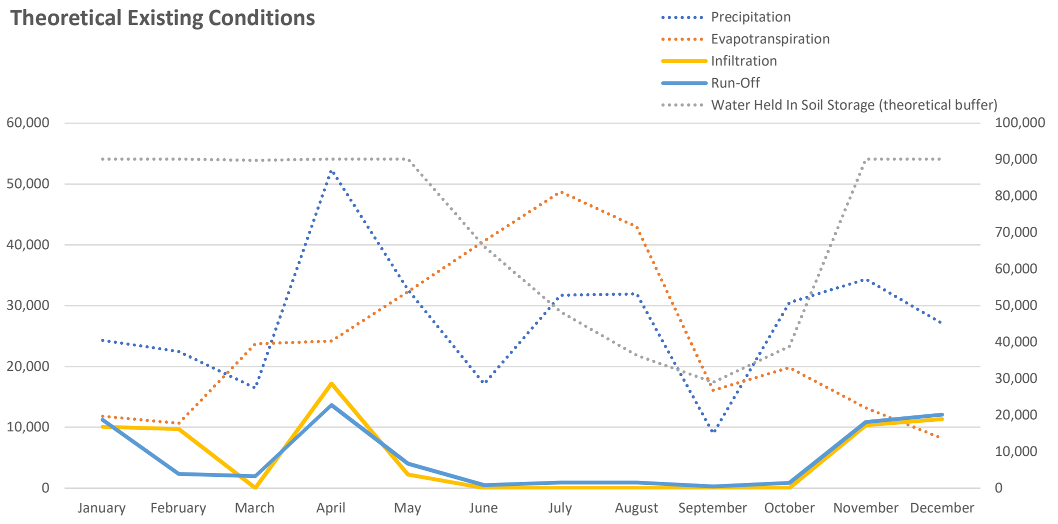
Project: Hydrogeological Investigation and CBWB
7370 Centre Road, Uxbridge, Ontario

Project Number: CT3058 (BE-217431.2)
For: Bridge Brook Corporation

Date: February, 2021
Reviewed By: ZK

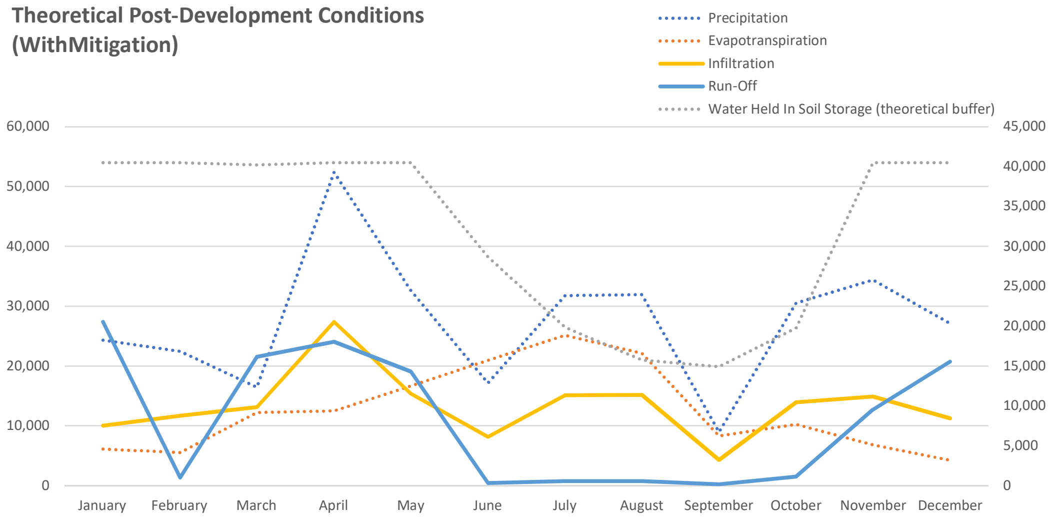
Theoretical Existing Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	24,309	11,842	90,174	10,065	11,233
February	22,451	10,655	90,174	9,705	2,355
March	16,435	23,712	89,828	0	1,955
April	52,373	24,191	90,174	17,183	13,634
May	32,627	32,284	90,174	2,247	4,001
June	17,121	40,618	66,194	0	483
July	31,752	48,732	48,319	0	895
August	31,927	42,976	36,371	0	900
September	8,964	16,105	28,977	0	253
October	30,507	19,811	38,813	0	860
November	34,363	13,165	90,174	10,323	10,876
December	27,075	8,195	90,174	11,360	12,088
	0	0	0	0	0
Minimum (Monthly)	8,964	8,195	28,977	0	253
Maximum (Monthly)	52,373	48,732	90,174	17,183	13,634
Average Monthly	27,492	24,357	70,795	5,074	4,961
Per Annum	329,905	292,285	-	60,883	59,532



Theoretical Post-Development Conditions (With Mitigation)

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	24,309	6,100	40,484	10,030	27,363
February	22,451	5,489	40,484	11,690	1,325
March	16,435	12,215	40,229	13,098	21,540
April	52,373	12,462	40,484	27,377	24,022
May	32,627	16,631	40,484	15,348	19,065
June	17,121	20,924	28,663	8,139	411
July	31,752	25,104	19,851	15,095	761
August	31,927	22,138	15,760	15,178	766
September	8,964	8,296	14,917	4,262	215
October	30,507	10,206	19,766	13,934	1,519
November	34,363	6,782	40,484	14,865	12,717
December	27,075	4,221	40,484	11,231	20,706
Minimum (Monthly)	8,964	4,221	14,917	4,262	215
Maximum (Monthly)	52,373	25,104	40,484	27,377	27,363
Average Monthly	27,492	12,547	31,841	13,354	10,867
Per Annum	329,905	150,568	-	160,246	130,409



Appendix E

Theoretical Catchment-Based Water Balance Analyses

TERRAPEX

THEORETICAL CATCHMENT-BASED WATER BALANCE ASSESSMENT

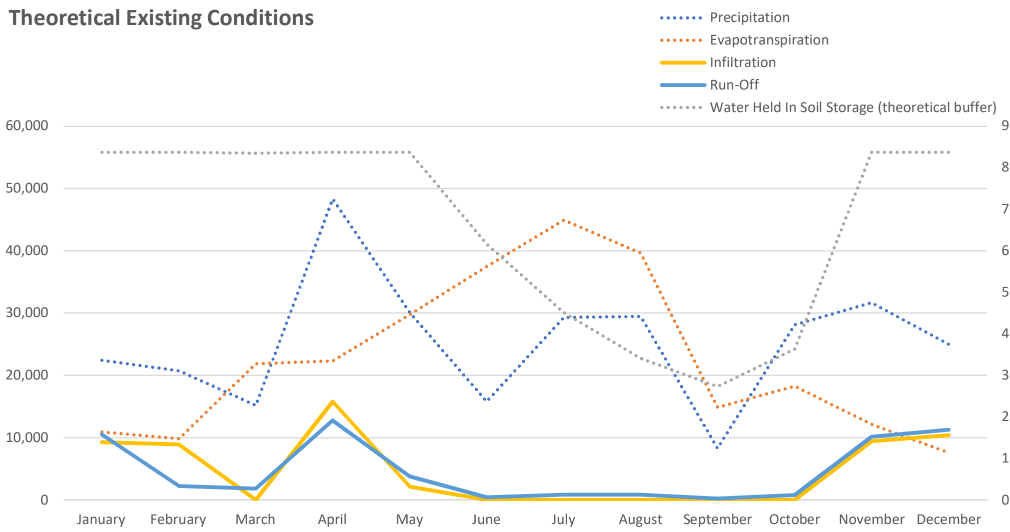
Project: Hydrogeological Investigation and CBWB
7370 Centre Road, Uxbridge, Ontario

Project Number: CT3058 (BE-217431.2)
For: Bridge Brook Corporation

Date: February, 2021
Reviewed By: ZK

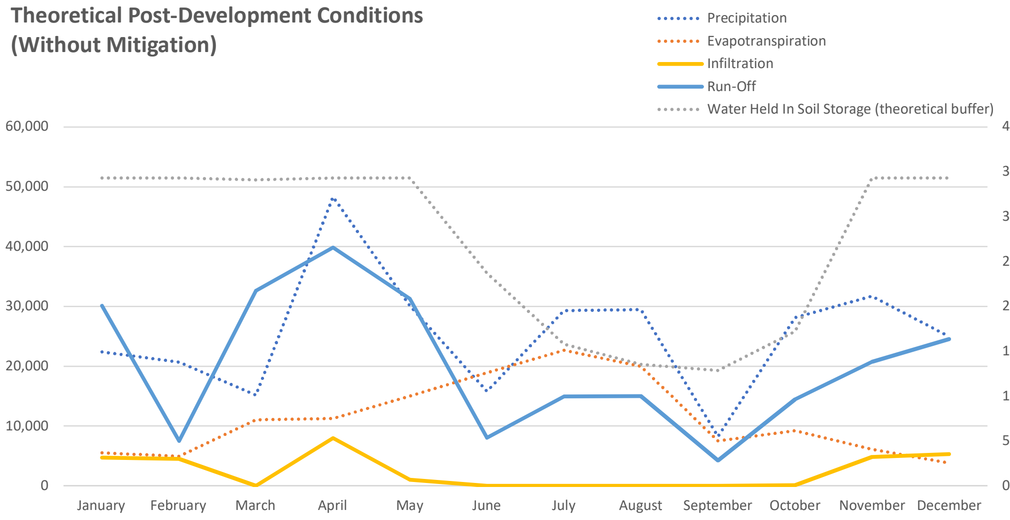
Theoretical Existing Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	22,420	10,921	83,709	9,242	10,489
February	20,707	9,827	83,709	8,924	2,200
March	15,158	21,868	83,493	0	1,806
April	48,304	22,310	83,709	15,813	12,745
May	30,092	29,774	83,709	2,094	3,743
June	15,791	37,460	61,593	0	446
July	29,285	44,944	45,108	0	827
August	29,446	39,634	34,088	0	831
September	8,268	14,853	27,270	0	233
October	28,137	18,271	36,341	0	794
November	31,693	12,141	83,709	9,427	10,125
December	24,971	7,558	83,709	10,397	11,269
Minimum (Monthly)	8,268	7,558	27,270	0	233
Maximum (Monthly)	48,304	44,944	83,709	15,813	12,745
Average Monthly	25,356	22,463	65,845	4,658	4,626
Per Annum	304,271	269,562	-	55,898	55,510



Theoretical Post-Development Conditions (Without Mitigation)

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	22,420	5,509	34,333	4,704	30,129
February	20,707	4,957	34,333	4,530	7,493
March	15,158	11,030	34,118	0	32,616
April	48,304	11,253	34,333	8,013	39,838
May	30,092	15,018	34,333	1,033	31,295
June	15,791	18,895	23,710	0	8,051
July	29,285	22,670	15,791	0	14,931
August	29,446	19,992	13,538	0	15,013
September	8,268	7,492	12,854	0	4,215
October	28,137	9,216	17,211	109	14,454
November	31,693	6,124	34,333	4,853	20,716
December	24,971	3,812	34,333	5,328	24,531
Minimum (Monthly)	8,268	3,812	12,854	0	4,215
Maximum (Monthly)	48,304	22,670	34,333	8,013	39,838
Average Monthly	25,356	11,331	26,935	2,381	20,274
Per Annum	304,271	135,967	-	28,571	243,283



TERRAPEX

THEORETICAL SITE WATER BALANCE ASSESSMENT

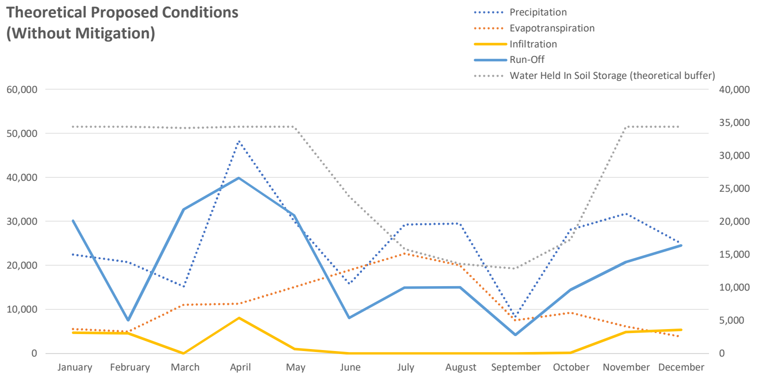
Project: Hydrogeological Investigation and CBWB
7370 Centre Road, Uxbridge, Ontario

Project Number: CT3058 (BE-217431.2)
For: Bridge Brook Corporation

Date: February, 2021
Reviewed By: ZK

Theoretical Proposed Conditions

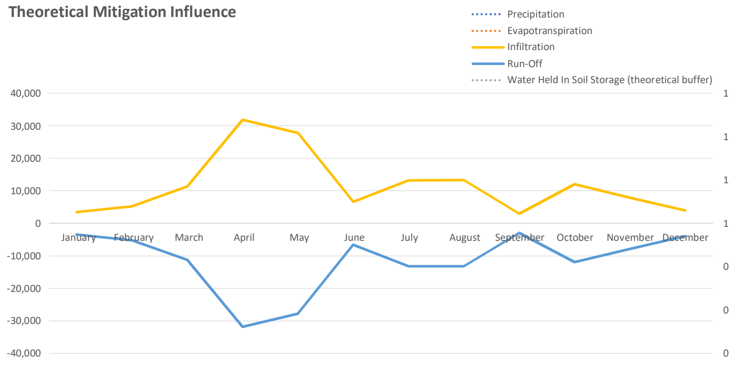
	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	22,420	5,509	34,333	4,704	30,129
February	20,707	4,957	34,333	4,530	7,493
March	15,158	11,030	34,118	0	32,616
April	48,304	11,253	34,333	8,013	39,838
May	30,092	15,018	34,333	1,033	31,295
June	15,791	18,895	23,710	0	8,051
July	29,285	22,670	15,791	0	14,931
August	29,446	19,992	13,538	0	15,013
September	8,268	7,492	12,854	0	4,215
October	28,137	9,216	17,211	109	14,454
November	31,693	6,124	34,333	4,853	20,716
December	24,971	3,812	34,333	5,328	24,531
Minimum (Monthly)	8,268	3,812	12,854	0	4,215
Maximum (Monthly)	48,304	22,670	34,333	8,013	39,838
Average Monthly	25,356	11,331	26,935	2,381	20,274
Per Annum	304,271	135,967	-	28,571	243,283



Theoretical Proposed Conditions (Without Mitigation)

Theoretical Mitigation Influence

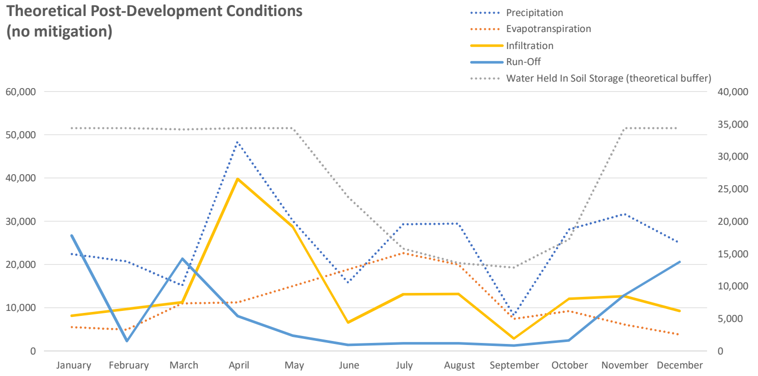
	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January				3,453	-3,453
February				5,203	-5,203
March				11,269	-11,269
April				31,773	-31,773
May				27,725	-27,725
June				6,590	-6,590
July				13,153	-13,153
August				13,232	-13,232
September				2,932	-2,932
October				11,955	-11,955
November				7,851	-7,851
December				3,928	-3,928
Minimum (Monthly)				2,932	-31,773
Maximum (Monthly)				31,773	-2,932
Average Monthly				11,589	-11,589
Per Annum					



Theoretical Mitigation Influence

Resulting Theoretical Proposed Post-Development Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
Jan	22,420	5,509	34,333	8,157	26,675
Feb	20,707	4,957	34,333	9,733	2,290
Mar	15,158	11,030	34,118	11,269	21,347
Apr	48,304	11,253	34,333	39,787	8,065
May	30,092	15,018	34,333	28,758	3,570
Jun	15,791	18,895	23,710	6,590	1,460
Jul	29,285	22,670	15,791	13,153	1,777
Aug	29,446	19,992	13,538	13,232	1,781
Sep	8,268	7,492	12,854	2,932	1,284
Oct	28,137	9,216	17,211	12,064	2,500
Nov	31,693	6,124	34,333	12,704	12,865
Dec	24,971	3,812	34,333	9,256	20,604
Minimum (Monthly)	8,268	3,812	12,854	2,932	1,284
Maximum (Monthly)	48,304	22,670	34,333	39,787	26,675
Average Monthly	25,356	11,331	26,935	13,970	8,685
Per Annum	304,271	135,967	-	167,635	104,219



Theoretical Post-Development Conditions (no mitigation)

TERRAPEX

THEORETICAL CATCHMENT-BASED WATER BALANCE ASSESSMENT

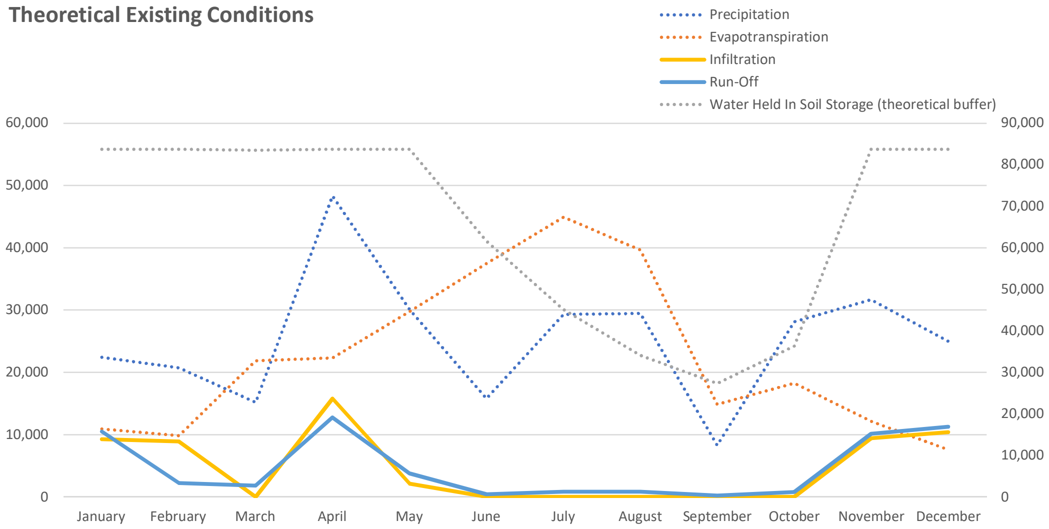
Project: Hydrogeological Investigation and CBWB
7370 Centre Road, Uxbridge, Ontario

Project Number: CT3058 (BE-217431.2)
For: Bridge Brook Corporation

Date: February, 2021
Reviewed By: ZK

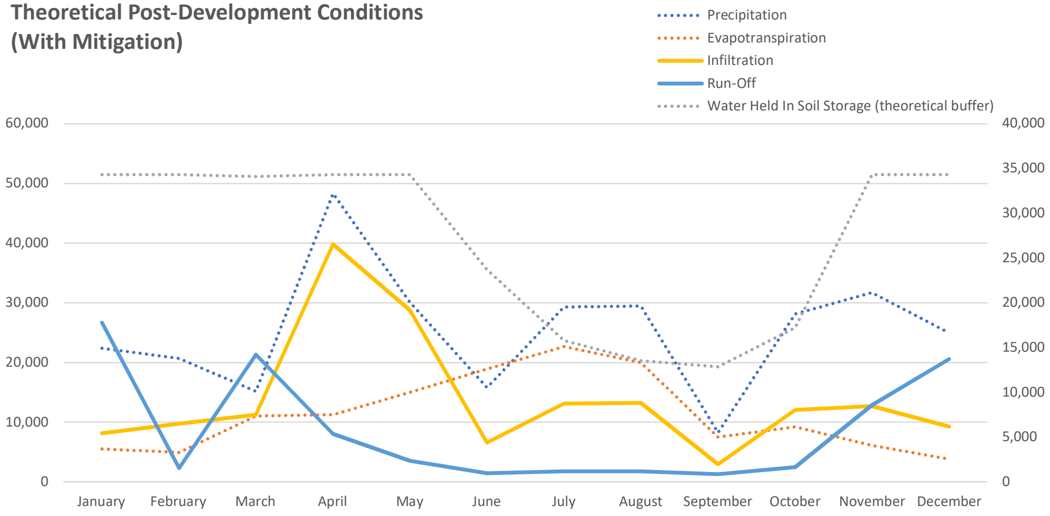
Theoretical Existing Conditions

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	22,420	10,921	83,709	9,242	10,489
February	20,707	9,827	83,709	8,924	2,200
March	15,158	21,868	83,493	0	1,806
April	48,304	22,310	83,709	15,813	12,745
May	30,092	29,774	83,709	2,094	3,743
June	15,791	37,460	61,593	0	446
July	29,285	44,944	45,108	0	827
August	29,446	39,634	34,088	0	831
September	8,268	14,853	27,270	0	233
October	28,137	18,271	36,341	0	794
November	31,693	12,141	83,709	9,427	10,125
December	24,971	7,558	83,709	10,397	11,269
Minimum (Monthly)	8,268	7,558	27,270	0	233
Maximum (Monthly)	48,304	44,944	83,709	15,813	12,745
Average Monthly	25,356	22,463	65,845	4,658	4,626
Per Annum	304,271	269,562	-	55,898	55,510



Theoretical Post-Development Conditions (With Mitigation)

	Precipitation (m^3/month)	Evapotranspiration (m^3/month)	Water Held In Soil Storage (theoretical buffer) (m^3/month)	Infiltration (m^3/month)	Run-Off (m^3/month)
January	22,420	5,509	34,333	8,157	26,676
February	20,707	4,957	34,333	9,733	2,290
March	15,158	11,030	34,118	11,269	21,347
April	48,304	11,253	34,333	39,786	8,065
May	30,092	15,018	34,333	28,758	3,570
June	15,791	18,895	23,710	6,590	1,461
July	29,285	22,670	15,791	13,153	1,778
August	29,446	19,992	13,538	13,232	1,781
September	8,268	7,492	12,854	2,932	1,283
October	28,137	9,216	17,211	12,064	2,499
November	31,693	6,124	34,333	12,704	12,865
December	24,971	3,812	34,333	9,256	20,603
Minimum (Monthly)	8,268	3,812	12,854	2,932	1,283
Maximum (Monthly)	48,304	22,670	34,333	39,786	26,676
Average Monthly	25,356	11,331	26,935	13,970	8,685
Per Annum	304,271	135,967	-	167,635	104,219



Appendix F

Lake Simcoe Region Conservation Authority Comments - Support Document

TERRAPEX

Draft: January 12, 2022
Revised Draft: March 2, 2022
CT3058.00

Bridge Brook Corporation,
7681 Highway 27, Unit #16
Woodbridge, ON L4L 4M5

Attention: John Spina,

Re: Lake Simcoe Region Conservation Authority Comments – Hydrogeological Investigation, Water Balance, and Catchment-Based Water Balance
7370 Centre Road, Uxbridge, Ontario

Dear Mr. Spina:

Terrapex Environmental Ltd. (Terrapex) is pleased to submit this letter summarizing additional information requested by the Lake Simcoe Region Conservation Authority (LSRCA) as part of comments received, dated August 18, 2021. The comments provided to Terrapex were directed toward the report completed by Beacon Environmental Ltd. (*Hydrogeological Investigation, Water Balance, and Catchment-Based Water Balance – 7370 Centre Road, Uxbridge, Ontario* released in February of 2021).

Consultation toward the comments was carried out as a conference call with LSRCA, and Shelly Cuddy in attendance on August 31, 2021. As indicated in the appended matrix responses (as amended, originally released September 13, 2021), the LSRCA deferred several comments that rely upon the release of detailed design plans, including: H1, H4, H5, H6, H9, H12, H13, and NH4, below.

The following addresses additional information requested as part of Comments H2, H7, H8, H10, and H11. Additional hydrogeological comment are provided upon request for Comments NH1, NH3, and NH4.

H2

Please provide geological cross section(s), including elevations of grades and groundwater levels across the site.

Response:

Please find the appended cross sections.

H7

a) The source and period of record of the climate data used and why it varies from the annual average for the subwatershed;

The report (Beacon, 2021) sources historical Environment Canada data available for Uxbridge West weather station located approximately 5 km northeast of the subject property, using an average of three years (2018 through 2020) for the estimates. Precipitation volumes were used from 2015, 2016, 2017, 2018, 2019, and 2020 to compensate for incomplete datasets from the weather station.

b) Source of ET or how it was calculated/determined;

The report calculates the evapotranspiration using the Penman-Monteith Evapotranspiration (FAO-56 Method). Local solar radiation, incoming solar radiation, sunset hour angles, and solar declination conditions were sourced from the National Aeronautical and Space Administration Langley Research Center (NASA 2018) to estimate the monthly site-specific evapotranspiration rate.

c) Rate of precipitation (i.e. mm/yr.);

Based on the information sources above, the rates of precipitation (mm/month/m2 and mm/year/m2) are as follows:

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec	YEAR
60.2	55.6	40.7	129.7	80.8	42.4	78.6	79.1	22.2	75.6	85.1	67.1	597.2

d) Rate of ET (mm/yr.) based on each land use type (e.g. SWM pond, forest, grass, impervious areas);

Evapotranspiration is calculated by the footprint and global position of the area, and is not based on land use (except perhaps albedo), in accordance with the Penman-Monteith Evapotranspiration (FAO-56 Method). The sources above provided the following variables to determine the ET/m2:

Mean Daily Temperature
Incoming Solar Radiation
Local Albedo (includes variation for snow months)
Wind Speed
Atmospheric Pressure
Actual Vapour Pressure
Solar declination
Sunset hour angle
Extraterrestrial Radiation

Clear Sky Solar Radiation
Net shortwave solar radiation
Net outgoing long-wave radiation

The estimated rate of evapotranspiration (mm/month/m^2) for each month as follows:

Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sept**	**Oct**	**Nov**	**Dec**	**YEAR**
29.2	29.1	58.5	61.6	79.6	103.5	120.2	106.0	41.0	48.9	33.5	20.2	731.3

e) Annual surplus (mm/yr.) based on each land use type

There are actually three answers for this question, because of the way it is calculated. The following are included below, for completeness:

a) *Total run-off, including snowmelt surplus from the previous month*
b) *Total run-off, including snowmelt surplus from the previous month, and with frozen snow held until the next month*
c) *Total run-off, with no consideration for stored surplus*

For the purposes of the water balance estimates, the three estimate parameters provide a range where: a) is most conservative, b) is most 'realistic', and c) is most simplistic.

a) Total run-off, including snowmelt surplus from the previous month:

	Jan m^3/mo	Feb m^3/mo	Mar m^3/mo	Apr m^3/mo	May m^3/mo	Jun m^3/mo	Jul m^3/mo	Aug m^3/mo	Sep m^3/mo	Oct m^3/mo	Nov m^3/mo	Dec m^3/mo
Catchment 201	22,915	27,426	25,863	43,626	24,618	6,384	11,840	11,905	3,343	11,375	15,393	18,329
FOD4-A	40	38	0	66	7	0	0	0	0	0	45	47
MAS2-1 and SWT-2	44	42	0	73	7	0	0	0	0	0	49	53
Catchment 202	583	629	323	1,053	376	80	148	149	42	142	493	561
FODs	140	135	0	240	32	0	0	0	0	0	142	157
Catchment 203 (Wet SMP)	1,398	1,656	1,494	2,649	1,440	369	684	688	193	766	965	1,142
Catchment 204	3,849	4,615	4,382	7,334	4,164	1,082	2,006	2,017	566	1,927	2,574	3,068
Catchment 205 (Dry SMP)	376	445	399	712	385	99	183	184	52	176	260	308
Catchment 208	146	173	153	277	148	38	70	71	20	67	102	120
NHS (marsh and swamp)	193	186	0	331	44	0	0	0	0	0	196	216
NHS (FODs)	445	420	0	733	74	0	0	0	0	0	498	530
Total	**30,129**	**35,764**	**32,616**	**57,093**	**31,295**	**8,051**	**14,931**	**15,013**	**4,215**	**14,454**	**20,716**	**24,531**

b) Total run-off, including snowmelt surplus from the previous month, and with frozen snow held until the next month:

	Jan m^3/mo	**Feb** m^3/mo	**Mar** m^3/mo	**Apr** m^3/mo	**May** m^3/mo	**Jun** m^3/mo	**Jul** m^3/mo	**Aug** m^3/mo	**Sep** m^3/mo	**Oct** m^3/mo	**Nov** m^3/mo	**Dec** m^3/mo
Catchment 201	4,248	5,746	10,273	30,442	24,618	6,384	11,840	11,905	3,343	10,843	8,928	4,939
FOD4-A	7	8	0	46	7	0	0	0	0	0	26	13
MAS2-1 and SWT-2	8	9	0	51	7	0	0	0	0	0	29	14
Catchment 202	108	132	128	735	376	80	148	149	42	135	286	151
FODs	26	28	0	167	32	0	0	0	0	0	82	42
Catchment 203 (Wet SMP)	259	347	594	1,849	1,440	369	684	688	193	730	559	308
Catchment 204	714	967	1,741	5,118	4,164	1,082	2,006	2,017	566	1,837	1,493	827
Catchment 205 (Dry SMP)	70	93	159	497	385	99	183	184	52	167	151	83
Catchment 208	27	36	61	193	148	38	70	71	20	64	59	32
NHS (marsh and swamp)	36	39	0	231	44	0	0	0	0	0	113	58
NHS (FODs)	82	88	0	511	74	0	0	0	0	0	289	143
Total	**5,585**	**7,493**	**12,955**	**39,838**	**31,295**	**8,051**	**14,931**	**15,013**	**4,215**	**13,778**	**12,015**	**6,610**

c) Total run-off, with no consideration for stored surplus:

	Jan m^3/mo	Feb m^3/mo	Mar m^3/mo	Apr m^3/mo	May m^3/mo	Jun m^3/mo	Jul m^3/mo	Aug m^3/mo	Sep m^3/mo	Oct m^3/mo	Nov m^3/mo	Dec m^3/mo
Catchment 201	1,959	2,052	2,434	15,314	12,166	6,384	11,840	11,905	3,343	10,843	8,928	3,343
FOD4-A	5	5	0	29	0	0	0	0	0	0	26	11
MAS2-1 and SWT-2	5	6	0	32	0	0	0	0	0	0	29	12
Catchment 202	57	60	30	388	152	80	148	149	42	135	286	114
FODs	15	16	0	93	0	0	0	0	0	0	82	34
Catchment 203 (Wet SMP)	121	127	141	994	703	369	684	688	193	730	559	211
Catchment 204	328	344	412	2,573	2,061	1,082	2,006	2,017	566	1,837	1,493	558
Catchment 205 (Dry SMP)	33	34	38	251	188	99	183	184	52	167	151	57
Catchment 208	13	13	14	98	72	38	70	71	20	64	59	22
NHS (marsh and swamp)	21	23	0	128	0	0	0	0	0	0	113	47
NHS (FODs)	54	58	0	326	0	0	0	0	0	0	289	120
Total	**2,611**	**2,739**	**3,070**	**20,225**	**15,342**	**8,051**	**14,931**	**15,013**	**4,215**	**13,778**	**12,015**	**4,530**

H8

It appears these areas maybe based on a figure in another report (Beacon, 2020) which is not include here, therefore it is unclear how each land use type corresponds to the subject site.

Please provide a pre- development figure clearly indicating all land use types used within the water balance assessments.

Response:
Please find the appended figure from Beacon, 2020.

H10

It was noted that infiltration factors of 0.5 and 0.6 were used within the assessment however it is unclear which areas they correspond to and if the same factors were applied to both pre- and post-development conditions. Please provide a breakdown of pre- and post-development areas in which the infiltration factors correspond to.

The infiltration factors used in the pre- development conditions are indicated in the following table:

Pre-Development Catchment Land Use	**General Topography** (A)	**Soil Classification** (B)	**Cover Factor** (C)	**Infiltration Factor** (A+B+C)
Principle Area – (corn fields)	0.2	0.2	0.1	0.5
Mature Forest Areas (areas defined as FOD 1)	0.2	0.2	0.2	0.6
Marshes and Swamp Areas (areas defined as MAS2-1 1 and SWT-2 1)	0.2	0.2	0.1	0.5
Driveway (4 metres wide by 732 metres long)	-	-	-	-

The infiltration factors used in the post- development conditions are indicated in the following table:

Proposed Land Uses $^{1, 2}$	**General Topography** (A)	**Soil Classification** (B)	**Cover Factor** (C)	**Infiltration Factor** (A+B+C)
Catchment 201	0.2	0.2	0.1	0.5
FOD4-A	0.2	0.2	0.2	0.6
MAS2-1 and SWT-2	0.2	0.2	0.1	0.5
Catchment 202	0.2	0.2	0.1	0.5
FODs	0.2	0.2	0.2	0.6
Catchment 203 (Wet SMP)	0.2	0.2	0.1	0.5
Catchment 204	0.2	0.2	0.1	0.5
Catchment 205 (Dry SMP)	0.2	0.2	0.1	0.5
Catchment 208	0.2	0.2	0.1	0.5
NHS (marsh and swamp)	0.2	0.2	0.1	0.5
NHS (FODs)	0.2	0.2	0.2	0.6

H11

The post-development water balance results reported in Table 8 do not match the table within the appendix. Please amend as appropriate.

Table 8 (Beacon, 2021), referring to the Global Site-Specific Water Balance should read as follows, as indicated in **Appendix D** of the same report.

Component	**Pre-Development Conditions**	**Post-Development Conditions**	
	(m^3 per annum)	(m^3 per annum)	**Relative Difference from Pre-Development** (m^3 per annum)
(P) Precipitation	329,905	329,905	no change
(ET) Evapotranspiration	292,285	150,568	-141,717
(Q_G) Infiltration	60,883	31,668	-29,215
(Q_S) Run-off	59,532	258,987	+199,455

Additional comments:

Comment on the following additional items was requested, and are limited to a hydrogeological point of view.

NH1

Section 8.5
As per Policy 2.3.15 in the Durham Regional Official Plan (Durham OP), development and site alteration are not permitted in key natural heritage and/or hydrologic features and their associated vegetation protection zones except for the listed exceptions.

Similarly, Policy 2.3.3.3.iii.a) in the Township of Uxbridge Official Plan (Uxbridge OP), does not permit development in key natural heritage and/or hydrologic features.

As per the Durham OP and Uxbridge OP, key natural heritage features include significant habitat of endangered species, fish habitat, wetlands, significant woodlands and significant wildlife habitat, and key hydrologic features include permanent and intermittent streams, wetlands, seepage areas and springs.

Please revise the site plan to ensure all development and site alteration (including grading) is located outside the key natural heritage features, key hydrologic features, and their associated buffers on the subject property, such as the on-site wetland communities (MAM2-10, SWT2-5, MAS2-1, SWT2-2), intermittent streams (headwater drainage feature (HDF) 1, 2 and 4), and the buffers to the significant woodland, wetlands, and watercourses.

Headwater drainage features are generally defined as “non-permanently flowing drainage features that may not have defined bed or banks; they are first-order and zero-order intermittent and ephemeral channels, swales and connected headwater wetlands, but do not include rills or furrows.” (TRCA,2014)

It is provided in the Wetland Function Assessment (WFA) carried out by Terrapex (2020), that features HDF2 through HDF4 are interpreted to not be influenced by groundwater, and as such, any water found in these features would be required to come from surface water sources. In contrast, HDF1 is understood to have groundwater influence, which may be permanent, and not ephemeral or intermittent. It is posited that this may remove this feature from the definition of an HDF, as provided above.

NH3

Section 6, Table 5
Please confirm whether a seep feature is present in the southwestern portion of the subject property, north of the houses on Galloway Cres. Photos of this area need to be submitted to the LSRCA or a site visit with the LSRCA should be scheduled to confirm the presence/absence of this key hydrologic feature.

The location indicated in the question is relatively proximal to the feature designated HDF1. It is provided in the Wetland Function Assessment (WFA) carried out by Terrapex (2020), that no groundwater seepage was observed on the subject property during site visits. As indicated in that report, groundwater in that area has an upward vertical gradient.

NH4

Section 7.4
As per Comment #NH1 above, wetlands, intermittent streams and seeps are considered key hydrologic features under the Durham OP and Uxbridge OP.

Please update the site plan and associated catchment-based water balance to ensure the existing hydrologic inputs supporting these sensitive hydrologic features are maintained post-development.

As discussed in the conference call with the LSRCA (August 31, 2021), further updates to the catchment-based water balance will be provided with the forthcoming detailed designs. As indicated in the above comment, a catchment-based water balance will be provided for HDF1 through HDF4.

Sincerely,

Terrapex Environmental Ltd.

DRAFT

Zen Keizars, P.Geo., FGC
Senior Hydrogeologist

Appended:

H2 - Cross-sections
H8 - Matrix Response
Matrix Response Document

Site Location

Figure 1

7370 Centre Road Uxbridge

BEACON ENVIRONMENTAL

Project: 217431
Last Revised: September, 2020

Client: Mediterra Corp.

Prepared by: BD
Checked by: JM

N

1:8,100

Inset Map:1:50,000

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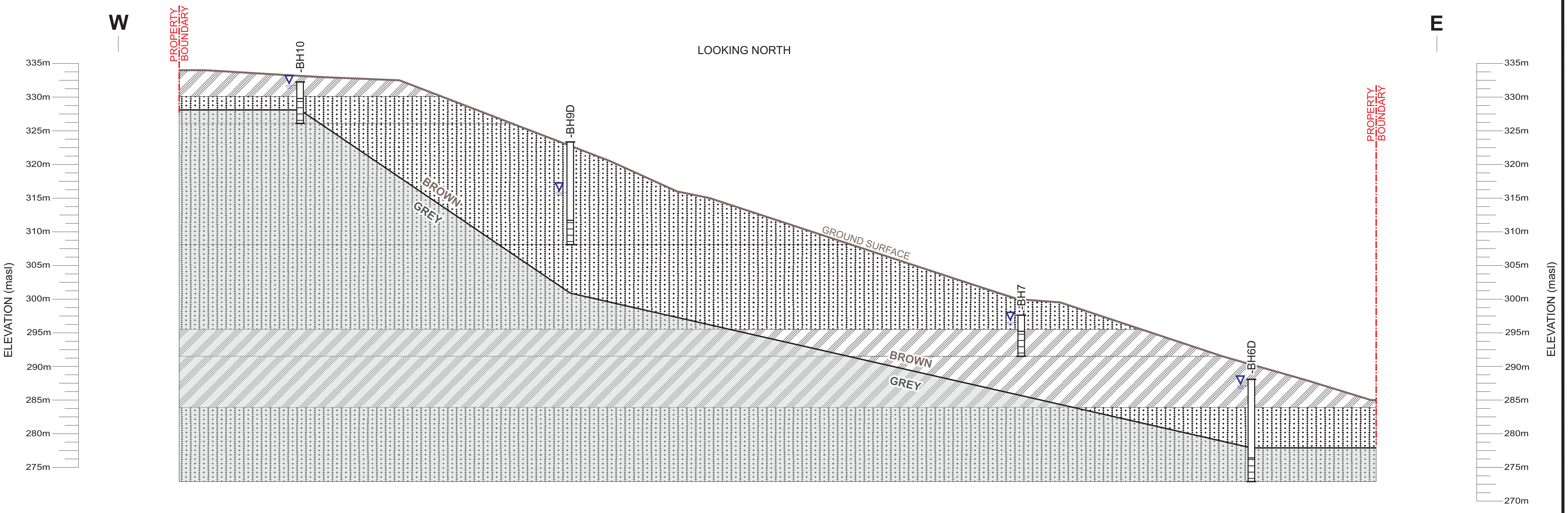
TERRAPEX

CROSS SECTION A-A’ (WEST TO EAST)

7370 CENTRE ROAD
UXBRIDGE, ONTARIO

CLIENT

BRIDGE BROOK CORPORATION



LEGEND

▦ SILTY CLAY

▨ SILTY SAND

-MW104 - MONITORING WELL DESIGNATION

STATIC WATER LEVEL- ▽
(March 16, 2020)

- SCREENED ZONE

- BOREHOLE

HORIZONTAL SCALE:

0 50m 100m
(APPROXIMATE)

PROJECT #	CT3058.00
SCALE	AS SHOWN
DATE	AUGUST 2021
DRAWN	SW
CHECKED	
DRAWING #	FIGURE 5

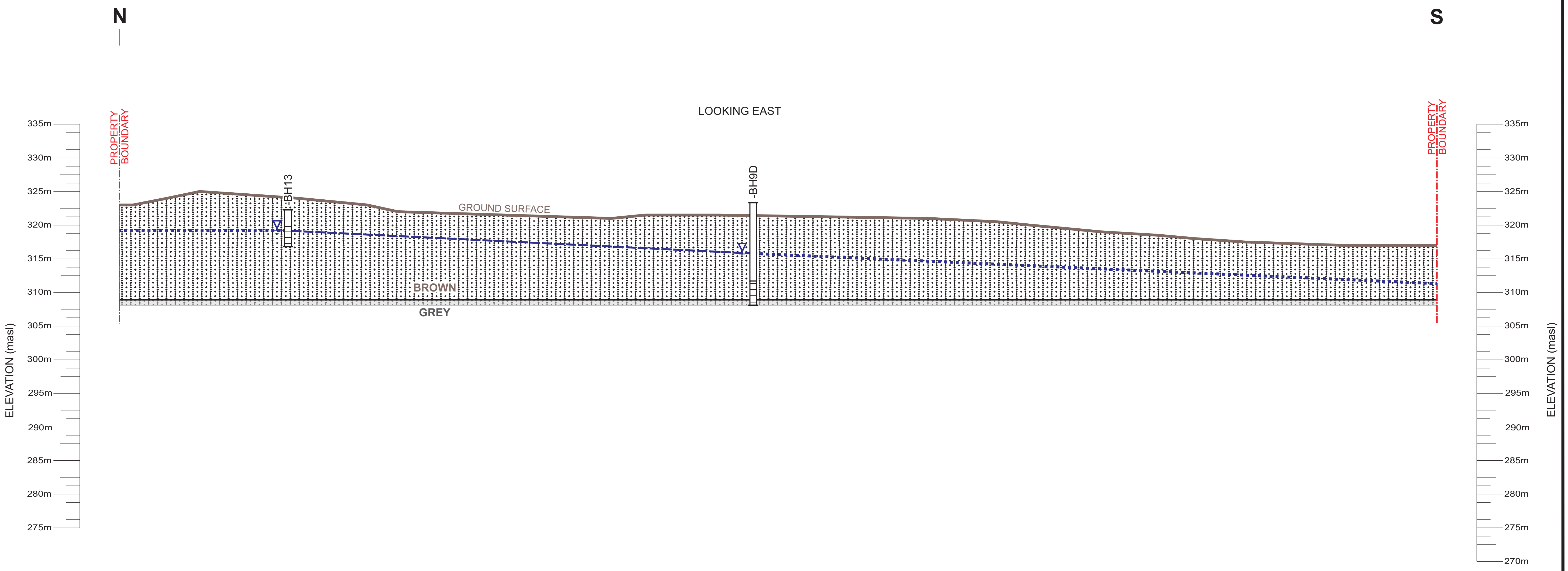
TERRAPEX

CROSS SECTION B1-B1' (NORTH TO SOUTH)

7370 CENTRE ROAD
UXBRIDGE, ONTARIO

CLIENT

BRIDGE BROOK CORPORATION



LEGEND

- ▨ SILTY CLAY
- ⋯ EXTRAPOLATED GROUNDWATER LEVEL
- ╌ INTERPOLATED GROUNDWATER LEVEL

STATIC WATER LEVEL- ▽
(March 16, 2020)

- MW104 - MONITORING WELL DESIGNATION
- SCREENED ZONE
- BOREHOLE

HORIZONTAL SCALE:
0 25m 50m
(APPROXIMATE)

PROJECT # CT3058.00
SCALE AS SHOWN
DATE OCTOBER 2021
DRAWN SW
CHECKED
DRAWING #
FIGURE 6

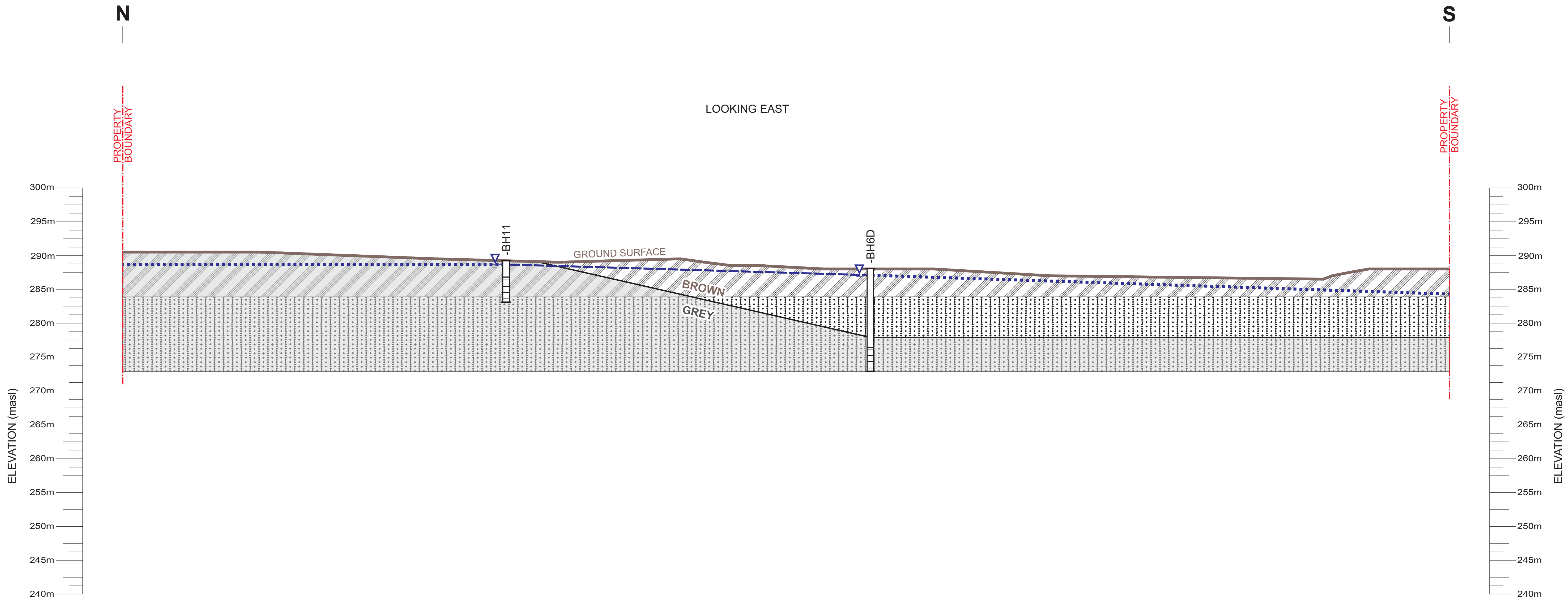
TERRAPEX

CROSS SECTION B2-B2' (NORTH TO SOUTH)

7370 CENTRE ROAD
UXBRIDGE, ONTARIO

CLIENT

BRIDGE BROOK CORPORATION



LEGEND

▦ SILTY CLAY
▨ SILTY SAND
┈ EXTRAPOLATED GROUNDWATER LEVEL
— — INTERPOLATED GROUNDWATER LEVEL
STATIC WATER LEVEL- ▽ (March 16, 2020)
-MW104 - MONITORING WELL DESIGNATION
- SCREENED ZONE
- BOREHOLE

HORIZONTAL SCALE:
0 25m 50m
(APPROXIMATE)

PROJECT # *CT3058.00*
SCALE *AS SHOWN*
DATE *OCTOBER 2021*
DRAWN *SW*
CHECKED
DRAWING # *FIGURE 7*

C:\Dropbox\Dropbox (Beacon)\All GIS Projects\2017\217431 7370 Centre Road Uxbridge EIS\MXD\2020-08-12_Figure02_ExistingConditions_217431.mxd

Existing Conditions

Figure 2

7370 Centre Road Uxbridge

Legend

Subject Property

ELC Communities

Staked Dripline (LSRCA July 24, 2020)

Staked Wetland (LSRCA July 24, 2020)

Staked Top of Bank (LSRCA July 24, 2020)

Section Divide

Wetlands (Beacon 2020)

Watercourse (Beacon 2020)

Headwater Drainage Feature

Intermittent

Ephemeral

Code	Community Description
	Wetland Communities
SWD3-4	Manitoba Maple Mineral Deciduous Swamp
SWD4-3	White Birch - Poplar Mineral Deciduous Swamp
MAS2-1	Cattail Mineral Shallow Marsh
SWT2-2	Willow Mineral Thicket Swamp
	Forest Communities
CUW1	Mineral Cultural Woodland
FOD3-1	Dry - Fresh Aspen Deciduous Forest
FOD4-2	Dry - Fresh White Ash Deciduous Forest
FOD7	Fresh - Moist Lowland Deciduous Forest
FOD7-2	Fresh - Moist Ash Lowland Deciduous Forest
FOD7-4	Fresh - Moist Black Walnut Lowland Deciduous Forest
	Cultural Communities
CUM1	Mineral Cultural Meadow
CUM1-1	Dry - Moist Old Field Meadow
CUP3-3	Scotch Pine Coniferous Plantation
CUT1	Mineral Cultural Thicket
	Other Communities
AG	Agricultural
ANT	Anthropogenic

BEACON
ENVIRONMENTAL

Project: 217431
Last Revised: August 2020

Client: Mediterra Corp.

Prepared by: BD
Checked by: TDH

DRAFT

N

1:4,100

0 80 160 m

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1	**H1** The FSSR indicates the site area is 39.9 ha whereas the Hydrogeological Investigation indicates 40.3 ha. Please ensure site areas are consistent within all the reports.	Terrapex	Have confirmed this area with team, and forthcoming reports with detailed design will be updated with the 39.9 ha value.

2	**H2** Please provide geological cross section(s), including elevations of grades and groundwater levels across the site.	Terrapex	Cross-sections will be included in subsequent reports. A Letter has been completed by Terrapex (2022) which includes this information.

3	**H3** The report notes that as a result of a site visit on August 22, 2019 no obvious groundwater-dependent features or seepage areas were observed on the site. an impact assessment on both the north-central and southeast features have not been included within the report. However, there is reference made regarding the assessment of wetland functions in a report by Terrapex (2020). This report was not provided with the 1st submission and therefore it's unclear if it adequately addresses the potential impact to both these features in post-development conditions. Please provide a groundwater assessment for all natural features on the site.	Terrapex	It is understood that the Wetland Function Assessment (Terrapex, 2020) will be included in subsequent submissions. The Terrapex report provides a groundwater assessment of the following four features, to determine if features are functioning as groundwater headwaters or as surfacewater collection areas: (1) HDF1 (2) HDF2 (3) HDF3 (4) HDF4 As indicated in the Terrapex report, only HDF1 (south-central property line) was found to have an upward vertical gradient from groundwater.

4	**H4** A water balance was completed for the entire site, however the FSSR indicates that the development will consist of 2 phases. As such, the water balance for each phase will need to be completed and addressed through each application separately.	Terrapex	To be addressed at detailed design, per call with LSRCA (31Aug2021)

5	**H5** A catchment-based water balance was provided for the watercourse at the SE corner of the site. The catchment used in the assessment appears to coincide with drainage catchment 101 from the FSSR and the general groundwater flow direction across the site. From the information provided it is unclear which drainage catchment supports the wetland at the north end of the site. A pre- and post-development catchment-based (a.k.a. feature-based) water balance is required for all features that will remain on the site and should include an impact assessment of changes to those features. Please clearly identify the drainage catchments for all natural features on the site and quantify the amount of groundwater/surface water which supports them.	Terrapex	Additional FBWBs to be addressed, if required, at detailed design, per call with LSRCA (31Aug2021)

6	**H6** The majority of both groundwater and surface flows are shown to be directed to the wetland and water course at the southeast corner of site. There is no assessment on how the proposed infrastructure (e.g. large impervious stormwater management pond) may change local groundwater flow patterns or impact discharge (baseflow) or overland flow to these features. Please provide more information on how the flow to the features will be maintained post-development without having an impact on the current function.	Terrapex	To be addressed, at detailed design, per call with LSRCA (31Aug2021)

7	**H7** Section 4.1 It appears some information regarding the climate data source has been omitted or accidently clipped from the report. The annual average precipitation for Uxbridge Brook subwatershed is 892 mm/yr. which appears to vary from the rate used within the assessment. Please provide more information on the source climate data used in the water balance assessment, including: a) The source and period of record of the climate data used and why it varies from the annual average for the subwatershed; b) Source of ET or how it was calculated/determined; c) Rate of precipitation (i.e. mm/yr.); d) Rate of ET (mm/yr.) based on each land use type (e.g. SWM pond, forest, grass, impervious areas); and e) Annual surplus (mm/yr.) based on each land use type	Terrapex	As requested, datasources will be outlined in greater detail in the next release. A Letter has been completed by Terrapex (2022) which includes this information.

8	**H8** Table 6 Table 6 provides a breakdown of land use types used within the pre-development water balance assessment. It appears these areas maybe based on a figure in another report (Beacon, 2020) which is not include here, therefore it is unclear how each land use type corresponds to the subject site. Please provide a pre-development figure clearly indicating all land use types used within the water balance assessments.	Terrapex	As requested, a figure indicating the landuse types will be outlined in greater detail in the next release. A Letter has been completed by Terrapex (2022) which includes this information.

9	**H9** Table 7 Table 7 provide a breakdown of impervious/pervious areas as sourced from the FSSR (SCS, 2020). Please provide an additional preliminary breakdown (to be further refined at detailed design) of the types of land uses (e.g. roads, driveways, roofs, parks, lawns, NHS, stormwater ponds, etc.) along with a post-development figure clearly indicating all land use types.	Terrapex	To be addressed, at detailed design, per call with LSRCA (31Aug2021)

10	**H10** It was noted that infiltration factors of 0.5 and 0.6 were used within the assessment however it is unclear which areas they correspond to and if the same factors were applied to both pre- and post-development conditions. Please provide a breakdown of pre- and post-development areas in which the infiltration factors correspond to.	Terrapex	As requested, this will be outlined in greater detail in the next release. A Letter has been completed by Terrapex (2022) which includes this information.

11	**H11** Table 8 The post-development water balance results reported in Table 8 do not match the table within the appendix. Please amend as appropriate.	Terrapex	As requested, this will be addressed in the next release. A Letter has been completed by Terrapex (2022) which includes this information.

12	**H12** Both the FSSR and balance assessment indicate the stormwater management blocks (203 and 205) are 50% pervious. However, the elevations shown on FSSR Figures 2.4 and 2.5 indicate both ponds are several metres lower than the groundwater levels (obtained from the closest monitoring wells BH7 & BH11). Ponds intercepting the water table should have an impermeable liner which would make them 100% impervious within the water balance assessment. Please clearly show pervious/impervious areas on a water balance figure as noted above and adjust the water balance calculations as necessary.	Terrapex	This will require input from the FSSR team, and will be addressed in detailed design releases.

13	**H13** Table 9 Table 9 notes that infiltration-based LIDs will increase infiltration by 99,363 m3/yr. There is no information on how this volume was determined. Preliminary calculations on BMP sizing within the FSSR shows that approximately 1/3 of the infiltration deficit can be mitigated through the various infiltration trenches proposed for the site. Please provide more information including calculations demonstrating how much infiltration is achieved by each LID.	Terrapex	This will require input from the FSSR team, and will be addressed in detailed design releases.

14	**H14** It was indicated that downspout disconnection will be utilized to offset some of the infiltration in post-development conditions. LID guidelines (CVC, 2012) indicate that for C & D type soils, up to 25% of runoff from roof areas can be considered as additional infiltration if specific LID parameters are met. Please identify: a) the area(s) of where downspout disconnect is being applied in the water balance assessment; b) the quantity of mitigation achieved; and c) how these LID criteria will be met	Terrapex	This will require input from the FSSR team, and will be addressed in detailed design release

15	**H15** Three infiltration tests were completed at Bh6, Bh7 and BH11 indicating rates of 42 to 49 mm/hr. Once the site plan has been confirmed further testing will need to be conducted at the location(s) and bottom elevation(s) of all proposed infiltration -based facilities.	Terrapex	To be addressed, at detailed design, per call with LSRCA (31Aug2021)

16	**H16** Example cross sections have been provided for infiltration LID (i.e. Rear yard infiltration trenches), however it is unclear how these relate to the soils and the seasonally high groundwater levels across the site. Please provide cross sections of all proposed infiltration LIDs including proposed ground elevations, highest groundwater elevations, dimensions and materials.	Terrapex	This will require input from the FSSR team, and will be addressed with detailed design release

Environmental Impact Study		
Section 8.5 As per Policy 2.3.15 in the Durham Regional Official Plan (Durham OP), development and site alteration are not permitted in key natural heritage and/or hydrologic features and their associated vegetation protection zones except for the listed exceptions. Similarly, Policy 2.3.3.3.iii.a) in the Township of Uxbridge Official Plan (Uxbridge OP), does not permit development in key natural heritage and/or hydrologic features. As per the Durham OP and Uxbridge OP, key natural heritage features include significant habitat of endangered species, fish habitat, wetlands, significant woodlands and significant wildlife habitat, and key hydrologic features include permanent and intermittent streams, wetlands, seepage areas and springs. Please revise the site plan to ensure all development and site alteration (including grading) is located outside the key natural heritage features, key hydrologic features, and their associated buffers on the subject property, such as the on-site wetland communities (MAM2-10, SWT2-5, MAS2-1, SWT2-2), intermittent streams (headwater drainage feature (HDF) 1, 2 and 4), and the buffers to the significant woodland, wetlands, and watercourses.		In keeping with the general definition of HDFs as “non-permanently flowing drainage features that may not have defined bed or banks; they are first-order and zero-order intermittent and ephemeral channels, swales and connected headwater wetlands, but do not include rills or furrows.” (TRCA,2014) It is provided in the Wetland Function Assessment (WFA) carried out by Terrapex (2020), that features HDF2 through HDF4 are interpreted to not be influenced by groundwater, and as such, any first-order or zero-order water found in these features would be required to come from surface water sources. It is provided in the Wetland Function Assessment (WFA) carried out by Terrapex (2020), that features HDF2 through HDF4 are interpreted to not be influenced by groundwater, and as such, any water found in these features would be required to come from surface water sources. In contrast, HDF1 is understood to have groundwater influence, which may be permanent, and not ephemeral or intermittent. It is posited that this may remove HDF1 from the definition of an HDF, as provided above.

3	Section 6, Table 5 Please confirm whether a seep feature is present in the southwestern portion of the subject property, north of the houses on Galloway Cres. Photos of this area need to be submitted to the LSRCA or a site visit with the LSRCA should be scheduled to confirm the presence/absence of this key hydrologic feature.		It is understood that the location indicated in the question is relatively proximal or to the west of the feature designated HDF1. It is provided in the Wetland Function Assessment (WFA) carried out by Terrapex (2020), that no groundwater seepage was observed on the subject property during site visits. As indicated in that report, groundwater in that area has an upward vertical gradient.

4	Section 7.4 As per Comment #NH1 above, wetlands, intermittent streams and seeps are considered key hydrologic features under the Durham OP and Uxbridge OP. Please update the site plan and associated catchment-based water balance to ensure the existing hydrologic inputs supporting these sensitive hydrologic features are maintained post-development.		As discussed in the conference call with the LSRCA (August 31, 2021), further updates to the catchment-based water balance will be provided with the forthcoming detailed designs. It is understood that this reiterates the need communicated by the LSRCA for a catchment-based water balance to be provided for each of HDF1 through HDF4.

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Our ref: 11227711

23 February 2023

John Spina
Bridgebrook Corporation
7681 Highway 27
Unit 16
Woodbridge, ON L4L 4M5

7370 Centre Road, Uxbridge, ON: Response to Agency Comments Dated 16-June-2022

Dear Mr. Spina,

Please find enclosed GHD's responses to Lake Simcoe Region Conservation Authority (LSRCA). Initial comments from the Agency were issued in May 2021 and responses were subsequently prepared and submitted. A subsequent review resulted in LSRCA asking for further information/clarification. This current letter is in response to the second review, which occurred in June 2022. We have included the original comments (and their associated number) for reference. As GHD was not the original consultant retained to complete the Environmental Impact Study a revised EIS could not be issued, however an addendum was completed.

Please contact our office if you have any questions or require further project support.

Regards,

Katherine Ryan
Terrestrial and Wetland Biologist

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1. <u>*Comment NH1 (6-May-2021):*</u> *As per Policy 2.3.15 in the Durham Regional Official Plan (Durham OP), development and site alteration are not permitted in key natural heritage and/or hydrologic features and their associated vegetation protection zones except for the listed exceptions. Similarly, Policy 2.3.3.3.iii.a) in the Township of Uxbridge Official Plan (Uxbridge OP), does not permit development in key natural heritage and/or hydrologic features. As per the Durham OP and Uxbridge OP, key natural heritage features include significant habitat of endangered species, fish habitat, wetlands, significant woodlands and significant wildlife habitat, and key hydrologic features include permanent and intermittent streams, wetlands, seepage areas and springs. Please revise the site plan to ensure all development and site alteration (including grading) is located outside the key natural heritage features, key hydrologic features, and their associated buffers on the subject property, such as the on-site wetland communities (MAM2-10, SWT2-5, MAS2-1, SWT2-2), intermittent streams (headwater drainage feature (HDF) 1, 2 and 4), and the buffers to the significant woodland, wetlands, and watercourses.*

   <u>*Comment (16-June-2022)*</u>*: Partially addressed.*

   a) Please revise the site plan to ensure all development and site alteration (including grading) is located outside key natural heritage features, key hydrologic features, and their associated buffers on the subject property. These features include the on-site wetland (SWT2-5 community identified in Block 473), intermittent streams (headwater drainage feature (HDF) 2 and 4 were identified as intermittent watercourses in the EIS (Beacon Environmental Limited, March 2021)), and the buffers associated with the significant woodland, wetlands, and watercourses.

   b) The revised site plan proposes Street D through the FOD7-A woodland community, which disrupts the connectivity between the central wetland in Block 470 Park and the larger eastern natural heritage features in Block 475 Open Space. Please revise the EIS to assess the potential impacts associated with this proposed street through this corridor.

   c) The central Block 470 Park needs to be revised to ensure the wetland in the southern portion of the block is rezoned Open Space/Environmental Protection to ensure the wetland and watercourse are protected in perpetuity.

   As per Comment #NH7 below, the stormwater outfalls need to be relocated outside key natural heritage features and their associated buffers. As per the Uxbridge OP, buffers are to provide the maintenance and, where possible, improvement or restoration of natural self-sustaining vegetation.

   <u>**Response:**</u> a) The Site plan has been updated to respect the natural features and required buffers. In order to support the proposed development a reduced 15-meter buffer was proposed for the watercourse (HDF features) and encroachments are required to support the road crossing to provide connectivity across the property. Section 9.1 of the EIS report summarizes the net gain/net loss of the key natural heritage features or key hydrologic features and their applicable buffers as a result of any grading or development proposed for the site. As identified in Section 11 of the EIS (Beacon 2021), "*compensation will be required to address feature loss, reduction of buffers and regulated species in order to meet an overall test of no negative impact and conform with policy documents.*" Opportunities will be sought out for on-site compensation and cash-in-lieu as outlined in the Ecological Offsetting Policy. Table 6 of this letter outlines the encroachment areas for the natural features and their respective buffers. Grading will be limited to within the lots and outside of the associated natural feature buffers.

   A Functional Servicing and Stormwater Management Report prepared by SCS Consulting Group Ltd. (dated Feb. 2023) includes grading. Grading work is kept external to all buffers with the exception of the road crossing on Street 'A' to the greatest extent possible. Some potential grading work within the buffer of the wetland in the park area to the south. Any area graded in the buffer is to support the adjacent development envelope. That new slope will be stabilized and plantings established on the slope as part of the general rehabilitation of the buffer areas.

b) Street D runs through the FOD7-A woodland community. The potential impacts associated with this street through the corridor are limited. The main corridor exists to the north, contiguous with the larger blocks of vacant lands, with regenerating natural vegetation. The large majority of the property is active agricultural lands with the road crossing footprint to be constructed on an existing farm lane/access road. The road crossing would be an upgrade to the existing lane. Mitigation measure should be put in place to ensure, during construction no sediment encroaches into the natural features, with installation of silt fencing prior to construction. Silt fencing will protect the wetland, watercourse and woodland features located within that natural corridor.

At the detailed design stage of the crossing, grading plans and construction footprint would be developed to determine the mitigation, compensation or plantings required. As part of the LSRCA permit application for the crossing at that time, additional information and plans will be included regarding landscaping and mitigation measures including timing windows.

c) Acknowledged. At the detailed design stage GHD will work with the stormwater engineers to ensure that stormwater is directed away from the key natural heritage features and their associated buffers. We will examine options to have an outlet at the toe of slope and away from the creek with suggested options such as a spreader, natural channel or methods to limit footprint and compensation measures if necessary. Review of the detailed outfall design and the creek crossing by a biologist is recommended.

Grading in the park may be within the buffer, but regrading and plantings will be completed.

2. *Comment NH2 (6-May-2021): As per Policy 2.3.4.2 in the Uxbridge OP, a minimum naturally vegetated buffer zone of 30 m is required for both sides of watercourses. In addition, a minimum buffer of 15 m is required for wetlands to mitigate effects of urbanization. Please revise the site plan to ensure the correct buffer widths are provided to the key hydrologic features on the subject property. As per Comment #NH1 above, please ensure all development and site alteration (including grading) is located outside of these corrected buffer widths*.

   Comment NH2 (16-June-2022): Partially addressed.

   Please ensure justification for a reduced watercourse buffer is provided in the revised NHE.

Response: The updated Site Plan has been designed to be outside of all-natural feature, with the exception of the watercourse crossing. The Uxbridge Official Plan requires a 30-meter buffer off of all watercourses, in addition to a 15-meter buffer requirement on the wetlands. A variable buffer has been proposed off the watercourse achieving a minimum of 15-meters. **Attachment 1** (Figure 1) identifies the minimum 15-meter buffer implemented off the watercourse feature, however the greatest buffer extent will be utilized, which provides much larger buffers in some areas. Specifically, the areas which can maintain a larger than 15-meter buffer area:

1) Block 470 provides opportunity to expand the buffer to 30 meters north of HDF 1, while also extending the buffer south to the property line to achieve 30 meters and greater.

2) When examining opportunities along the Uxbridge Brook main stem and HDF 3, a 15-meter buffer can be achieved around HDF 3, which had not previously been identified on the Figure. The 15-meter buffer can be expanded to 30 meters and greater to match the greatest buffer extent in this area which would be the drip-line setback.

3) The buffer associated with HDF 2 can also be expanded to 30 meters on both sides along the southern extent of this feature.

4) The northern extent of HDF 2, north of the proposed crossing can also be extended to 30 meters along the western side. The most westerly ephemeral watercourse will also achieve a 30-meter buffer in most areas as the buffers extend into retained natural features.

As the property is primarily active agricultural field directly influencing and adjacent the watercourse features with no current buffers, the implementation of a vegetated buffer will enhance and maintain the hydrological function. The areas with reduced buffers (15-meters) shall be planted heavily. Plantings associated with the buffers will provide additional protection from runoff, provide a screen to disturbance from the adjacent residential development and provide opportunity for riparian enhancement which may have been limited due to the adjacent agricultural landscape. With the implementation of the mitigation measures as laid out in Section 9.0 including the installation of sediment and erosion control measures, no impacts are anticipated on the features or functions of the watercourse feature on the subject property. A reduced buffer of 15 meters off the watercourse, in some areas will provide suitable protection to these features with the appropriate mitigation measures as laid out in Section 9.0 of the EIS. In addition, the ecological offsetting Policy will be implemented for the buffer encroachment for the HDF to ensure no net loss. This calculation will be completed in a separate document at the detailed design stage. No grading is to occur within the natural features or their associated buffers with the exception of the proposed road crossing.

3. *Comment NH6 (6-May-2021): The proposed development involves the removal of woodland communities (FOD4-A, FOD7-2, CUW1-A) which should be ecologically offset with on-site restoration as per the LSRCA's Ecological Offsetting Policy. This Policy can be accessed via the link: https://www.lsrca.on.ca/Pages/Ecological-Offsetting.aspx. As per the Policy, prepare an Ecological Offsetting Strategy providing the total area of the woodland feature including buffers that are proposed for removal and the total area of any locations proposed for woodland replacement. Ensure all remaining natural heritage areas are afforded the appropriate environmental protection through zoning.*

   Please note offsetting/compensation plantings need to be located outside of buffers to natural heritage/hydrologic features as these buffers are already required to be planted as per Policy 6.34 in the Lake Simcoe Protection Plan. In addition, the proposed development must demonstrate conformity with applicable policies prior to proposing compensation for the removal of natural heritage features and hydrologic features. Compensation is not an acceptable mitigation measure to ensure no negative impacts to natural heritage and hydrologic features and their function.

   Comment NH6 (16-June-2022): Partially addressed.

   As per the LSRCA's Ecological Offsetting Policy, it must be demonstrated that on-site restoration is considered prior to cash-in-lieu compensation. A combination of on-site restoration and cash-in-lieu is strongly recommended when there are site constraints.

   Response: On site restoration was considered prior to cash-in-lieu as demonstrated within the proposal to plant the buffer areas. As determined in Section 9.1 of EIS (Beacon 2021) a total of 1.9 ha are at a deficit for natural feature encroachment and natural feature removal. An adjustment to this number will need to be made with the updated Site plan respecting all buffers, with the exception of some areas maintaining a 15-meter buffer. GHD calculated an area of 0.2389 ha of natural feature encroachment and natural feature removal will be required as a result of the road crossing. The ecological offsetting required for the reduced HDF buffer in some areas has not been calculated to date however will be calculated and included in a separate report addressing the ecological off-setting calculation. It is understood that a combination of both on-site and cash-in-lieu are recommended. The proposed buffer plantings will allow for some on-site enhancements. Given the property is surrounded by intensive urbanization and residential developments, the current plan meets the character of the surrounding area. The property is mostly agricultural lands with minimal natural features on and adjacent to the property. The narrow corridor that runs north-south through the property is entirely surrounded by active agricultural lands currently.

4. *Comment NH7 (6-May-2021): Please delineate the general area of where the stormwater outfall will be located to ensure it will be outside of natural heritage and hydrologic features and their associated buffers.*

   Comment NH7 (16-June-2022): Not addressed.

   Please ensure the revised site plan relocates the stormwater outfalls outside key natural heritage features and their associated buffers. As per the Uxbridge OP, buffers are to provide the maintenance and, where possible, improvement or restoration of natural self-sustaining vegetation.

Response: Acknowledged. The stormwater management ponds will be designed to mitigate any negative effects that may occur on the natural features or their functions.

At the detailed design stage GHD will work with the stormwater engineers to ensure that stormwater is directed away from the key natural heritage features and minimal encroachment into their associated buffers. We will examine options to have an outlet at the toe of slope and back from the creek banks with suggested options such as a flow spreader, natural channel or other methods to limit footprint and compensation measures if necessary. Review of the detailed outfall design and the creek crossing by a biologist is recommended.

A summary of the natural features and proposed buffers can be identified below in table 6. Modifications to this original table were made to reflect the most recent site plan.

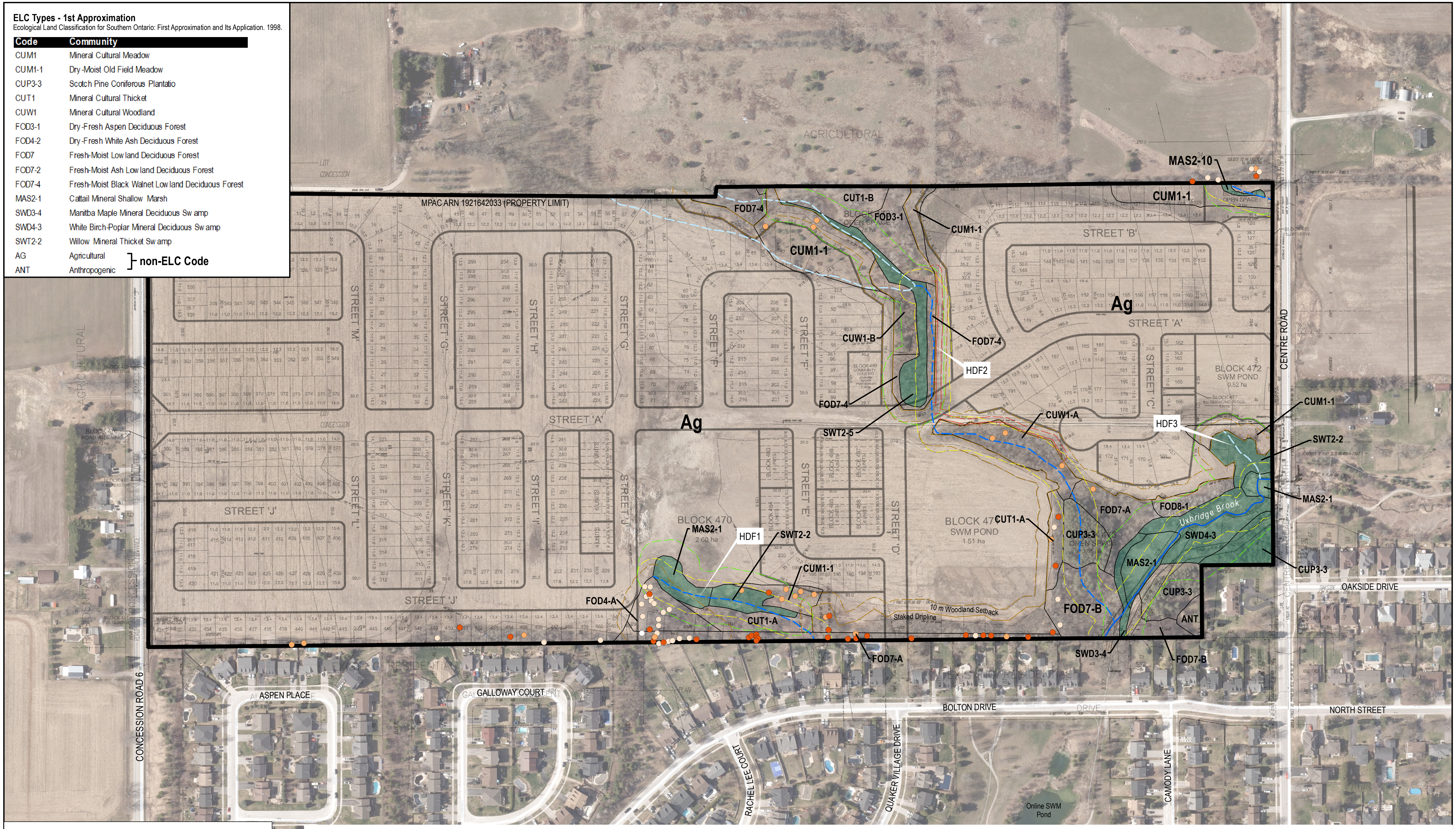
Table 6. Natural Features and Proposed Buffer

Feature/Function	On-site Description or Locations (Attachment 1)	Buffer Proposed	Comment
Significant Valleylands	Uxbridge Brook Valley	6m (as originally proposed by Beacon), now an average of 10-meter buffer from Top of Bank, with the exception of the encroachment as a result of the HDF crossing.	10 m is sufficient to mitigate immediate effects of the adjacent development, grading to occur outside of the buffer areas, with the exception of the road crossing.
Significant Woodland	Uxbridge Brook and HDF 2 excluding FOD7-A, FOD4-A	10-m from dripline, with the exception of the HDF crossing which would result in removal of 109.14 sq meters of woodland and 668.sq. m of woodland buffer encroachment	10 m is sufficient to mitigate effects of adjacent development, no grading will occur within the buffer areas, with the exception of the road crossing
Wetland	HDF 2 HDF 3 and Uxbridge Brook	15-meter buffer, with the exception of some wetland removal (70.24 sq. m) and wetland buffer encroachment (819.97 sq. m) as a result of the HDF road crossing.	No grading within buffers, with the exception of the road crossing
Fish Habitat	Uxbridge Brook, downstream extent of HDF 2	Variable buffer achieving 30 meters in most areas, with a minimum of 15-meter buffer where 30 meters was not achievable.	No grading within buffers, with the exception of the road crossing. The ecological offsetting requirements for the reduced buffer in some areas will be identified in a separate document at the detailed design stage

Habitat of Endangered or Threatened Species	Butternuts	n/a	Need to be addressed with MECP
	Bat habitat in treed communities	n/a	Information provided in a separate memo (GHD, 2021).

Attachment 1

Figure 1. Feature Area/Gain Loss and Areas of Potential



ELC Types - 1st Approximation

Ecological Land Classification for Southern Ontario: First Approximation and Its Application. 1998.

Code	Community
CUM1	Mineral Cultural Meadow
CUM1-1	Dry-Moist Old Field Meadow
CUP3-3	Scotch Pine Coniferous Plantatio
CUT1	Mineral Cultural Thicket
CUW1	Mineral Cultural Woodland
FOD3-1	Dry-Fresh Aspen Deciduous Forest
FOD4-2	Dry-Fresh White Ash Deciduous Forest
FOD7	Fresh-Moist Lowland Deciduous Forest
FOD7-2	Fresh-Moist Ash Lowland Deciduous Forest
FOD7-4	Fresh-Moist Black Walnut Lowland Deciduous Forest
MAS2-1	Cattail Mineral Shallow Marsh
SWD3-4	Manitba Maple Mineral Deciduous Swamp
SWD4-3	White Birch-Poplar Mineral Deciduous Swamp
SWT2-2	Willow Mineral Thicket Swamp
AG	Agricultural
ANT	Anthropogenic

AG, ANT } non-ELC Code

Data Disclaimer

This map is a re-creation of another map and the data on this map was originally collected by Beacon Environmental. GHD makes no claims on the accuracy of the data.

Legend

- Top of Bank (Beacon Environmental 2020)
- Staked Dripline (Beacon Environmental 2020)
- 6 m Staked Top of Bank Setback (Beacon Environmental 2020)
- 10 m Woodland Setback (Beacon Environmental 2020)
- 15 m Wetland Setback (Beacon Environmental 2020)
- 15 m Watercourse Setback (Beacon Environmental 2020)
- Intermittent
- Ephemeral
- Watercourse (Beacon Environmental 2021)
- ☐ Vegetation Community (Beacon Environmental 2020)
- 🟩 Vegetation Community (Beacon Environmental 2020)

Butternut Trees (Beacon Environmental 2020)

- ● Category 3
- ● Category 2
- ● Category 1/Dead Tree
- ○ Hybrid Tree

1 cm = 32 meters

0 20 40 60 80

Meters

Map Projection: Transverse Mercator
Horizontal Datum: North American 1983
Grid: NAD 1983 UTM Zone 17N

Paper Size ANSI B

N

Bridgebrook Corp.
7370 Centre Road, Uxbridge, ON
Town of Uxbridge
Environmental Impact Study

Feature Area/Gain Loss and Areas of Potential

Project No.	11227711
Revision No.	
Date	Feb 13, 2023

Figure 1

Q:\GIS\PROJECTS\11122000s\11229711\Layouts\202302_EIS001\11227711_202302_EIS001_GIS001 - Feature Area Gain Loss and Areas of Potential.mxd
Print date: 13 Feb 2023 - 06:46

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Meeting Minutes

Date:	August 31, 2021
Time:	11:00 AM to 11:28 AM
File:	Uxbridge (005)
Topic:	LSRCA Comments Matrix HydroG – H4, H5, H15, & H16

Attendees

Lake Simcoe Region Conservation Authority:

- Shelly Cuddy
- Dave Ruggle

Terrapex:

- Zen Keizars

MDTR Group:

- John Spina
- Amna Amir

Meeting Discussion Summary

1. H4: Two phases

John said that it is very likely that the development will proceed in phases, but where these phases will be is unknown at this time. Mentioned that the wastewater treatment plant's capacity will determine the number of units in phase 1.

Shelley asked if this would be known at the detailed design stage? John said yes.

Shelley said that the purpose of this is to ensure that the mitigation plan or the LID plan goes ahead for those phases separately. To see through if there's an infiltration loss in phase 1 and it potentially not be mitigated for 5 years down the road. *Shelley made a recommendation to defer this to the detailed design stage*. She said this would be playing with the numbers based on area and matching and changing the mitigation plan once there is a better understanding of what will go forward.

2. H5: Requirement to do a FBWB for all features

Shelley said this emerged from the fact that a lot of work was done looking at the feature at the southeast corner, but it looks like the catchment-based water balance was based on the catchment defined by SCS and that was catchment 101. That catchment supports the whole drainage feature and the two various wetlands at the north and south – but it's only giving one number. When they look at the mitigation to the feature to the North or to the drainage feature going North to South, they don't know how to mitigate it because ther is just one number and she thinks that that catchment has to be subdivided further to define what the infiltration and runoff to the feature to the North, the drainage feature going through the site, and the wetland in the south. Too large of a catchment to make an adequate mitigation plan.

John reminded LSRCA of an email that mentioned that if there's no interference from a grading perspective or no diversion taking place, why is this a concern?

Shelley said since homes are being put there – If you don't know how much roof drainage to direct to that feature (if it is not quantified in the pre-development condition) you don't know how much to put back to that feature. In post-development there is more impervious area which directs water to storm sewers and outlets at a SWM pond – which is a diversion. And then when there is overland flow – in post-development conditions it either goes to the storm sewer or goes from a rooftop to that feature. This needs to be quantified in pre-development and post-development. Yes overall, this goes back to the watercourse in the south, but what's missing is the quantity of groundwater and surface water that's going to the feature in the North, the feature through the site, in pre-development and how will that be matched in the drainage plan post-development. It is not matched currently, and they don't have quantities to determine if it's matched or not.

Shelley said this is a exercise in dividing those numbers up by the areas, further refinement in that pre-development catchment 101 to determine surface flows going to those features just to divide these numbers up and enhance what's already been done.

Dave asked if this can go to detailed design?

Shelley said that there is a number of properties in the north where the roof drainage will be directed to that feature. Is catchment 101 enough for these properties? Shelley also brought up that Jessica had concerns about that NHS and she asked for a catchment based water balance as well. She said we need better numbers.

John asked if there was a possibility of waiting until detailed design with a condition that we were warned and we've been alerted to the fact that before we start detailed design we look at this particular issue and make sure it's addressed to LSRCA's satisfaction – word the condition appropriately and once we get draft approval we will look at this issue first to ensure water remains balanced

Shelley said she is okay with this. She recommends that Zen's gives us some preliminary numbers on surface water overland features going to those features as targets.

3. <u>Delineation of Features</u>

Zen asked LSCRA to clarify the delineation of the features.

a) The North Feature

Shelley confirmed that she is only concerned about the feature that is on the property. Wetland pocket at the North Central – east of catchment 101 where the watercourse enters the property.

b) Drainage feature to the south

Zen asked if this is the linear feature that goes along the treeline at the bottom of the site? Shelley said yes and that another comment is concerned with this feature – that the SWM pond is blocking the surface drainage – will that impact anything? No assessment seen of that.

Shelley wants to see this quantified through water balance. She wants to see an infiltration number and a runoff number to see if this number is matched pre-development to the number post-development.

Catchment 101 needs to be subdivided – needs to see the numbers (targets) for the different flows, there is only one number right now which is not significant enough

Zen said that we need Nick (SCS) to subdivide catchment 101 accordingly

Shelley said they may need to guess where catchments end and where one begins, put lines to delineate where flows are going to give targets

John asked what stage this work needs to be done?

Shelley said this could be deferred to detailed design, but needs to confirm with Dave from a planning perspective

Dave said he will craft a condition once he has a conversation with his team

4. H15: Locations

Shelley confirmed this can wait until the detailed design stage

5. H16: Cross Sections

Shelley confirmed this can wait until the detailed design stage

Next Steps

- Zen (Terrapex) to populate Matrix
- Zen (Terrapex) to do some additional work, provide preliminary numbers and refine
- Dave (LSCRA) to craft a condition

- Nick (SCS) to subdivide catchment 101 (may need to guess where catchments end and where one begins, needs to put lines to delineate where flows are going to give targets)
- MDTR Group to meet with Dave (LSRCA) regarding EIS comments with Beacon

Selva Soren

From: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Sent: October 4, 2022 8:51 AM
To: McIntosh, Nick
Cc: John Spina; Steven Ramjass
Subject: RE: 7370 Centre Rd - Uxbridge (APID62191)

Hi Nick, thanks for the below. Regarding comment HG16, based on your comments below, we are fine with deferring the requested information until detailed design.

Regarding comment E1, it is referring to the water course in the northeast corner of the plan. We will want this confirmed in this functional phase. Please confirm your comments below in the next submission.

Hope this helps,
Dave

From: McIntosh, Nick <nmcintosh@scsconsultinggroup.com>
Sent: September 23, 2022 2:57 PM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Cc: John Spina <john@mdtrgroup.com>; Steven Ramjass <steven@mdtrgroup.com>
Subject: 7370 Centre Rd - Uxbridge (APID62191)

Hello Dave,

We are currently preparing an updated FSR to address the latest comments provided on the application noted above and wanted to clarify a couple more things.

- Comment E1 has asked us to confirm that “all 3 watercourses” can safely convey the 100-year storm event however in the original comment provided in May 2021 it only asks for 2 watercourses. Can you please confirm if this is a typo or if we need to confirm conveyance in a third watercourse. From what we can tell, the only other possible tributary that this comment could be referring to is in the northeast corner of the proposed development where an existing wetland is located. The wetland will be maintained per the latest draft plan however there is no real conveyance system associated with it, there is a municipal culvert underneath Centre Road immediately north of the site that conveys excess runoff from the wetland under the road to the east therefore there is no concern of conveyance in this area. Can you please clarify with your staff.
- Comment H16 is requesting that cross sections of all proposed LIDs be provided to confirm proposed elevations, separation from ground water, dimensions, and materials. Given the type of LIDs proposed which are spread throughout the entirety of the site (catchbasin infiltration trenches and rear yard infiltration trenches), detailing specific grading and groundwater information in sections for every LID will be an incredibly onerous undertaking at this stage. We are hoping that by providing some additional information on the detail such as minimum clearance to groundwater and the typical soils that the trenches are designed for that this should be sufficient until detailed design when profiles of the roadside trenches, and summary tables of the rear yard infiltration trenches can be prepared. Through our review of the seasonally high groundwater information and preliminary grading plan, we have only proposed LIDs where sufficient clearance can be provided. Can you please confirm if this is acceptable.

If you have any questions or require additional information let me know.

Regards,

Nick McIntosh, M.A.Sc, P.Eng
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Selva Soren

From: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Sent: February 16, 2023 9:33 AM
To: Steven Ramjass
Subject: RE: LSRCA Comments - Follow up (H3)

Hi Steven, thanks for the follow up. Yes, your assumption is correct that the winter season is less important and spring, summer and fall readings should be sufficient.

Dave

From: Steven Ramjass <steven@mdtrgroup.com>
Sent: February 16, 2023 9:28 AM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Subject: RE: LSRCA Comments - Follow up (H3)

Good Morning Dave,

I am following up in regards to my previous email.

Could you confirm the details for comment H3 below?

Thanks,
Steven

Steven Ramjass
Planner

E: steven@mdtrgroup.com
O: 905-265-1976 ext 2600
F: 905-265-1979

www.mdtrgroup.com

7681 Hwy 27 | Unit 16 | Woodbridge| ON | L4L 4M5

From: Steven Ramjass
Sent: February 14, 2023 9:53 AM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Subject: LSRCA Comments - Follow up (H3)

Good Morning Dave,

I previously contact you for confirmation to address the below comment (H3).

The wetland Function Assessment (Terrapex, 2020) was reviewed and assesses the groundwater contributions to the wetland features on the site. It appears the evaluation was completed based on groundwater level data collected during the summer/fall months which are typically characterized by lowest groundwater conditions. In additional groundwater contributions to wetlands can be transient in nature and fluctuate through the year. Please continue to the monitor to capture seasonal trends.

Based on your response you were accepting that we could take one reading a month with the exception of the Spring season which will require multiple readings through loggers, correct?

We already have monitoring data for the Summer and Fall. If we were to only provide Spring season monitoring data and tie them in to the current Wetland Function Assessment through an addendum would that be sufficient enough to clear this comment at this time?
Again it is my assumption that the Winter season is not of particularly interest correct?

Thanks,
Steven

Steven Ramjass
Planner

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Selva Soren

From:	Dave Ruggle <D.Ruggle@lsrca.on.ca>
Sent:	October 31, 2022 11:40 AM
To:	Steven Ramjass
Subject:	RE: LSRCA Comments - Water Balance

Hi Steven, after further review, the LSRCA can defer the hydrogeology comment H14 to detailed design. While we would prefer to have this information in the functional stage, we understand the current situation and more information will be forthcoming once the phasing is determined.

Thanks ,
Dave

Dave Ruggle, BAA, MCIP, RPP
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Please note: the LSRCA Board of Directors approved a change to our Fee Policy. The new fees took effect January 3, 2022. Please click here to view the staff report and see page 34-40 for the new fee schedule.

Twitter: @LSRCA
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From: Steven Ramjass <steven@mdtrgroup.com>
Sent: October 28, 2022 11:37 AM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Subject: RE: LSRCA Comments - Water Balance

Good Morning Dave,

In regards to LSRCA comment H14:
It was indicated that downspout disconnection will be utilized to offset some of the infiltration in post-development conditions. LID guidelines (CVC, 2012) indicate that for C & D type soils, up to 25% of runoff from roof areas can be considered as additional infiltration if specific LID parameters are met. Please identify:

a) the area(s) of where downspout disconnect is being applied in the water balance assessment.

b) the quantity of mitigation achieved; and

how these LID criteria will be met

Would you consider having this completed at detailed design? We do not have approval for the site yet and changes may occur. We want to provide a finalized breakdown on the LIDS: downspout disconnection at detailed design when we have approval on the current site plan.

Also, could the site water balance be updated at detailed design? The phasing has not been confirmed and the draft plan has fewer lots than the initial submission thus the site should be balanced. When we have confirmation on the phasing and the draft plan we can provide a site water balance along with a water balance for each phase.

Thanks,
Steven

Steven Ramjass
Planner

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From: Steven Ramjass
Sent: September 23, 2022 4:41 PM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Cc: John Spina <john@mdtrgroup.com>; McIntosh, Nick <nmcintosh@scsconsultinggroup.com>
Subject: LSRCA Comments - Water Balance

Good Afternoon Dave,

Hope you are well.

Thank you for taking the time to outline the LSRCA comments that require attention at this planning stage. However, we require clarification in regards to the update to the site water balance.

We ask that the site water balance be updated at detail design and not be required as part of the revisions to the FSR now being undertaken. The site water balance will continue to change as more revisions to the draft plan may be possible pending its approval. In the meantime, we have already provided a site water balance on the first draft plan submitted. The new draft plan has fewer lots (50) and thus less impervious; no reason why the site cannot be balanced. We ask kindly that you defer a revised site water balance to detailed design when the Phases have been confirmed and we will then provide it along with a water balance for each phase.

We look forward to a reply, hopefully next week.

If you have any questions or concerns, please feel free to contact us.

Thanks,

Selva Soren

From: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Sent: October 6, 2022 11:08 AM
To: Steven Ramjass
Cc: John Spina
Subject: RE: LSRCA Comment - NH1

Hi Steven, I understand the issue and I am fine with an addendum to the EIS.

Dave

From: Steven Ramjass <steven@mdtrgroup.com>
Sent: October 6, 2022 11:04 AM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Cc: John Spina <john@mdtrgroup.com>
Subject: RE: LSRCA Comment - NH1

Good Morning Dave,

Thank you for your response in regards to comment H3.

After reviewing comment NH1, it requires revisions to the EIS that was previously completed by Beacon. Currently, GHD is assisting us with the environmental site review/analysis and not Beacon. Can you confirm if an addendum to the EIS would be sufficient in resolving this comment?

Thanks,
Steven

Steven Ramjass
Planner

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From: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Sent: October 6, 2022 9:30 AM

To: Steven Ramjass <steven@mdtrgroup.com>
Subject: RE: LSRCA Comment - H3

Hi Steven, yes, that would also include the wetland in the northeast section of the plan to assess impact to the feature.

Dave

From: Steven Ramjass <steven@mdtrgroup.com>
Sent: October 5, 2022 10:30 AM
To: Dave Ruggle <D.Ruggle@lsrca.on.ca>
Subject: LSRCA Comment - H3

Good Morning Dave,

In regards to Comment H3, can you confirm if the LSRCA would like us to continue to monitor all natural features (central, and southeast). Does this include monitoring the wetlands to the north east as well?

Thanks,
Steven

Steven Ramjass
Planner

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