Stormwater Management and Servicing Report

181 Burton Avenue

City of Barrie
County of Simcoe

PEARSON ENGINEERING

PEARSONENG.COM

(Revised February 2024)

February 2022

19100

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Stormwater Management & Servicing Report
181 Burton Ave, Barrie

1. Introduction

PEARSON Engineering Ltd. has been retained by Monolite Holdings Inc. (Client) to prepare a Stormwater Management (SWM) and Servicing Report in support of the 4-storey residential building located at 181 Burton Avenue in the City of Barrie (City), in the County of Simcoe (County).

The subject property is approximately 0.20 ha in size and is currently a partially treed vacant lot and generally slopes from south to north. The Project site fronts onto Burton Avenue to the South, a vacant treed lot to the north and existing commercial sites to the east and west. The location of the site can be seen on Figure 1.

1.1. Terms of Reference

The intent of this SWM Report is to:

- Identify the existing site characteristics including any external drainage conditions;
- Illustrate the design of the stormwater conveyance and detention system, capable of accommodating both minor and major storm flows from the site;
- Incorporate the appropriate Best Management Practices for controlling on-site erosion and sedimentation during construction while ultimately ensuring that the post-development release of stormwater is of adequate quality; and
- Summarize this design in a technically comprehensive and concise manner.

2. Design Population

The proposed development is to consist of a 4-storey apartment building with 24 residential units with associated parking and services. Utilizing a population density of 1.67 people per unit as per City of Barrie design standards for apartment buildings. Based on these figures, a design population of 40 persons is estimated for the project.

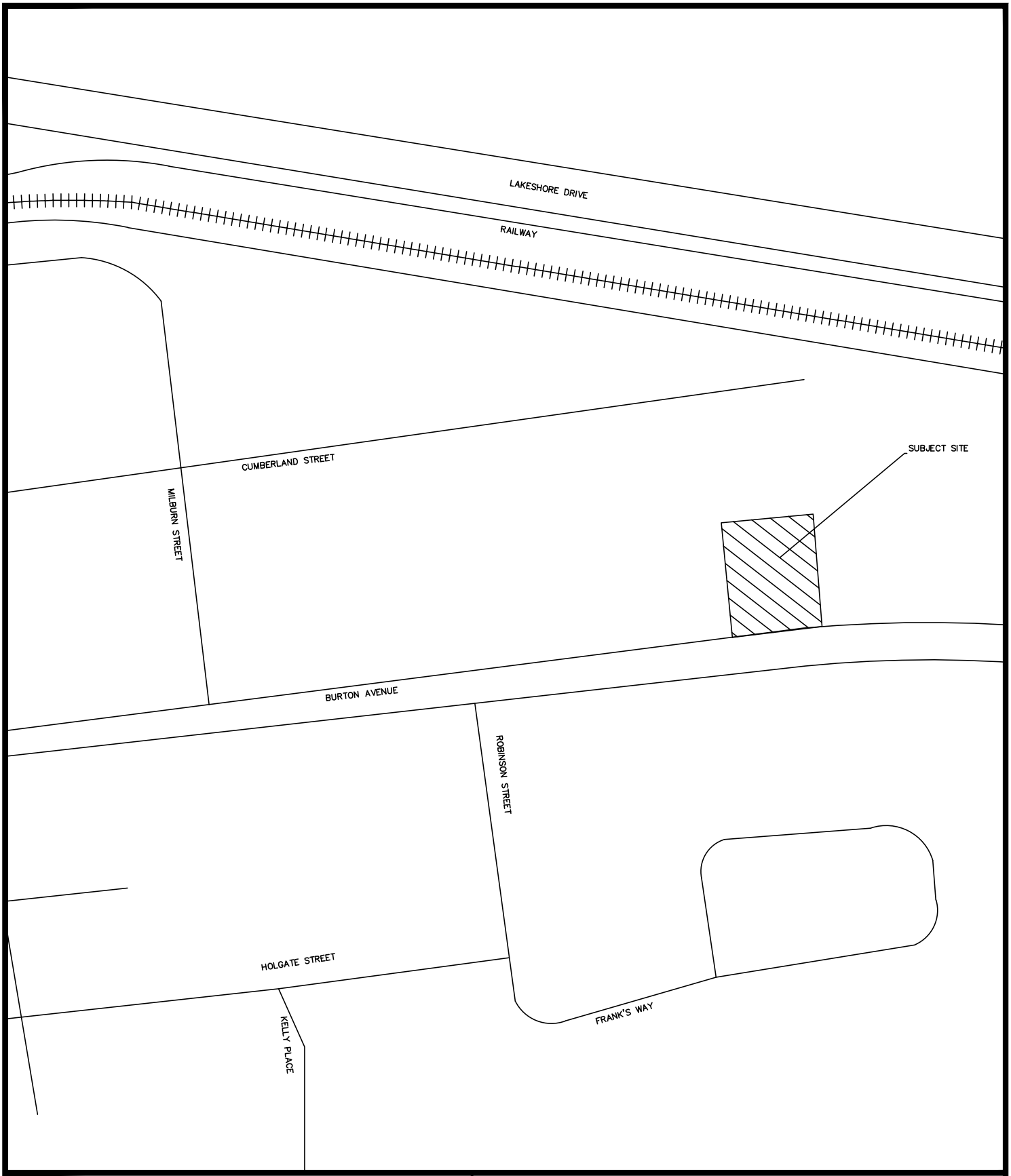
3. Water Supply and Distribution

3.1. Water Servicing Design Criteria

The site is to have a design population of 40 persons. Utilizing the City of Barrie Engineering Design Criteria for residential water demand of 225 L/capita/day, an Average Day Demand (ADD) of 0.10 L/s was calculated. A Peak Rate factor of 4.13 was used in calculating a Peak Hour Demand of 0.43 L/s for the proposed development. Calculations for the domestic water requirements for the site can be found in Appendix A.

3.2. Internal Water Distribution System

The project site will be serviced by connecting into the existing 300 mm diameter watermain on the north side of Burton Avenue. The proposed 50 mm diameter domestic watermain and a 150 mm diameter fire service will extend to the proposed building to meet domestic and fire fighting requirements. A municipal fire hydrant fronting the site is proposed to provide adequate firefighting coverage for the proposed building as per City Standards. Refer to Drawing SS-1 for the water servicing layout.



APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

SITE LOCATION PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	PG/MWD	HORIZ SCALE		PROJECT #	19100
DRAWN BY	PG	VERT SCALE		DRAWING #	FIG–1
CHECKED BY	GMP	DATE	JAN 2021	REVISION #	0

3.3. Fire Flow Requirements

The required Fire Underwriters Survey (FUS) assessment was used to calculate the required fire flow and was determined to be approximately 200 L/s (3,168 GPM). The building construction consists of a structure made of wood frame exterior materials consisting of structural elements such as wood, limited combustible contents factor, and a sprinklered water system. The footprint area of the proposed building is 448 m^2. As per City of Barrie Standards, the minimum required fire flow is 200 L/s (3,168 GPM) for apartment buildings. The calculations mentioned above indicate the same required fire flow, therefore, the development requires a fire flow of 200 L/s (3,168 GPM). Fire flow calculations are included in Appendix A.

A hydrant flow test was completed by Vipond Inc. in May 2022 indicating that a static pressure of 64 psi was available at the existing hydrant on the south side of Burton Avenue. This flow test also resulted in a flow that can be supplied of approximately 106 L/s (1,688 GPM) at a residual pressure of 60 psi from the existing hydrant. Through extrapolation of the hydrant results, it was determined that a flow of 200 L/s (3,168 GPM) would result in a residual pressure of approximately 57 psi.

Given that the hydrant on Burton Avenue can supply 200 L/s at a residual pressure of approximately 57 psi, the available fire flow meets both FUS and City of Barrie firefighting requirements. Refer to the fire flow calculations and information that can be found in Appendix A.

4. Sanitary Servicing

4.1. Sanitary Design Criteria

The site is to have a design population of 40 persons. Utilizing the City of Barrie Engineering Design Criteria's sanitary flow rate per capita of 225 L/capita/day, an Average Daily Flow (ADF) of 0.10 L/s was calculated. Using a Peaking Factor of 4.00 for this project and an infiltration allowance of 0.10 L/s/ha, a peak flow of 0.44 L/s was calculated for the proposed development. The existing 300 mm diameter sanitary sewer on the south side of Burton Avenue has a capacity of 45.36 L/s at a slope of 0.22%. Therefore, the proposed peak flow is approximately 0.97% of the existing sanitary sewer's capacity and the sanitary design flows are expected to have no adverse effects on the existing sanitary sewer system. Sanitary design flow calculations can be found in Appendix B.

4.2. Internal Sanitary Sewer System

It is proposed that the sanitary sewers be constructed in accordance with the City of Barrie and the Ministry of the Environment, Conservation, and Parks (MECP) guidelines to service the Project. The Project's sanitary sewer system will convey flow via a 250 mm gravity sanitary sewer from the site and connect to the existing 300 mm diameter sanitary sewer on the south side of Burton Avenue. The sanitary sewer system will extend to the proposed building as per the City of Barrie design standards. Refer to Drawing SS-1 for the sanitary servicing layout.

5. Stormwater Management

A key component of the development needs to address environmental and related SWM issues. These are examined in a framework aimed at meeting the City, and the Lake Simcoe Regional Conservation Authority (LSRCA), and Ministry of the Environment, Conservation and Parks (MECP) requirements. SWM parameters have evolved from an understanding of the location and sensitivity of the site's natural systems. This SWM Report focuses on the necessary measures to satisfy the MECP's SWM requirements.

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

- Protect life and property from flooding and erosion.
- Maintain water quality for ecological integrity, recreational opportunities etc.
- Protect and maintain groundwater flow regime(s).
- Protect aquatic and fishery communities and habitats.
- Maintain and protect significant natural features.

5.1. Analysis Methodology

The design of the SWM Facilities for this site has been conducted in accordance with:

- The Ministry of the Environment Stormwater Management Planning and Design Manual, March 2003
- City of Barrie, Storm Drainage and Stormwater Management Policies and Design Guidelines – December 2017
- Lake Simcoe Region Conservation Authority Technical Guidelines for Stormwater Management Submissions – April 2022

In order to design the facilities to meet these requirements, it is essential to select the appropriate modeling methodology for the storm system design. Given the size of the site, the Modified Rational Method is appropriate for the design for the SWM system.

5.2. Existing Drainage Conditions

The existing Project site is currently a partially treed vacant lot located at 181 Burton Avenue. Review of the site's current drainage conditions identifies that the site flows south to north with a 3:1 slope at the north side of the site. Based on the RG Robinson Drawing STM-2 for the Burton Avenue Reconstruction the site is part of a catchment area that drains north to a drainage channel that crosses under the Canadian National Railway to Lakeshore Drive, before outletting to Kempenfelt Bay. Details of the existing storm drainage conditions are shown on Drawing STM-1 in Appendix H and the RG Robinson Drawing STM-2 in Appendix G.

According to the Hydrogeological Assessment Report prepared by Azimuth Environmental Inc., dated August 2023, the project site is comprised of a layer of topsoil underlain by fill consisting of brown and moist, with some gravel, followed by a layer of silty sand. The fill layer was determined to be very loose to loose relative density. Based on in-situ testing results completed from Guelph Permeameter testing, the estimated infiltration rate 93 mm/hr to 99 mm/hr with a design infiltration rate of 39 mm/hr. Groundwater measurements were taken between February 2021 and July 2023 with groundwater levels ranging at a depth of approximately 2.81 m to 4.08 m below the existing ground surface.

Given the size of the site, the rational method was used to determine the pre-development peak flows. The City of Barrie IDF curve parameters were used for determining the storm intensity values. The pre-development peak flows have been calculated and can be seen in Table 1 below. Detailed calculations can be found in Appendix C.

Table 1: Pre-Development Peak Flows

	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm
Total Site Peak Flow (m^3/s)	0.005	0.006	0.007	0.010	0.012	0.013

5.3. Proposed Drainage Conditions

The proposed drainage from the building rooftop will flow via roof leader to underground storage chambers for infiltration in the parking lot area north of the proposed building. Stormwater from the parking area will be directed overland to proposed permeable pavers complete with a clear stone storage layer. Water that does not filter through the pavers will drain to catchbasins located within the pavers. The catchbasin and storm sewer system was sized for the 5-year storm event using the rational method. Underground storage chambers and surface ponding will be provided including an orifice tube to restrict flows and reduce post development peak flows to pre-development values. Stormwater will be conveyed through an Oil-Grit Separator (OGS) before outletting to the existing 1,350 mm diameter storm sewer on Burton Avenue.

An emergency overflow weir will be provided through the driveway to Burton Avenue to convey the major system off site in the event of a storm greater than the 100-year storm or if the orifice tube becomes blocked. A small 0.05 ha portion south of the proposed building will drain uncontrolled to Burton Avenue and a small portion north of the parking lot will drain uncontrolled north, however it will be reduced compared to the existing conditions. The layout for the stormwater servicing and storm drainage patterns can be found on Drawing SS-1 and Drawing STM-2 found in Appendix I. Calculations for the proposed stormwater management system can be found in Appendix C.

As noted by Cambium, the wetland north of the site is presumed to be primarily groundwater fed as it is an isolated area with no obvious inlet or outlet. Site grading will still direct a small amount of surface drainage from the rear of the site to the wetland. Efforts were made to replicate the pre-development and post-development infiltration on site.

5.4. Stormwater Quantity Control

The proposed development will increase the imperviousness of the site and as such the post-development peak flows will increase. The calculated post-development runoff coefficient of 0.69 is greater than the pre-development runoff coefficient of 0.11. It is important to quantify the increase in stormwater runoff rates and attenuate these increases.

Quantity control on site will be provided through underground storage chambers located within the west side of the parking lot. A 63 mm diameter Vortex Valve orifice will be implemented downstream of CBMH1 to reduce the post-development peak flows leaving the site, causing stormwater to back up into the StormTech underground storage chambers. Emergency system flow will be conveyed through the driveway weir to Burton Avenue. Calculations in Appendix C demonstrate that 114 m^3 is required to control the 100-year storm event to pre-development value. Quantity control will be provided through 70 m^3 of underground storage located within the StormTech storage tanks and a further 44 m^3 of surface ponding resulting in a total of 114 m^3 of storage. Table 2 below summarizes post-development peak flows.

Table 2: Post-Development Peak Flows

	2 Year Storm	5 Year Storm	10 Year Storm	25 Year Storm	50 Year Storm	100 Year Storm
Uncontrolled Peak Flows (m^3/s)	0.004	0.005	0.006	0.008	0.010	0.011
Controlled Peak Flow (m^3/s)	0.001	0.001	0.001	0.002	0.002	0.002
Total Project Site (m^3/s)	**0.005**	**0.006**	**0.007**	**0.010**	**0.012**	**0.013**

5.5. Stormwater Quality Control

The MECP in March 2003 issued a “Stormwater Management Planning and Design Manual”. This manual has been adopted by a variety of agencies including the City of Barrie. The development’s Stormwater Quality Control objective is to provide Enhanced Protection quality control as stated in the MECP manual. To achieve enhanced protection, permanent and temporary control of erosion and sediment transport are proposed and are discussed in the following sections.

5.5.1. Permanent Quality Control

The development’s active parking facilities pose a risk to stormwater quality through the collection of grit, salt, sand, and oils on the paved surfaces. A CDS Oil/Grit Separator PMSU2015-4-C or equivalent treatment unit is proposed in order to treat the stormwater released from the site to the MECP’s Enhanced or Level 1 Protection Standard. The MECP standard stipulates a Total Suspended Solids (TSS) removal of at least 80%.

The catchbasins include sumps which will settle larger sediment particles. Heavy metals have an affinity to adsorb to sediment particles in runoff and the OGS unit is proposed to remove accumulated sediment from the stormwater. Stormwater will be conveyed by the storm sewer system and will flow through an OGS unit prior to draining to the existing stormwater sewer system. The proposed CDS-4-C OGS will treat the post-development flows with a TSS removal rate of approximately 70.0%. The OGS is sized to treat the controlled area of 0.14 ha with a runoff coefficient of 0.83. The remaining 10.0% will be treated by filtering stormwater through the proposed permeable pavers, for a total TSS removal rate of at least 80% as per MECP standards.

Regular inspections and proper maintenance of the proposed OGS unit will ensure the TSS removal rate will be achieved as well as protect the downstream watercourse from oil, grease, and heavy metals. Detailed information regarding the OGS unit and ETV Verification can be seen in Appendix F.

5.5.2. Quality Control During Construction

During construction, earth grading, and excavation will create the potential for soil erosion and sedimentation. It is imperative that effective environmental and sedimentation controls are in place and maintained throughout the duration of construction activities to ensure the stormwater runoff’s quality.

Therefore, the following recommendations shall be implemented and maintained during construction to achieve acceptable stormwater runoff quality:

- Installation of filter strips, silt fences and rock check dams or other similar facilities throughout the site, and specifically during all construction activities, in order to reduce stormwater drainage velocities and trap sediment on-site; and,
- Restoration of exposed surfaces with vegetative and non-vegetative material as soon as construction schedules permit; the duration in which surfaces are disturbed/exposed shall not exceed 30 days.
- Provision of a mud-mat where applicable at the construction entrances in order to control the tracking of sediment and debris onto municipal streets.
- Reduce stormwater drainage velocities where possible.
- Minimize the amount of existing vegetation removed.

The Environmental Protection and Removals Plan can be seen in Appendix I.

5.6. Volume Control

Since the project site meets the definition of Major Development as per LSRCA Guidelines, considerations were taken to meet the volume control criteria detailed in Section 2.2.2. The LSRCA guidelines state that for a new development that creates 500 m^2 or more of impervious surfaces, 25 mm of runoff over the total new and fully reconstructed impervious area of the site is to be retained and treated on site, with flexible alternatives if this criterion cannot be met. Flexible treatment alternatives include retaining runoff from a 12.5 mm storm event from all impervious surfaces or achieving volume reduction to the maximum extent practicable with a minimum 5 mm from all impervious surfaces. The 25 mm storm event over the site's impervious areas results in a total required volume of 33.9 m^3.

It is proposed to provide retention and filtration storage in the proposed permeable pavers. Three proposed permeable pavers designed as per MECP and City of Barrie guidelines have been provided in the parking lot and driveway areas for a total volume of 33.9 m^3, meeting the LSRCA volume control requirements. Therefore, the proposed storage volume of the permeable pavers equates to 25.3 mm across the impervious area of the site, therefore, exceeding the 25 mm volume control criteria. Detailed calculations can be seen in Appendix C.

6. Water Balance

Since the post-development state will increase the imperviousness of the site, considerations were taken in regard to groundwater recharge. Under pre-development conditions, the project site consists of pasture and small trees, and as per the water balance calculations provided in Azimuth's Hydrogeological Assessment, dated August 2023, the project site under pre-development conditions will infiltrate approximately 545 m^3 annually over the entire site. With the increased imperviousness of the site, this recharge will be reduced to 169 m^3, resulting in a deficit volume of 376 m^3. Refer to the Hydrogeological Assessment Report prepared by Azimuth Environmental Inc., dated August 2023 attached in Appendix G for more information.

In order to infiltrate an additional 376 m^3 annually, a yearly rainfall depth of 839 mm from the rooftop is required to be infiltrated. This percentage of annual rainfall occurs for rain events of 21 mm or less resulting in a storage volume of 9.4 m^3. However, the City of Barrie guidelines outline a requirement to provide retention for the first 5 mm of rainfall over the site area resulting in a required storage volume of 10.0 m^3. StormTech Chambers (Model #SC-740) have been proposed which will infiltrate 12.6 m^3 from the rooftop area exceeding the LSRCA and City of Barrie requirements. Detailed water balance calculations can be seen in Appendix D.

7. Phosphorus Budget

Local conservation authorities have determined the importance of reducing phosphorus levels in water courses in this area. Best efforts are to be employed to reduce phosphorus levels being contributed from the site.

The existing site consists of pasture lands and generates approximately 0.13 kg of phosphorus annually. The development of the project will increase the amount of phosphorus contributed from the site to 0.26 kg if uncontrolled. To minimize the sites phosphorus discharge, a treatment train approach will be implemented. Stormwater from the majority of the site's paved surfaces will be conveyed to permeable pavers that provide phosphorus reduction through filtration. The permeable pavers will be designed with a perforated underdrain, which will connect to the Project's storm sewer. Flows that are not infiltrated by the pavers will be captured by catchbasins located within the pavers and conveyed to the underground quantity storage tanks. Stormwater will be conveyed through an OGS treatment unit before being conveyed to the existing storm sewer on Burton Avenue. Stormwater from the roof will be captured and sent to underground infiltration tanks.

According to the LSRCA Phosphorus Loading Development Tool, the typical phosphorus reduction for underground infiltration chambers is 60%, 25% for underground storage tanks, 45% for permeable pavers, and 20% for the OGS treatment unit. Therefore, the controlled post-development phosphorus can be reduced to 0.14 kg. The following Table 3 details the anticipated phosphorous loadings for the pre-development and post-development conditions.

Table 3: Phosphorus Loadings

	Total P (kg)
Pre-Development	0.01
Uncontrolled Post-Development	0.26
Controlled Post-Development	0.14

Detailed calculations can be found in Appendix E.

8. Lake Simcoe Compensation Fees

The LSRCA implemented a Phosphorous Offsetting Policy in September 2017 with the latest revision in May 2023 and has a goal that all new development must reduce 100% of the phosphorous leaving the property. A fee of $89,425 per annual kg is charged for post-development phosphorous levels exceeding the pre-development levels of phosphorous leaving the site. Therefore, the required fee for the proposed development is shown in Table 5:

Table 4: Phosphorus Offsetting Fee Summary

Project Area	Offsetting Fee	
	Weight in Excess of Pre-Development (kg)	LSPOP Fee
Project Site	0.13	$11,625
Admin Fee (15%)	-	$1,744
Total	**-**	**$13,369**

The LSRCA has also implemented a Water Balance Recharge Policy (WBRP) for the Lake Simcoe Protection Plan in July 2021 which states that post-development recharge must equal pre-development. As the infiltration under post-development conditions is meeting the pre-development infiltration volume, the Recharge Compensation Calculator spreadsheet was not utilized to calculate the required fee since the annual water balance deficit is 0 m^3. For our site, the fee was calculated as $0.00.

As per Section 5.1 of the WBRP, only the greater of the two compensation fees is required and therefore the phosphorous fee governs for the site. Compensation fee calculations can be seen in Appendix E.

9. Maintenance

9.1. Permeable Pavers

Permeable pavers are proposed to provide filtration for quality control and 33.9 m^3 of volume control storage for the development. Pavers require regular inspection and maintenance to ensure that it functions properly. The limiting factor for permeable pavers is clogging within the aggregate layers, filler, or underdrain. The pavers themselves can be reused. Annual inspections of permeable pavement should be conducted in the spring to ensure continued infiltration performance. These inspections should check for spilling or deterioration and investigate whether water is draining between storms. The pavement reservoir should drain completely within 48 hours of the end of the storm event.

9.2. Underground Storage

The proposed underground storage chambers upstream of the orifice tube are proposed to provide 64.8 m^3 of storage volume for quantity control. All runoff from the parking and driveway area will be conveyed through into the storm sewer system and a proposed orifice tube will restrict flows leaving the site to less than or equal to pre-development levels. The storm catchbasins and catchbasin manholes should be inspected every six months during the first year to ensure that the storm sewer is free of any debris. In subsequent years, the storm structures should be inspected annually, or more if deemed necessary for this specific site.

Inspection of the sewers and storm structures should occur regularly and if sediment is accumulating, a cleanout should be performed. Maintenance should be executed using the JetVac process and a vacuum pump truck to evacuate sediment and debris from the system and is to be performed in dry weather. Material removed from the structures will be disposed of in a similar manner to that of other stormwater management facilities. The owner should keep a Record of Maintenance Book to log inspection results and cleanout frequency.

9.3. Oil/Grit Separator Unit

The OGS unit should be inspected on a monthly basis during the rainy season to ensure that the unit is cleaned out at the appropriate time. Where site conditions may cause a rapid accumulation of pollutants, more frequent inspections should be carried out. The CDS system should be cleaned when the sump has reached 75% capacity, or the sediment depth has accumulated to a depth of 650 mm. It is recommended that the OGS unit be cleaned out at the end of the rainy season. Maintenance is to be performed in dry weather. Material removed from the unit will be disposed of in a similar manner to other stormwater management facilities.

When oils are encountered in the unit, all contents of the unit should be immediately removed upon discovery using a MECP approved waste hauler via a vacuum truck or other approved means. Any sludge or sediment in the bottom of the unit should be removed and disposed of appropriately. Oils encountered in the unit is a reportable spill and should be reported to the MECP Spills Action Centre. Servicing should be performed immediately after any oil/containment spills in the area. Regular maintenance of the OGS unit will ensure satisfactory and long-term treatment.

9.4. Vortex Valve Orifice

The Vortex Valve orifice controlling flows towards the front of the property is located just downstream of CBMH1 and should be inspected monthly during the first year of operation and in the spring and fall thereafter. Any standing water observed during inspection of the catchbasin manhole that does not drain away may indicate a blocked orifice. The orifice structure should be kept clear of debris and any offending debris should be removed. Access to the Vortex Valve orifice can be achieved through CBMH1.

10. Conclusions

The proposed development will require the connection of sanitary and watermain services to the existing municipal services on Burton Avenue. Storm services for the development will be conveyed to Burton Avenue.

Quantity control for the development is provided in the StormTech underground storage units and surface ponding allowing post-development peak flows to be released at the allowable values through a vortex valve.

Quality control via permeable pavers, underground infiltration chambers, and an OGS unit is provided in order to maintain the quality of stormwater and to satisfy the MECP Enhanced level requirements.

A treatment train approach has been implemented in-order to reduce the phosphorous loading for the site.

All of which is respectfully submitted,

Pearson Engineering Ltd.

Mac Pinkney, P.Eng.
Project Engineer

Mike Dejean, P.Eng.
Partner, Manager of Engineering Services

Appendix A

Water Servicing and Fire Flow Calculations

PEARSON ENGINEERING

181 Burton Avenue, Barrie
Water Flow Calculations

Design Criteria

Demand per capita (Q):	225 L/cap/day	
Peak Rate Factor (Max. Hour)	4.13	(Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)
Max. Day Factor	2.75	(Table 3-1: Peaking Factors, MOE Design Guidelines for Drinking-Water Systems)

Site Data

Description	Density	Units	Flow Rate	Peaking Factors	
Townhouses	1.67 people/unit	24 units	225 L/cap/d	MAX DAY FACTOR*	2.75
				PEAK RATE FACTOR*	4.13
				*From MOE Manual based on Population of 500 - 1,000	

Calculate Population

Pop. Apartments	=	1.67	x	24
Pop. Total	=	40	people	

Calculate Average Day Demand (ADD)

ADD	=	225	x	40
ADD	=	9,018	L/day	
ADD	=	0.10	L/s	

Calculate Max Day Flow

MDF	=	0.10	x	2.75
MDF	=	0.29	L/s	

Calculate Peak Hour Demand

PHD	=	0.10	x	4.13
PHD	=	0.43	L/s	

PEARSON ENGINEERING

181 Burton Avenue, Barrie
Fire Flow Calculations

Required fire flow calculations as per the Fire Underwritors Survey's Water Supply for Public Fire Protection (DRAFT) - 2020:

Location:	181 Burton Avenue, Barrie	
OBC Occupancy:	Residential Occupancies - Class C	
Building Foot Print:	448 m^2	
# of Stories:	5	**Apartment Building**

Date: 2023-12-19
Project: 181 Burton Ave
Project Number: 19100

Type	Construction Class	Charge
5	Wood Frame	1.5
4	Heavy Timber (A-D)	0.80 - 1.50
3	Ordinary	1.0
2	Non-Combustible	0.8
1	Fire Resistive	0.6

Construction Class: Type 5 — Wood Frame

Automated Sprinkler Protection:

		Credit	Total
NFPA 13 sprinkler standard	Yes	30%	
Standard Water Supply	Yes	10%	50%
Fully Supervised System	Yes	10%	

Contents	Charge
Non-Combustible	-25%
Limited Combustible	-15%
Combustible	0%
Free Burning	15%
Rapid Burning	25%

Contents Factor: Limited Combustible — **Charge:** -15%

Exposure Side & Building	Length - Height Ratio	Distance to Exposure Building (m)	Charge
North Ex. Residential	> 100	> 30.1	0%
East Ex. Residential/Commercial	> 100	11.1	15%
South Ex. Commercial	> 100	> 30.1	0%
West Ex. Residential/Commercial	> 100	9.2	20%
		Total:	**35%**

Note: the max Exposure Adjustment Charge is 75%

Separation Distance	Charge
0.0 - 3.0 m	20% - 25%
3.1 - 10.0 m	15% - 20%
10.1 - 20.0 m	10% - 15%
20.1 - 30.0 m	0% - 10%
> 30.1 m	0%

Note: As per FUS 2020 Table 6, Charges for Type 5 were used for Non-Combustible Class

Are Buildings Contigious? No

Fire Resistant Building: Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating? No

Calculations: *C* = 1.5 — Wood Frame

Required Fire Flow: ***RFF = 220 x C x √A***

Where: *RFF* = required fire flow in liters per minute
C = Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements in building considered

Total Effective Area: *A* = 2,240 m²

RFF = 15,618 L/min
Round to Nearest 1000 L/min: RFF = 16,000 L/min

* Must be > 2,000 L/min or < 45,000 L/min

Correction Factors:

Contents Charge		-2,400	L/min
RFF Adjusted for Contents	**E =**	13,600	L/min
Reduction For Sprinkler	**F =**	6,800	L/min
RFF w/ Sprinkler Reduction		6,800	L/min
Exposure Charge	**G =**	4,760	L/min
RFF w/ Exposure Charge		11,560	L/min

As per "Water Supply for Public Fire Protection" pg.20 note H:
RFF **= E - F + G**

RFF = 13600 L/min - 6800 L/min + 4760 L/min
RFF = 11560 L/min

Required Fire Flow: **RFF =** 11,560 L/min

Round to Nearest 1000 L/min: **RFF = 12,000 L/min**

RFF= 3,168 GPM

RFF = 200 L/s

FLOW TEST RESULTS

FIRST FOR FIRE, LIFE SAFETY & SECURITY
VIPOND INC
est. 1945

DATE : MAY 19, 2022

TIME VALVE OPENED : 8:35 AM

TIME LAST VALVE CLOSED : 8:50 AM

LOCATION : 181 BURTON AVENUE
BARRIE
ONTARIO

TEST BY : LEN.K–ETHAN.B

NAME OF CITY OPERATOR : CAM NEWITT

STATIC PRESSURE : 64 PSI

SIZE OF UNDERGROUND MAIN :

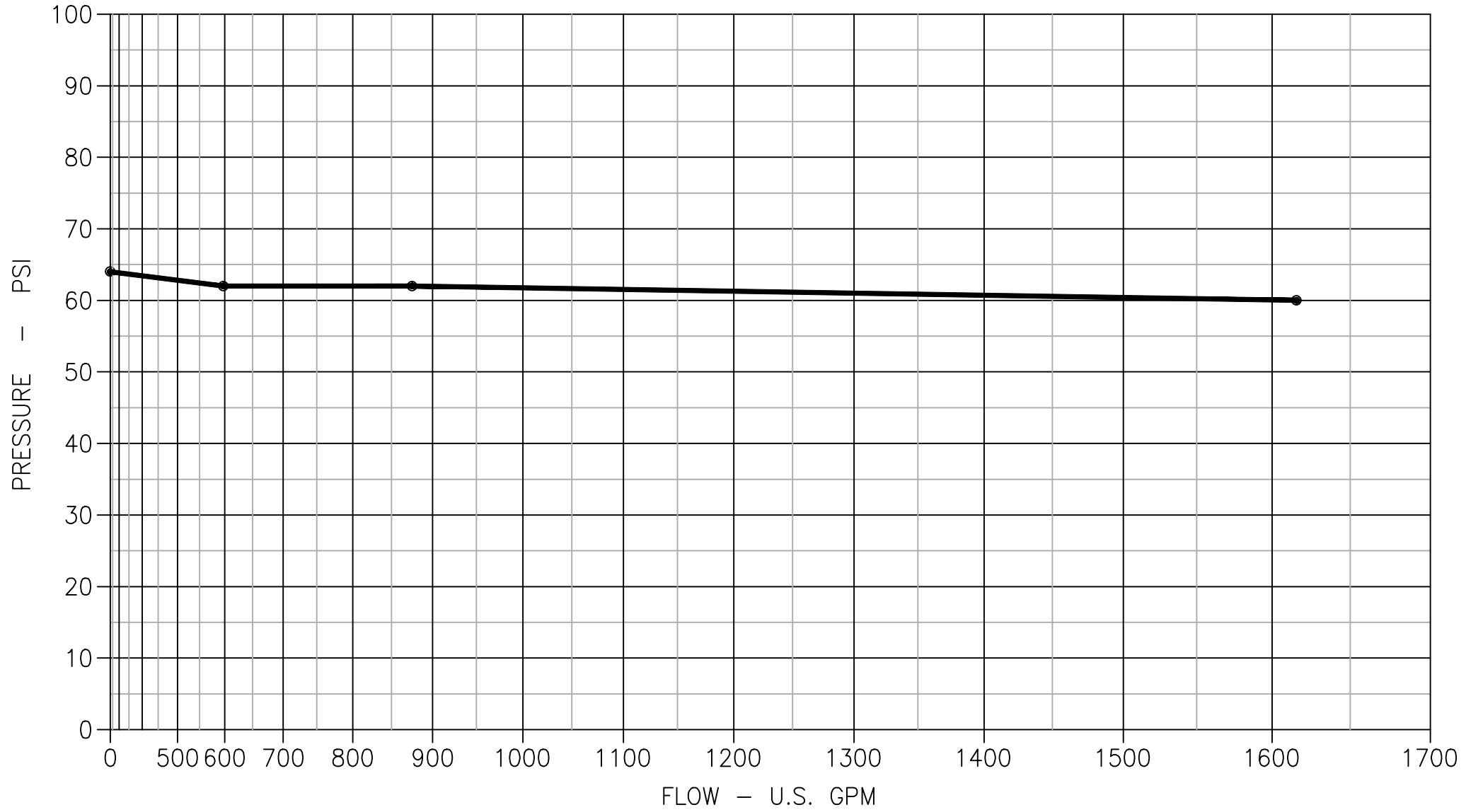
TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO–EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1–3/4	0.995	62	45	597
2	1	2–1/2	0.90	62	27	876
3	2	2–1/2	0.90	60	23	1618

FIRST FOR FIRE, LIFE SAFETY & SECURITY

VIPOND INC est. 1945

181 BURTON AVENUE	BY : LEN.K/ETHAN.B
BARRIE	OFFICE : BARRIE
ONTARIO	TEST BY : VIPOND & PUC
	DATE : MAY 19, 2022

STATIC:		RESIDUAL:		FLOW:
64 PSI	TEST#1	62 PSI	@	597 GPM
	TEST#2	62 PSI	@	876 GPM
	TEST#3	60 PSI	@	1618 GPM



Appendix B

Sanitary Servicing Calculations

PEARSON ENGINEERING

181 Burton Avenue, Barrie
Sanitary Flow Calculations

Design Criteria

Flow per capita (Q):	225 L/cap/day	
Peak Flow	Qp = P * Q * M / 86,400 + I * A	
Peaking Factor (Harmon Formula)	$M = 1 + (14 / (4 + (P / 1{,}000)^{0.5}))$	Where: 2 <= "M" <= 4
Infiltration Allowance:	0.10 L/s/ha	

Site Data

Description		Density		Units		Flow Rate
Apartment	1.67	people/unit	24	units	225	L/cap/d

Calculate Population

Pop. Apartments	=	1.67	x	24
Pop.	=	40	people	

Calculate Average Daily Flows

ADF (L/s)	=	225	x	40
ADF (L/s)	=	9,018	L/day	
ADF (L/s)	=	0.10	L/s	

Calculate Peaking Factor

$$M = 1 + \frac{14}{4 + \left(\frac{40}{1{,}000}\right)^{0.5}} + 0.1 * 0.12$$

M	=	4.35		
		Use Max Peaking Factor 4		

Calculate Peak Flow

Qp	=	0.10	x	4.00	
	=	0.42	L/s		
Infiltration Allowance	=	0.10	x	0.20	ha
	=	0.02	L/s		
Qp (Inc. Infiltration Allowance)	=	0.44	L/s		

181 Burton Avenue, Barrie
Sanitary Sewer Pipe Design Sheet

n = 0.013
Q_p = (P/1,000)*Q*M/86.4 (Q = 340 l/day/person)
M = 1+(14/(4+(P/1,000)^0.5)) (1.5 <= M <= 4)
Q_i = (P*90)/86,400 (90 L/Capita/Day)
(includes peaking factor)
D_{min} = 200 mm

$Q_{tot} = Q_p + Q_i$
Design Period = 20 years
Q_{Design} = 35 m^3/ha/day (commercial)
V: > 0.6 m/s & < 3.0 m/s
Grade: >0.5%
Population (P) = 45 PPL / ha or 3.5 PPL / Unit

FILE: 19100
CONTRACT/PROJECT: ISM, Burton Ave.
DATE: 19-Dec-23

Areas	MANHOLE		DWELLING	AREA	DENSITY	POP.	POP.	M	Qp	LENGTH	LENGTH (ACC.)	Qi	TOTAL Q	D	S	Q FULL	V FULL	PERCENT FULL
	FROM	TO	UNITS	(ha)	P.P.U	(P)	(ACC.)		(l/s)	(m)	(m)	(l/s)	(l/s)	(mm)	(%)	(l/s)	(m/s)	(%)
-	SAN CAP	SAN MH1	24	0.20	1.67	40.08	40.08	4.00	0.63	1.3	1.30	0.04	0.67	250	2.30	90.20	1.84	0.75
-	SAN MH1	SAN MH2	0	0.00	1.67	0.00	40.08	4.00	0.00	18.1	18.10	0.00	0.67	250	2.30	90.20	1.84	0.75

Appendix C

Stormwater Management Calculations

181 Burton Ave, Barrie
Calculation of Runoff Coefficients

Runoff Coefficient	=	0.15	0.95	0.95	0.08	0.95		Weighted
Surface Cover	=	Grass	Asphalt	Building	Forest	Conc.		Runoff Coefficient
Pre-Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	1998	750	0	0	1248	0		0.11
Pre Total	1998	750	0	0	1248	0		0.11
Post-Development	Total Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)	Area (m^2)		
1	457	338	110	0	0	8		0.36
2	143	42	93	0	0	8		0.71
3	448	0	0	448	0	0		0.95
4	394	69	299	0	0	27		0.81
5	459	111	342	0	0	6		0.76
6	98	98	0	0	0	0		0.15
Post Total	1998	658	844	448	0	48		0.69

181 Burton Ave, Barrie
Pre-Development Peak Flows

City of Barrie

Storm Event (yrs)	Coeff A	Coeff B	Coeff C
2	678.085	4.699	0.781
5	853.608	4.699	0.766
10	975.865	4.699	0.760
25	1146.275	4.922	0.757
50	1236.152	4.699	0.751
100	1426.408	5.273	0.759

Modified Rational Method
Q = CiCIA / 360

Where:
- Q - Flow Rate (m^3/s)
- C - Rational Method Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

Area Number	1	
Area	0.20	ha
Runoff Coefficient	0.11	
Time of Concentration	10	min
Return Rate	2	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	83.1	mm/hr
Pre-Development Peak Flow	0.005	m^3/s
Return Rate	5	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	108.9	mm/hr
Pre-Development Peak Flow	0.006	m^3/s
Return Rate	10	year
Peaking Coefficient (Ci)	1.00	
Rainfall Intensity	126.5	mm/hr
Pre-Development Peak Flow	0.007	m^3/s
Return Rate	25	year
Peaking Coefficient (Ci)	1.10	
Rainfall Intensity	148.2	mm/hr
Pre-Development Peak Flow	0.010	m^3/s
Return Rate	50	year
Peaking Coefficient (Ci)	1.20	
Rainfall Intensity	164.2	mm/hr
Pre-Development Peak Flow	0.012	m^3/s
Return Rate	100	year
Peaking Coefficient (Ci)	1.25	
Rainfall Intensity	180.2	mm/hr
Pre-Development Peak Flow	0.013	m^3/s

181 Burton Ave, Barrie
Post-Development Peak Flows

City of Barrie

Storm Event (yrs)	Coeff A	Coeff B	Coeff C
2	**678.085**	**4.699**	**0.781**
5	**853.608**	**4.699**	**0.766**
10	**975.865**	**4.699**	**0.760**
25	**1146.275**	**4.922**	**0.757**
50	**1236.152**	**4.699**	**0.751**
100	**1426.408**	**5.273**	**0.759**

Modified Rational Method
Q = CiCIA / 360

Where:
- Q - Flow Rate (m^3/s)
- C - Rational Method Runoff Coefficient
- I - Storm Intensity (mm/hr)
- A - Area (ha.)
- Ci - Peaking Coefficient

	Uncontrolled Area to Burton Ave	Uncontrolled Area to North	Controlled Area to Burton Ave
Area Number	1	6	2 to 5
Area	0.05 ha	0.01 ha	0.14 ha
Runoff Coefficient	0.36	0.15	0.83
Time of Concentration	10 min	10 min	10 min
Return Rate	2 year	2 year	2 year
Peaking Coefficient (Ci)	1.00	1.00	1.00
Rainfall Intensity	83.1 mm/hr	83.1 mm/hr	83.1 mm/hr
Post-Development Peak Flow	0.004 m^3/s	0.000 m^3/s	0.028 m^3/s
Return Rate	5 year	5 year	5 year
Peaking Coefficient (Ci)	1.00	1.00	1.00
Rainfall Intensity	108.9 mm/hr	108.9 mm/hr	108.9 mm/hr
Post-Development Peak Flow	0.005 m^3/s	0.000 m^3/s	0.036 m^3/s
Return Rate	10 year	10 year	10 year
Peaking Coefficient (Ci)	1.00	1.00	1.00
Rainfall Intensity	126.5 mm/hr	126.5 mm/hr	126.5 mm/hr
Post-Development Peak Flow	0.006 m^3/s	0.001 m^3/s	0.042 m^3/s
Return Rate	25 year	25 year	25 year
Peaking Coefficient (Ci)	1.10	1.10	1.10
Rainfall Intensity	148.2 mm/hr	148.2 mm/hr	148.2 mm/hr
Post-Development Peak Flow	0.007 m^3/s	0.001 m^3/s	0.054 m^3/s
Return Rate	50 year	50 year	50 year
Peaking Coefficient (Ci)	1.20	1.20	1.20
Rainfall Intensity	164.2 mm/hr	164.2 mm/hr	164.2 mm/hr
Post-Development Peak Flow	0.009 m^3/s	0.001 m^3/s	0.065 m^3/s
Return Rate	100 year	100 year	100 year
Peaking Coefficient (Ci)	1.25	1.25	1.25
Rainfall Intensity	180.2 mm/hr	180.2 mm/hr	180.2 mm/hr
Post-Development Peak Flow	0.010 m^3/s	0.001 m^3/s	0.075 m^3/s

PEARSON ENGINEERING

181 Burton Ave.
Stage-Storage-Discharge Table

Elevation (m)	Area (m^2)	Volume (m^3)	Cum. Vol. (m^3)	Orifice Head (m)	Orifice Flow (m^3/s)	Weir Head (m)	Weir Flow (m^3/s)	Total Flow (m^3/s)
230.80	0	0	0	0.06	0.000	0.00	0.000	0.0002
230.90	0	8	8	0.16	0.001	0.00	0.000	0.0012
230.95	0	8	16	0.21	0.001	0.00	0.000	0.0014
231.00	0	8	23	0.26	0.001	0.00	0.000	0.0013
231.10	0	8	31	0.36	0.001	0.00	0.000	0.0011
231.20	0	8	39	0.46	0.001	0.00	0.000	0.0013
231.30	0	8	47	0.56	0.001	0.00	0.000	0.0014
231.36	0	8	55	0.62	0.001	0.00	0.000	0.0015
231.40	0	8	63	0.66	0.002	0.00	0.000	0.0015
231.51	0	8	70	0.77	0.002	0.00	0.000	0.0017
231.60	0	0	70	0.86	0.002	0.00	0.000	0.0018
231.70	0	0	70	0.96	0.002	0.00	0.000	0.0019
231.80	0	0	70	1.06	0.002	0.00	0.000	0.0020
231.90	0	0	70	1.16	0.002	0.00	0.000	0.0021
232.00	0	0	70	1.26	0.002	0.00	0.000	0.0022
232.10	0	0	70	1.36	0.002	0.00	0.000	0.0023
232.13	0	0	70	1.39	0.002	0.00	0.000	0.0024
232.20	344	12	82	1.46	0.002	0.00	0.000	0.0025
232.30	579	46	129	1.56	0.003	0.00	0.000	0.0026
232.40	730	65	194	1.66	0.003	0.00	0.000	0.0027
232.43	755	22	216	1.69	0.003	0.00	0.000	0.0028

Orifice	
Diameter	63 mm
Invert Elevation	230.71
Orifice Constant	0.63
Orifice Centroid	230.74
Orifice Flow Formula	$0.80\pi(D/2000)^2x(2x9.81xH)^{0.5}$

Major Storm Control Weir	
Width	6.00 m
Invert of Weir	232.43 m
Weir Flow Formula	$1.7WH^{1.5}$

PEARSON ENGINEERING

181 Burton Ave, Barrie
Quantity Control Volume Calculations

DATE:	06-Feb-24
FILE:	19100
CONTRACT/PROJECT:	181 Burton
COMPLETED BY:	MJWP

Modified Rational Method Parameters

Pre Development Area (ha)	Post Development Area (ha)	Time of Concentration (min)	Time Increments (min)	Pre Development Runoff Coefficient	Post Development Runoff Coefficient
0.20	0.14	10	5	0.11	0.83

Note: Refer to page Calculation of Runoff Coefficients for detailed calculations of Modified Rational Method parameters.

Pre-Development Runoff Rate

	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year
C	0.11	0.11	0.11	0.12	0.13	0.13
I	83.11	108.92	126.55	148.15	164.22	180.15
A	0.20	0.20	0.20	0.20	0.20	0.20
Q	0.005	0.006	0.007	0.010	0.012	0.013

Note: Q= 0.00278CIA

Rainfall Station	City of Barrie

SWM Pond Design Input

Storm Event (yrs)	Chicago Storm Coefficient A	Chicago Storm Coefficient B	Chicago Storm Coefficient C	Allowable Outflow (m3/s)	Post Development Runoff Coefficient
2	678.09	4.70	0.78	0.001	0.83
5	853.61	4.70	0.77	0.001	0.83
10	975.87	4.70	0.76	0.001	0.83
25	1146.28	4.92	0.76	0.002	0.91
50	1236.15	4.70	0.75	0.002	0.99
100	1426.41	5.27	0.76	0.002	1.00

Results

Storm Event (yrs)	Storage (m^3)	Time (min)
2	36	330
5	52	410
10	64	485
25	80	420
50	100	470
100	114	510

Note: Storage volume calculated as per Hydrology Handbook, Second Edition, American Society of Civil Engineers, 1996

Time (min)	2 Year Intensity mm/hr	2 Year Inflow m^3/s	2 Year Outflow m^3/s	2 Year Storage m^3	Difference	5 Year Intensity mm/hr	5 Year Inflow m^3/s	5 Year Outflow m^3/s	5 Year Storage m^3	Difference	10 Year Intensity mm/hr	10 Year Inflow m^3/s	10 Year Outflow m^3/s	10 Year Storage m^3	Difference	25 Year Intensity mm/hr	25 Year Inflow m^3/s	25 Year Outflow m^3/s	25 Year Storage m^3	Difference	50 Year Intensity mm/hr	50 Year Inflow m^3/s	50 Year Outflow m^3/s	50 Year Storage m^3	Difference	100 Year Intensity mm/hr	100 Year Inflow m^3/s	100 Year Outflow m^3/s	100 Year Storage m^3	Difference
255	8.82	0.003	0.001	36	0	12.07	0.004	0.001	50	0	14.27	0.005	0.001	61	0	17.03	0.006	0.002	78	0	19.00	0.008	0.002	96	0	20.94	0.008	0.002	109	0
260	8.69	0.003	0.001	36	0	11.90	0.004	0.001	51	0	14.06	0.005	0.001	61	0	16.79	0.006	0.002	78	0	18.73	0.007	0.002	96	0	20.64	0.008	0.002	109	0
265	8.57	0.003	0.001	36	0	11.73	0.004	0.001	51	0	13.87	0.005	0.001	61	0	16.55	0.006	0.002	78	0	18.47	0.007	0.002	97	0	20.35	0.008	0.002	109	0
270	8.44	0.003	0.001	36	0	11.56	0.004	0.001	51	0	13.67	0.005	0.001	61	0	16.32	0.006	0.002	78	0	18.22	0.007	0.002	97	0	20.07	0.008	0.002	109	0
275	8.33	0.003	0.001	36	0	11.40	0.004	0.001	51	0	13.49	0.004	0.001	61	0	16.10	0.006	0.002	78	0	17.97	0.007	0.002	97	0	19.79	0.008	0.002	110	0
280	8.21	0.003	0.001	36	0	11.25	0.004	0.001	51	0	13.31	0.004	0.001	62	0	15.89	0.006	0.002	79	0	17.73	0.007	0.002	97	0	19.53	0.008	0.002	110	0
285	8.10	0.003	0.001	36	0	11.10	0.004	0.001	51	0	13.13	0.004	0.001	62	0	15.68	0.006	0.002	79	0	17.50	0.007	0.002	97	0	19.27	0.008	0.002	110	0
290	7.99	0.003	0.001	36	0	10.96	0.004	0.001	51	0	12.96	0.004	0.001	62	0	15.48	0.006	0.002	79	0	17.28	0.007	0.002	97	0	19.03	0.008	0.002	110	0
295	7.89	0.003	0.001	36	0	10.82	0.004	0.001	51	0	12.80	0.004	0.001	62	0	15.28	0.006	0.002	79	0	17.06	0.007	0.002	98	0	18.78	0.008	0.002	111	0
300	7.79	0.003	0.001	36	0	10.68	0.004	0.001	51	0	12.64	0.004	0.001	62	0	15.09	0.006	0.002	79	0	16.85	0.007	0.002	98	0	18.55	0.007	0.002	111	0
305	7.69	0.003	0.001	36	0	10.55	0.003	0.001	51	0	12.48	0.004	0.001	62	0	14.91	0.005	0.002	79	0	16.65	0.007	0.002	98	0	18.32	0.007	0.002	111	0
310	7.59	0.003	0.001	36	0	10.42	0.003	0.001	51	0	12.33	0.004	0.001	62	0	14.73	0.005	0.002	79	0	16.45	0.007	0.002	98	0	18.10	0.007	0.002	111	0
315	7.50	0.002	0.001	36	0	10.30	0.003	0.001	51	0	12.18	0.004	0.001	62	0	14.55	0.005	0.002	79	0	16.26	0.006	0.002	98	0	17.89	0.007	0.002	111	0
320	7.41	0.002	0.001	36	0	10.17	0.003	0.001	51	0	12.04	0.004	0.001	62	0	14.38	0.005	0.002	79	0	16.07	0.006	0.002	98	0	17.68	0.007	0.002	111	0
325	7.32	0.002	0.001	36	0	10.05	0.003	0.001	51	0	11.90	0.004	0.001	62	0	14.22	0.005	0.002	79	0	15.88	0.006	0.002	98	0	17.48	0.007	0.002	112	0
330	7.24	0.002	0.001	36	0	9.94	0.003	0.001	51	0	11.77	0.004	0.001	63	0	14.06	0.005	0.002	80	0	15.71	0.006	0.002	99	0	17.28	0.007	0.002	112	0
335	7.15	0.002	0.001	36	0	9.83	0.003	0.001	51	0	11.63	0.004	0.001	63	0	13.90	0.005	0.002	80	0	15.53	0.006	0.002	99	0	17.08	0.007	0.002	112	0
340	7.07	0.002	0.001	36	0	9.72	0.003	0.001	51	0	11.51	0.004	0.001	63	0	13.75	0.005	0.002	80	0	15.36	0.006	0.002	99	0	16.90	0.007	0.002	112	0
345	6.99	0.002	0.001	36	0	9.61	0.003	0.001	51	0	11.38	0.004	0.001	63	0	13.60	0.005	0.002	80	0	15.20	0.006	0.002	99	0	16.71	0.007	0.002	112	0
350	6.92	0.002	0.001	36	0	9.51	0.003	0.001	52	0	11.26	0.004	0.001	63	0	13.45	0.005	0.002	80	0	15.04	0.006	0.002	99	0	16.53	0.007	0.002	112	0
355	6.84	0.002	0.001	36	0	9.41	0.003	0.001	52	0	11.14	0.004	0.001	63	0	13.31	0.005	0.002	80	0	14.88	0.006	0.002	99	0	16.36	0.007	0.002	112	0
360	6.77	0.002	0.001	36	0	9.31	0.003	0.001	52	0	11.02	0.004	0.001	63	0	13.17	0.005	0.002	80	0	14.73	0.006	0.002	99	0	16.19	0.006	0.002	113	0
365	6.70	0.002	0.001	36	0	9.21	0.003	0.001	52	0	10.91	0.004	0.001	63	0	13.04	0.005	0.002	80	0	14.58	0.006	0.002	99	0	16.02	0.006	0.002	113	0
370	6.63	0.002	0.001	36	0	9.12	0.003	0.001	52	0	10.80	0.004	0.001	63	0	12.91	0.005	0.002	80	0	14.43	0.006	0.002	99	0	15.86	0.006	0.002	113	0
375	6.56	0.002	0.001	36	0	9.02	0.003	0.001	52	0	10.69	0.004	0.001	63	0	12.78	0.005	0.002	80	0	14.29	0.006	0.002	99	0	15.70	0.006	0.002	113	0
380	6.49	0.002	0.001	36	0	8.93	0.003	0.001	52	0	10.59	0.004	0.001	63	0	12.65	0.005	0.002	80	0	14.15	0.006	0.002	99	0	15.55	0.006	0.002	113	0
385	6.43	0.002	0.001	36	0	8.85	0.003	0.001	52	0	10.48	0.003	0.001	63	0	12.53	0.005	0.002	80	0	14.01	0.006	0.002	100	0	15.40	0.006	0.002	113	0
390	6.36	0.002	0.001	36	0	8.76	0.003	0.001	52	0	10.38	0.003	0.001	63	0	12.41	0.005	0.002	80	0	13.88	0.006	0.002	100	0	15.25	0.006	0.002	113	0
395	6.30	0.002	0.001	36	0	8.68	0.003	0.001	52	0	10.28	0.003	0.001	63	0	12.29	0.004	0.002	80	0	13.75	0.005	0.002	100	0	15.10	0.006	0.002	113	0
400	6.24	0.002	0.001	36	0	8.59	0.003	0.001	52	0	10.19	0.003	0.001	63	0	12.18	0.004	0.002	80	0	13.62	0.005	0.002	100	0	14.96	0.006	0.002	113	0
405	6.18	0.002	0.001	36	0	8.51	0.003	0.001	52	0	10.09	0.003	0.001	63	0	12.06	0.004	0.002	80	0	13.49	0.005	0.002	100	0	14.82	0.006	0.002	113	0
410	6.12	0.002	0.001	36	0	8.43	0.003	0.001	52	0	10.00	0.003	0.001	63	0	11.95	0.004	0.002	80	0	13.37	0.005	0.002	100	0	14.69	0.006	0.002	114	0
415	6.06	0.002	0.001	36	0	8.36	0.003	0.001	52	0	9.91	0.003	0.001	63	0	11.85	0.004	0.002	80	0	13.25	0.005	0.002	100	0	14.55	0.006	0.002	114	0
420	6.01	0.002	0.001	36	0	8.28	0.003	0.001	52	0	9.82	0.003	0.001	63	0	11.74	0.004	0.002	80	0	13.13	0.005	0.002	100	0	14.42	0.006	0.002	114	0
425	5.95	0.002	0.001	36	0	8.21	0.003	0.001	52	0	9.73	0.003	0.001	63	0	11.64	0.004	0.002	80	0	13.02	0.005	0.002	100	0	14.30	0.006	0.002	114	0
430	5.90	0.002	0.001	36	0	8.14	0.003	0.001	52	0	9.65	0.003	0.001	63	0	11.53	0.004	0.002	80	0	12.91	0.005	0.002	100	0	14.17	0.006	0.002	114	0
435	5.85	0.002	0.001	36	0	8.06	0.003	0.001	52	0	9.56	0.003	0.001	63	0	11.44	0.004	0.002	80	0	12.80	0.005	0.002	100	0	14.05	0.006	0.002	114	0
440	5.80	0.002	0.001	36	0	8.00	0.003	0.001	52	0	9.48	0.003	0.001	63	0	11.34	0.004	0.002	80	0	12.69	0.005	0.002	100	0	13.93	0.006	0.002	114	0
445	5.75	0.002	0.001	36	0	7.93	0.003	0.001	52	0	9.40	0.003	0.001	63	0	11.24	0.004	0.002	80	0	12.58	0.005	0.002	100	0	13.81	0.006	0.002	114	0

: Maximum Storage Volume

181 Burton Ave, Barrie
Permeable Pavers Sizing Calculations

Infiltration volumes from MOE Stormwater Management Planning and Design Manual to size Permeable Pavers Table 3.2 Water Quality Storage Requirements are as follows:

Design Area Total	=	0.10	ha		
Total Imperviousness	=	77%			
Storage Volume	=	37.2	m^3/ha		(Enhanced 80% long-term S.S. removal)
Area 1 Storage Volume Required	=	0.10		x	37.2
	=	3.7	m^3		

Required storage volume calculated over 25 mm of the total impervious area on the site as per the LSRCA Volume Control:

Storage Volume	=	1,340	x	0.025
Area Storage Volume Required	=	33.5	m^3	

Note: Therefore, the storage required with 25 mm over the total impervious area on the site governs.

Find Storage Volume provided in Permeable Pavers:

<u>Catchment 2 Area</u>			
Area of Pavers (A)	=	25.1	m^2
Depth of Trench (d)	=	0.50	m
Storage Volume (V)	=	0.4(A x d)	
	=	5.0	m^3
<u>Catchment 4 Area</u>			
Area of Pavers (A)	=	70.4	m^2
Depth of Trench (d)	=	0.50	m
Storage Volume (V)	=	0.4(A x d)	
	=	14.1	m^3
<u>Catchment 5 Area</u>			
Area of Pavers (A)	=	74.1	m^2
Depth of Trench (d)	=	0.50	m
Storage Volume (V)	=	0.4(A x d)	
	=	14.8	m^3

		Required		**Provided**	
Area Storage Volume	=	33.5	m^3	33.9	m^3

Use Equation 4.12 to find Area of Permeable Pavers:

Area Design Volume (V)	=	33.9	m^3
Depth of Controlling Filter Medium (d)	=	0.65	m
Coefficient of Permeability of the Controlling Filter Media (k)	=	45.0	mm/hr
Operating Head of Water On the Filter (h)	=	0.15	m
Design Drawdown Time (t)	=	24	hr

Surface Area Of Filter (A) $= \frac{1000Vd}{k(h+d)t}$

$= 25.5 \ m^2$

		Required		Provided	
Area 1 Surface Area	=	25.5	m^2	169.6	m^2

181 Burton Ave, Barrie
Volume Control Sizing Calculations

As the site meets the definition of Major Development, find the required volume control storage as per LSRCA Guidelines Section 2.2.2. The control requirement volume is calculated over 25 mm of the total impervious area on the site:

Storage Volume	=	1,340		x	0.025
Area Storage Volume Required	=	33.5	m^3		

Find storage volume provided in Rooftop Soakaway Pits:

Total Volume Provided	=	33.9	m^3	(As per Permeable Pavers Sizing Sheet)

Find total equivalent rainfall depth provided in Rooftop Soakaway Pits:

$$\text{Total Equivalent Rainfall Depth} = \frac{\text{Permeable Pavers Volume}}{\text{Impervious Area Over Site}}$$

$$= \frac{33.9\ m^3}{1{,}340\ m^2}$$

$$= 25.3\ mm$$

Therefore,the required storage volume will be made for the first 25.3 mm of any rainfall event with the use of the proposed permeable pavers.

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Q = 0.0028*C*I*A (m^3/s)
C = Runoff Coefficient
I = Rainfall Intensity = $A/(Time+B)^C$
A = Area (ha)

181 Burton Ave, Barrie
Storm Sewer Pipe Design Sheet
5-Year Storm Event

DATE: 06-Feb-24
FILE: 19100
CONTRACT/PROJECT: 181 Burton Ave

Areas	Manhole		Length	Increment			Total	Flow Time (min)		I	Total Q	S	D	Q Full	V Full
	From	To	(m)	C	A	CA	CA	TO	IN	(mm/h)	(m^3/s)	(%)	(mm)	(m^3/s)	(m/s)
Area 3	Roof	CBMH4	4.1	0.95	0.04	0.04	0.04	10.00	0.07	108.92	0.01	0.50	300	0.07	0.97
-	CBMH4	CBMH3	14.4	0.00	0.00	0.00	0.04	10.07	0.28	108.52	0.01	0.40	300	0.06	0.87
Area 5	CBMH3	CBMH2	25.6	0.76	0.05	0.03	0.08	10.35	0.49	106.99	0.02	0.40	300	0.06	0.87
Area 4	CBMH2	MH1	13.8	0.81	0.04	0.03	0.11	10.84	0.27	104.38	0.03	0.40	300	0.06	0.87
-	MH1	CBMH1	4.0	0.00	0.00	0.00	0.11	10.84	0.08	104.38	0.03	0.40	300	0.06	0.87
Area 2	CBMH1	STM CDS OGS	21.1	0.71	0.01	0.01	0.12	10.92	0.41	103.98	0.03	0.40	300	0.06	0.87
-	STM CDS OGS	BURTON AVE	14.0	0.00	0.00	0.00	0.12	11.32	0.24	101.96	0.03	0.50	300	0.07	0.97

ECHELON ENVIRONMENTAL
55 Albert Street, Suite #200
Markham, ON, Canada
Tel 905-948-0000

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Vaerkstedsvej 20
DK-4600 Koege, Denmark
Tel +45 56 63 85 80 Fax +45 56 63 86 80

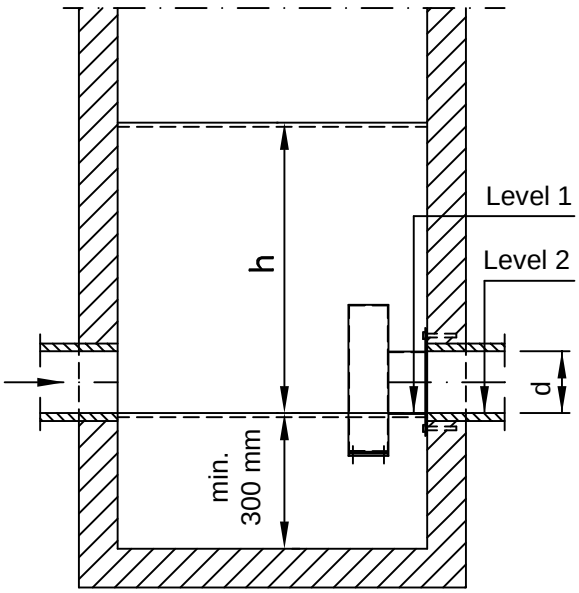
Date 25.01.2022 Ref. No. 24102.1.1
Type CEV 225 160 P
Q = 1.6 l/s at h = 0.69 m

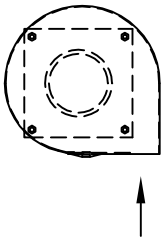
Projekt: 181 Burton Ave., Barrie, ON

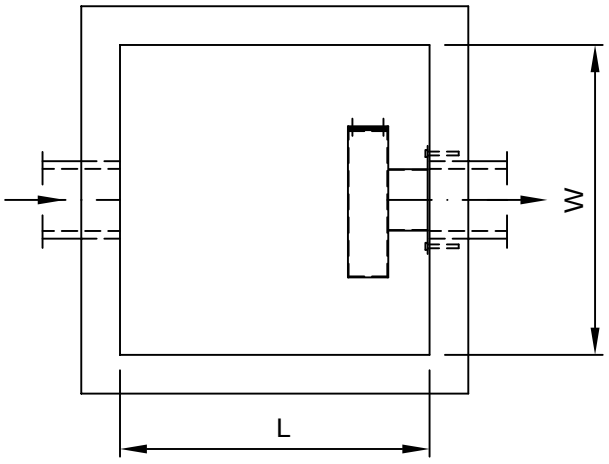
-

When ordering please state the information as follows:

1)	**Ref. No.**	**:**	**24102.1.1**
2)	**d**	**:**	**min. ø 65 mm**
3)	**L**	**:**	**min. 2xD mm**
4)	**W**	**:**	**min. 1.5xD mm**





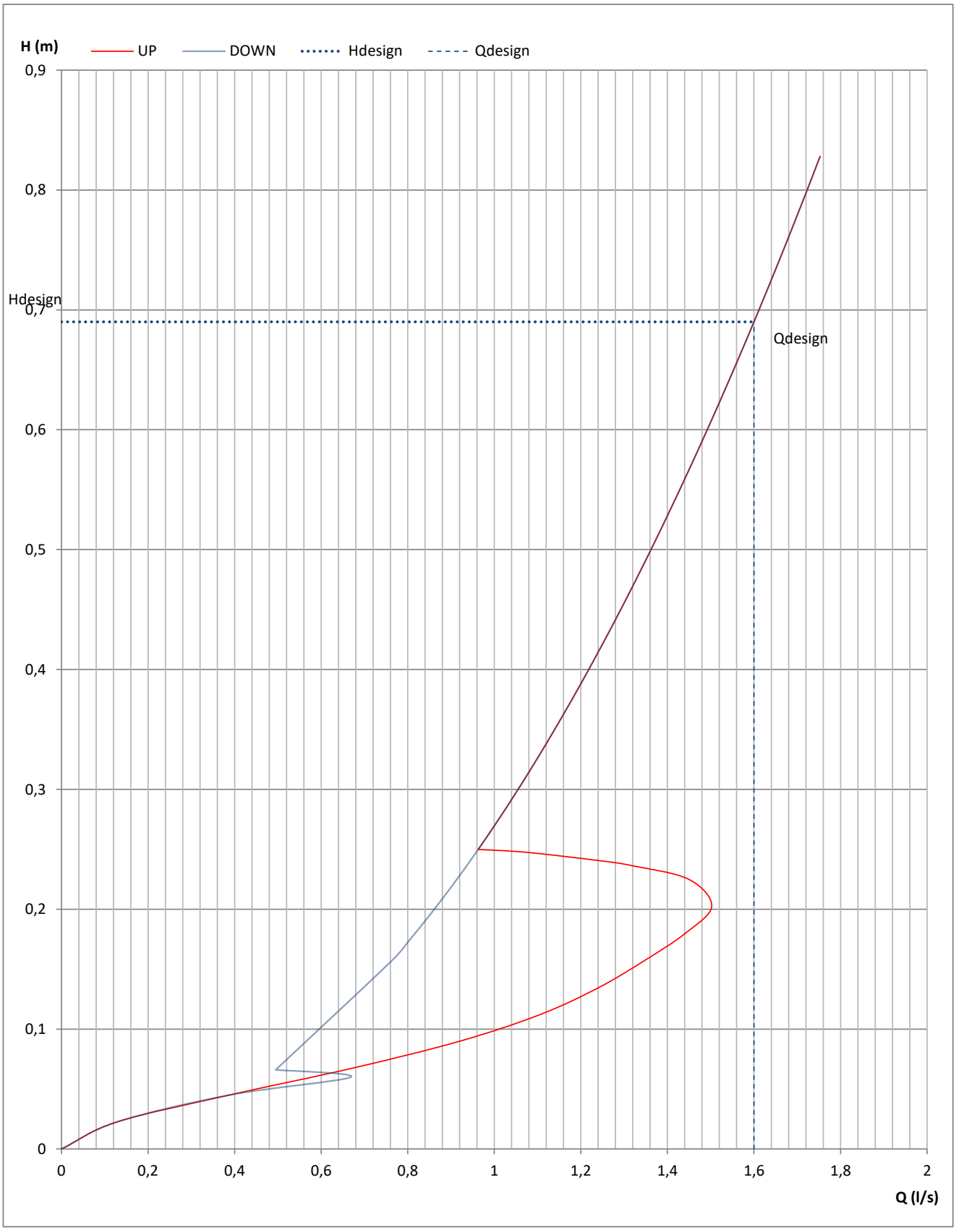


Installation

The flow regulator is provided with a mounting plate. The mounting plate must be fastened to the wall of the chamber covering the outlet opening by means of drilled or embedded bolts/threaded rods of acid-resistant steel.
Please note that level 1 and level 2 must be equal.
Tightening between plate and wall of chamber is made with waterresistant silicone, rubber sealing or the like.

Ref: 24102.1.1
Date: 25-01-2022
Design: Q=1,6l/s
H=0,69m

CEV 225 ø63



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Appendix D

Water Balance Calculations

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181 Burton Ave, Barrie
Post-Development Water Balance (With No Infiltration)

Catchment Designation	Site				
	Grassed	Impervious	Building	Total	
Area	658	892	448	1998	
Pervious Area	658	0	0	658	
Impervious Area	0	892	448	1340	
Infiltration Factors					
Topography Infiltration Factor	0.2	0.0	0.0		(From MOE Table 3.1 for Rolling Land)
Soil Infiltration Factor	0.3	0.0	0.0		(From MOE Table 3.1 for an average value
Land Cover Infiltration Factor	0.1	0.0	0.0		between Medium combinations of clay and loam
MOE Infiltration Factor	0.6	0.0	0.0		and Open sandy loam)
Actual Infiltration Factor	0.6	0.0	0.0		
Run-Off Coeffiecient	0.4	1.0	1.0		
Runoff from Impervious Surfaces*	0.0	0.95	0.95		
Inputs (per Unit Area)					
Precipitation	907	907	907	907	(Precipitation values from Environment Canada)
Run-On	0	0	0	0	
Other Inputs	0	0	0	0	
Total Inputs	907	907	907	907	
Outputs (per Unit Area)					
Precipitation Surplus	428.0	861.7	861.7	718.8	
Net Surplus	428.0	861.7	861.7	718.8	
Evapotranspiration	479.0	45.4	45.4	188.2	(Evapotranspiration values from LSRCA
Infiltration	256.8	0.0	0.0	84.6	Appendix A: Climate Data Tables Barrie Creeks
Rooftop Infiltration	0.0	0.0	0.0	0.0	Subwatershed)
Total Infiltration	256.8	0.0	0.0	84.6	
Runoff Pervious Areas	171.2	0.0	0.0	56.4	
Runoff Impervious Areas	0.0	861.7	861.7	577.8	
Total Runoff	171.2	861.7	861.7	634.2	
Total Outputs	907.0	907.0	907.0	907.0	
Difference (Inputs - Outputs)	0.0	0.0	0.0		
Inputs (Volumes)					
Precipitation	597	809	406	1813	
Run-On	0	0	0	0	
Other Inputs	0	0	0	0	
Total Inputs	597	809	406	1813	
Outputs (Volumes)					
Precipitation Surplus	282	769	386	1436	
Net Surplus	282	769	386	1436	
Evapotranspiration	315	40	20	376	
Infiltration	169	0	0	169	
Rooftop Infiltration	0	0	0	0	
Total Infiltration	169	0	0	169	
Runoff Pervious Areas	113	0	0	113	
Runoff Impervious Areas	0	769	386	1155	
Total Runoff	113	769	386	1267	
Total Outputs	597	809	406	1813	
Difference (Inputs - Outputs)	0	0	0	0	

Note: Highlighted cells are input cells.

PEARSON ENGINEERING

181 Burton Ave, Barrie
Post-Development Water Balance (With Infiltration)

Catchment Designation	Site				
	Grassed	Impervious	Building (With Infiltration)	Total	
Area	658	892	448	1998	
Pervious Area	658	0	0	658	
Impervious Area	0	892	448	1340	
Infiltration Factors					
Topography Infiltration Factor	0.2	0	0		(From MOE Table 3.1 for Rolling Land)
Soil Infiltration Factor	0.3	0	0		(From MOE Table 3.1 for an average value between Medium combinations of clay and loam and Open sandy loam)
Land Cover Infiltration Factor	0.1	0	0		
MOE Infiltration Factor	0.6	0	0		
Actual Infiltration Factor	0.6	0	0		
Run-Off Coeffiecient	0.4	1.0	1.0		
Runoff from Impervious Surfaces*	0	0.95	0.95		
Inputs (per Unit Area)					
Precipitation	907	907	907	932.9	(Precipitation values from Environment Canada)
Run-On	0	0	0	0	
Other Inputs	0	0	0	0	
Total Inputs	907	907	907	932.9	
Outputs (per Unit Area)					
Precipitation Surplus	428.0	861.7	861.7	718.8	
Net Surplus	428.0	861.7	22.7	530.7	
Evapotranspiration	479.0	45.4	884.4	376.3	(Evapotranspiration values from LSRCA Appendix A: Climate Data Tables Barrie Creeks Subwatershed)
Infiltration	256.8	0.0	0.0	84.6	
Rooftop Infiltration	0.0	0.0	**839.0**	188.1	
Total Infiltration	256.8	0.0	839.0	272.7	Depth of rainfall over the rooftop required to be infiltrated to achieve water balance.
Runoff Pervious Areas	171.2	0.0	0.0	56.4	
Runoff Impervious Areas	0.0	861.7	-816.4	201.7	
Total Runoff	171.2	861.7	-816.4	258.0	
Total Outputs	907.0	907.0	907.0	907.0	
Difference (Inputs - Outputs)	0.0	0.0	0.0	25.9	
Inputs (Volumes)					
Precipitation	597	809	406	1864	
Run-On	0	0	0	0	
Other Inputs	0	0	0	0	
Total Inputs	597	809	406	1864	
Outputs (Volumes)					
Precipitation Surplus	282	769	386	1436	
Net Surplus	282	769	10	1061	
Evapotranspiration	315	40	396	752	
Infiltration	169	0	0	169	
Rooftop Infiltration	0	0	376	376	
Total Infiltration	169	0	376	**545**	
Runoff Pervious Areas	113	0	0	113	
Runoff Impervious Areas	0	769	-366	403	
Total Runoff	113	769	-366	516	
Total Outputs	597	809	406	1813	
Difference (Inputs - Outputs)	0	0	0	52	

Note: Highlighted cells are input cells.

181 Burton Ave, Barrie
Water Balance Calculations

Annual Rainfall Depth Required:

Depth of Rainfall Required	=	839.0	mm	(From Post-Development Water Balance (w. Infiltration))

Find Percent of Annual Rainfall that Required Rainfall Depth represents:

Annual Rainfall for Study Area	=	932.9	mm
% Annual Rainfall	=	839.0 / 932.9	mm / mm
	=	90%	

From MOE Figure C-2, 90% of annual rainfall occurs for storm events of 21 mm or less.

Find storage volume required for rainfall events of 25 mm to Rooftop Infiltration Gallery:

Roof Top Area	=	448	m^2		
Rainfall Depth	=	21	mm		
Storage Volume Required	=	A	x	D	
	=	448	x	21	
	=	9.4	m^3		

Minimum Infiltration Volume as per City of Barrie Storm Drainage and Stormwater Management Policies and Design Guidelines Section 4.1.3 is as follows:

Storage Volume Required	=	Site Area	x	5	mm
	=	1,998	x	0.005	
	=	10.0	m^3		

It is proposed to infiltrate the 21 mm storm event over the rooftop area, resulting in a required storage volume of 10.0 m³ exceeding the City of Barrie and LSRCA Criteria. Therefore, water balance for the site is achieved.

Use Equation 4.12 to find Area of infiltration chambers in order to demonstrate a drawdown time between 24 - 48 hours:

Area Design Volume (V)	=	9.4	m^3	
Depth of Controlling Filter Medium (d)	=	0.61	m	
Coefficient of Permeability of the Controlling Filter Media (k)	=	39.0	mm/hr	(Factored Percolation Time as per Azimuth's Hydrogeological Assessment, dated August 2023)
Design Drawdown Time (t)	=	36	hr	
Surface Area Of Filter (A)	=	1,000Vd / kdt		
	=	6.7	m^2	

		Required		**Provided**
Area 1 Surface Area	=	6.7	m^2	36.4 m^2

Therefore, the bottom area of the infiltration chambers provides adequate to provide a drawdown time between 24 and 48 hours.

Appendix E

Phosphorus Budget Calculations

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181 Burton Ave, Barrie
Phosphorus Budget

Barrie Creeks	Forest	Hay-Pasture	High Intensity Residential	Wetland
Phosphorus Export (kg/ha/year)	0.05	0.07	1.32	0.05

Pre-Development Condition:

	Forest	Hay-Pasture	High Intensity Residential	Wetland
Area (ha)	0.12	0.08	0.00	0.00
Total P (kg)	0.01	0.01	0.00	0.00

Total Pre-Development P (kg) **0.01**

Post-Development Condition (Uncontrolled):

	Forest	Hay-Pasture	High Intensity Residential	Wetland
Area (ha):	0.00	0.00	0.20	0.00
Total P (kg) :	0.00	0.00	0.26	0.00

Total Uncontrolled Post-Development (kg): **0.26**

Post-Development Condition (Controlled):

Untreated Area	Forest	Hay-Pasture	High Intensity Residential	Wetland
Area (ha):	0.00	0.00	0.06	0.00
Total P (kg) :	0.00	0.00	0.07	0.00

Without Treatment
Total Post Development (kg): 0.07

Area Draining to Rooftop Infiltration	Forest	Hay-Pasture	High Intensity Residential	Wetland
Area (ha):	0.00	0.00	0.04	0.00
Total P (kg) :	0.00	0.00	0.06	0.00

Soakaway Infiltration
Total P (kg): 0.06
Soakaway Infiltration Proficiency (%): 60
P Removed (kg): 0.04
P Remaining (kg): 0.02

Area Draining to Permeable Pavers, Quantity Control, and OGS Treatment Unit:	Forest	Hay-Pasture	High Intensity Residential	Wetland
Area (ha):	0.00	0.00	0.10	0.00
Total P (kg) :	0.00	0.00	0.13	0.00

Sand or Media Filters	
Total P (kg):	0.13
Sand or Media Filters Proficiency (%):	45
P Removed (kg):	0.06
P Remaining (kg):	0.07
Underground Storage	
Total P Remaining from Permeable Pavers(kg):	0.07
Underground Storage Proficiency (%):	25
P Removed (kg):	0.02
P Remaining (kg):	0.05
Oil Grit Separator	
Total P Remaining from Underground Storage (kg):	0.05
Oil Grit Separator Proficiency (%):	20
P Removed (kg):	0.01
P Remaining (kg):	0.04
Total Site P (kg):	**0.14**

Phosphorus Offsetting Calculation:

As per the LSRCA's Phosphorous Offsetting Policy, dated May 2023, the required fee for the development is:

Total Post-Development Phosphorous Remaining over Pre-Development Conditions:

Total Post-Development P (kg):	=	0.14	-	0.01
	=	0.13		
LSPOP Fee =	$35,770 x 2.5 x Weight (kg)		(Plus Administrative Fee)	
LSPOP Fee =	=	35,770 x 2.5 x 0.13		
Sub-Total LSPOP Fee:	**=**	**$11,625**		
LSPOP Administrative Fee (15%):	**=**	$11,625	x	0.15
	=	**$1,744**		
Total LSPOP Fee:	**=**	$11,625	+	$1,744
Total LSPOP Fee:	**=**	**$13,369**		

Appendix F

Oil/Grit Separator Details & Maintenance Manual

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON ETV PARTICLE SIZE DISTRIBUTION

Project: 181 Burton Avenue
Location: Barrie, ON
OGS ID: OGS

Engineer: Pearson Engineering
Contact: Mac Pinkney, P. Eng
Report Date: 21-Aug-23

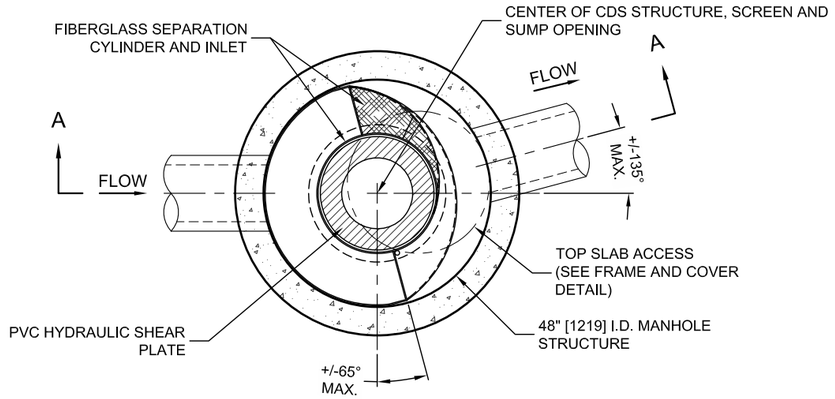
Area: 0.14 ha
C: 0.83
CDS Model: 4

Treatment Capacity: 27.2 l/s
Particle Size Distribution: ETV

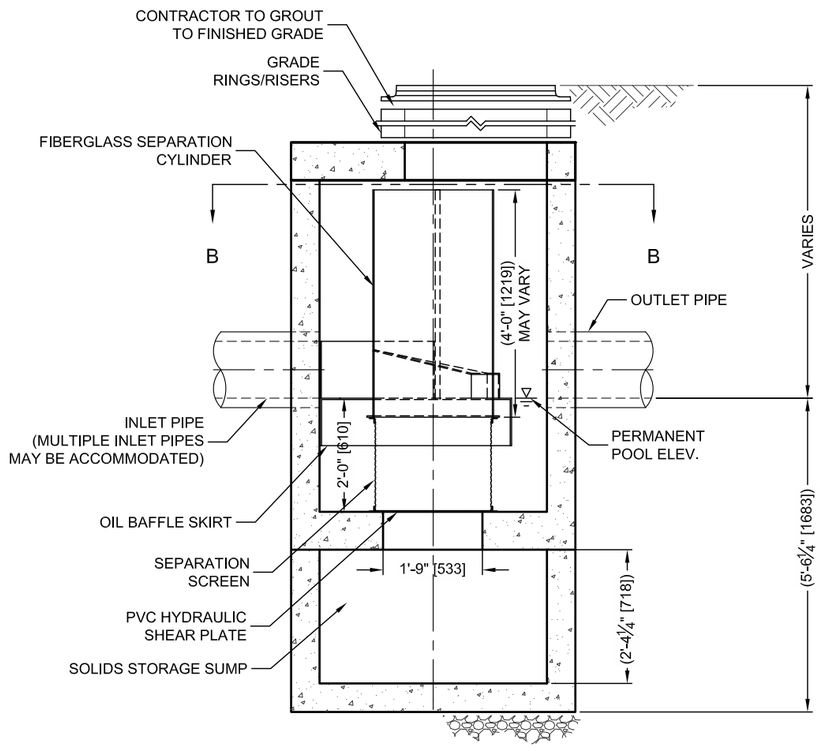
Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	8.7%	8.7%	0.2	0.2	0.6	76.8	6.7
1.0	10.8%	19.6%	0.3	0.3	1.2	76.0	8.2
1.5	9.5%	29.0%	0.5	0.5	1.8	75.3	7.1
2.0	8.4%	37.4%	0.6	0.6	2.4	74.5	6.3
2.5	6.8%	44.2%	0.8	0.8	3.0	73.8	5.0
3.0	5.6%	49.8%	1.0	1.0	3.6	73.1	4.1
3.5	5.1%	54.9%	1.1	1.1	4.2	72.4	3.7
4.0	4.9%	59.8%	1.3	1.3	4.8	71.7	3.5
4.5	4.1%	63.9%	1.5	1.5	5.3	71.0	2.9
5.0	3.5%	67.4%	1.6	1.6	5.9	70.4	2.5
6.0	4.9%	72.3%	1.9	1.9	7.1	69.1	3.4
7.0	4.0%	76.3%	2.3	2.3	8.3	67.8	2.7
8.0	3.2%	79.5%	2.6	2.6	9.5	66.6	2.2
9.0	2.2%	81.7%	2.9	2.9	10.7	65.4	1.5
10.0	2.0%	83.7%	3.2	3.2	11.9	64.3	1.3
15.0	8.2%	91.9%	4.8	4.8	17.8	59.2	4.8
20.0	3.4%	95.2%	6.5	6.5	23.8	55.1	1.9
25.0	2.5%	97.7%	8.1	8.1	29.7	51.7	1.3
30.0	1.4%	99.1%	9.7	9.7	35.6	49.0	0.7
35.0	0.3%	99.4%	11.3	11.3	41.6	46.9	0.1
40.0	0.6%	100.0%	12.9	12.9	47.5	45.2	0.3
45.0	0.0%	100.0%	14.5	14.5	53.5	43.9	0.0
50.0	0.0%	100.0%	16.2	16.2	59.4	42.8	0.0
							70.0

Predicted Net Annual Load Removal Efficiency = 70.0%
Predicted % Annual Rainfall Treated = 100.0%

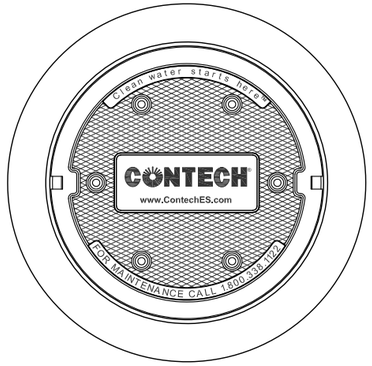
1 - Based on 27 years of hourly rainfall data from Canadian Station 6110557, Barrie ON
2 - TSS Removal Rate Based on ETV Testing



PLAN VIEW B-B
N.T.S.



ELEVATION A-A
N.T.S.



FRAME AND COVER
(DIAMETER VARIES)
N.T.S.

CDS-4-C DESIGN NOTES

THE STANDARD CDS-4-C CONFIGURATION IS SHOWN.

SITE SPECIFIC DATA REQUIREMENTS

STRUCTURE ID			
WATER QUALITY FLOW RATE (CFS OR L/s)			*
PEAK FLOW RATE (CFS OR L/s)			*
RETURN PERIOD OF PEAK FLOW (YRS)			*
SCREEN APERTURE (2400)			*
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 WEIGHTS, PLEASE CONTACT YOUR CONTECH ENGINEERED SOLUTIONS LLC REPRESENTATIVE. www.ContechES.com
4. CDS WATER QUALITY STRUCTURE SHALL BE IN ACCORDANCE WITH ALL DESIGN DATA AND INFORMATION CONTAINED IN THIS DRAWING.
5. STRUCTURE SHALL MEET AASHTO HS20 LOAD RATING, ASSUMING GROUNDWATER ELEVATION AT, OR BELOW, THE OUTLET PIPE INVERT ELEVATION. ENGINEER OF RECORD TO CONFIRM ACTUAL GROUNDWATER ELEVATION. CASTINGS SHALL MEET HS20 (AASHTO M 306) AND BE CAST WITH THE CONTECH LOGO.
6. IF REQUIRED, PVC HYDRAULIC SHEAR PLATE IS PLACED ON SHELF AT BOTTOM OF SCREEN CYLINDER. REMOVE AND REPLACE AS NECESSARY DURING MAINTENANCE CLEANING.

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 CDS MANHOLE STRUCTURE (LIFTING CLUTCHES PROVIDED).
C. CONTRACTOR TO ADD 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.

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

CDS-4-C ONLINE CDS STANDARD DETAIL

◆ Verification Statement ◆ Verification Statement ◆ Verification Statement ◆

VERIFICATION STATEMENT

GLOBE Performance Solutions

Verifies the performance of

CDS Hydrodynamic Separator®

Developed by CONTECH Engineered Solutions LLC
Scarborough, Maine, USA

Registration: GPS-ETV_VR2020-03-31_CDS_r1

In accordance with

ISO 14034:2016

Environmental Management —
Environmental Technology Verification (ETV)

John D. Wiebe, PhD
Executive Chairman
GLOBE Performance Solutions

March 31, 2020
Vancouver, BC, Canada

GLOBE PERFORMANCE SOLUTIONS

Verification Body
GLOBE Performance Solutions
404 – 999 Canada Place | Vancouver, B.C | Canada |V6C 3E2

Technology description and application

The CDS® is a Stormwater treatment device designed to remove pollutants, including sediment, trash and hydrocarbons from Stormwater runoff. The CDS is typically comprised of a manhole that houses flow and screening controls that use a combination of swirl concentration and continuous deflective separation.

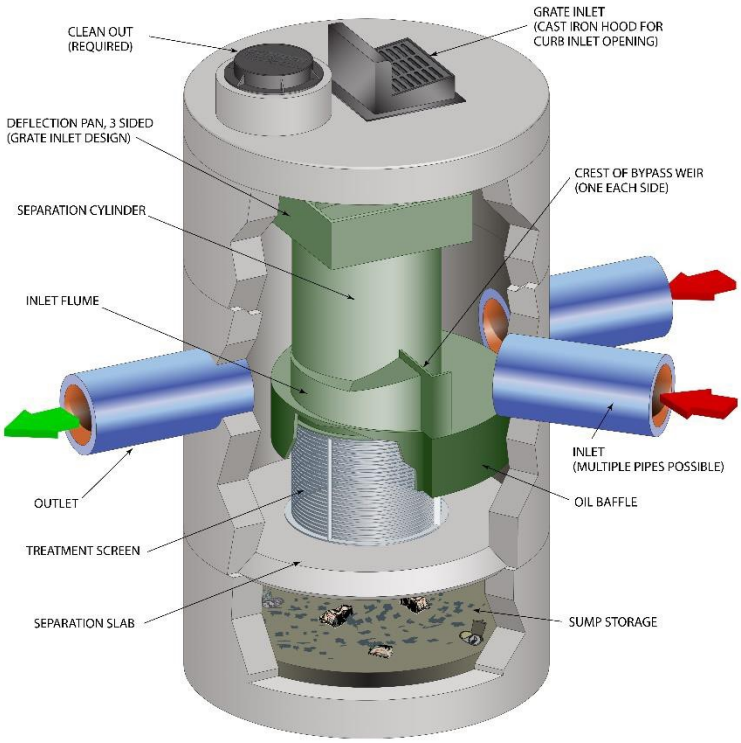


Figure 1. Graphic of typical inline CDS unit and core components.

When stormwater runoff enters the CDS unit, treatment flows are routed through one of two inlet flumes into the separation chamber. During high intensity rain events the water surface elevation in the system rises and once flows exceed the capacity of the inlet flumes a portion of flow begins to overtop the weirs at the top of the flumes which serve as an internal bypass. Flows routed over the internal bypass are then conveyed to the outlet. The water and associated gross pollutants contained within the separation cylinder are kept in continuous circular motion by the energy generated from the incoming flow. This has the effect of a continuous deflective separation of the pollutants and their eventual deposition into the sump storage below. A perforated screen plate allows the filtered water to pass through to a volute return system and thence to the outlet pipe. The oil and other light liquids are retained within the oil baffle. Figure 1 shows a schematic representation of a typical CDS unit including critical components

Performance conditions

The data and results published in this Technology Fact Sheet were obtained from the testing program conducted on the Contech CDS-4 OGS device, in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014). The Procedure was prepared by the Toronto and Region Conservation Authority (TRCA) for Environment Canada's Environmental Technology Verification (ETV) Program requirements. A copy of the Procedure may be accessed at www.etvcanada.ca.

Performance claim(s)

Capture test[1]:

During the sediment capture test, the Contech CDS OGS device with a false floor set to 50% of the manufacturer's recommended maximum sediment storage depth and a constant influent test sediment concentration of 200 mg/L, removed 74, 70, 63, 53, 45, 42, 32 and 23 percent of influent sediment by mass at surface loading rates of 40, 80, 200, 400, 600, 1000, 1400 and 1893 L/min/m^2, respectively.

Scour test[a]:

During the scour test, the Contech CDS OGS device with preloaded test sediment reaching 50% of the manufacturer's recommended maximum sediment storage depth, generated corrected effluent concentrations of 1.8, 6.5, 8.2, 11.2, and 309.3 mg/L during a test run[2] with approximately 5 minute duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Light liquid re-entrainment test[a]:

During the light liquid re-entrainment test, the Contech CDS OGS device with surrogate low-density polyethylene beads preloaded within the oil collection skirt area, representing floating liquid to a volume equal to a depth of 50.8 mm over the sedimentation area, retained 100, 99.9, 98.6, 99.5, and 99.7 percent of loaded beads by volume during a test run[2] with 5 minutes duration surface loading rates of 200, 800, 1400, 2000, and 2600 L/min/m^2, respectively.

Performance results

The test sediment consisted of ground silica (1 – 1000 micron) with a specific gravity of 2.65, uniformly mixed to meet the particle size distribution specified in the testing procedure. The *Procedure for Laboratory Testing of Oil Grit Separators* requires that the three sample average of the test sediment particle size distribution (PSD) meet the specified PSD percent less than values within a boundary threshold of 6%. The comparison of the average test sediment PSD to the CETV specified PSD in Figure 2 indicates that the test sediment used for the capture and scour tests met this condition.

[1] The claim can be applied to other units smaller or larger than the tested unit as long as the untested units meet the scaling rule specified in the Procedure for Laboratory of Testing of Oil Grit Separators (Version 3.0, June 2014)

[2] See variance #1 in "Variances from testing procedure" section below.

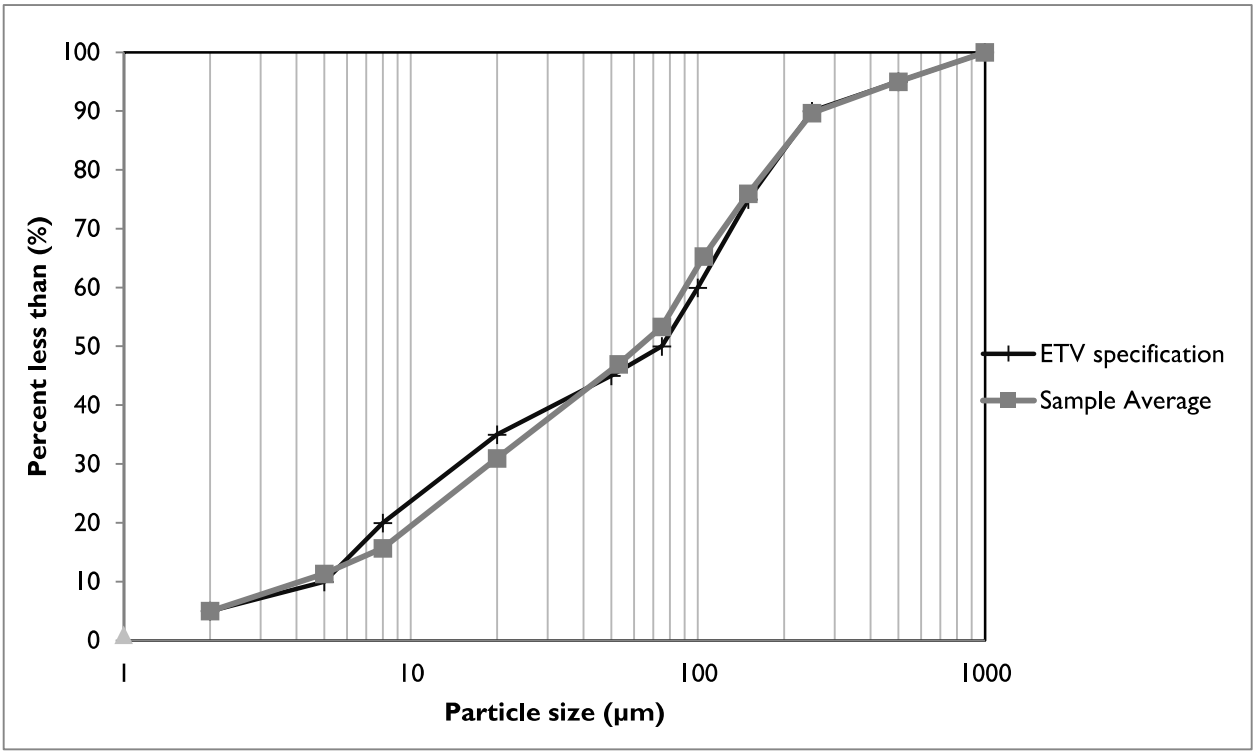


Figure 2. The three sample average particle size distribution (PSD) of the test sediment used for the capture and scour test compared to the specified PSD.

The capacity of the device to retain sediment was determined at eight surface loading rates using the modified mass balance method. This method involved measuring the mass and particle size distribution of the injected and retained sediment for each test run. Performance was evaluated with a false floor simulating the technology filled to 50% of the manufacturer's recommended maximum sediment storage depth. The test was carried out with clean water that maintained a sediment concentration below 20 mg/L. Based on these conditions, removal efficiencies for individual particle size classes and for the test sediment as a whole were determined for each of the tested surface loading rates (Table 1).

In some instances, the calculated removal efficiencies were above 100% for certain particle size fractions (marked with asterisks in Table 1). These discrepancies are not entirely avoidable and may be attributed to errors relating to the blending of sediment, collection of representative samples, and laboratory analysis of PSD. Due to these errors, caution should be exercised in applying the removal efficiencies by particle size fraction for the purposes of sizing the tested device (see Bulletin # CETV 2016-11-0001). The results for "all particle sizes by mass balance" in Table 1 are based on measurements of the total injected and retained sediment mass, and are therefore not subject to sampling or PSD analysis errors.

Table 1. Removal efficiencies (%) at specified surface loading rates.

Particle size fraction (µm)	Surface loading rate (L/min/m²)							
	40	80	200	400	600	1000	1400	1893
>500	100	100*	66	79	97	100*	84	77
250 - 500	100*	100*	85	95	100*	91	100*	75
150 - 250	99	100*	100*	97	100	75	68	37
105 - 150	100	100*	100*	74	47	45	30	27
75 - 105	90	91	100*	61	33	36	26	18
53 - 75	71	27	54	100	42	44	15	16
20 - 53	65	51	20	8	10	8	5	4
8 - 20	28	22	9	7	1	1	2	1
5 – 8	30	9	0	8	2	0	1	0
<5	11	8	16	2	6	5	2	2
All particle sizes by mass balance	**73.5**	**70.3**	**63.4**	**52.6**	**45.1**	**41.5**	**32.4**	**23.0**

* Removal efficiencies were calculated to be above 100%. Calculated values typically ranged between 101 and 175% (average 126%). Higher values were observed for the >500 µm and 150-250 µm size fractions during the 80 L/min/m² test run. See text and Bulletin # CETV 2016-11-0001 for more information.

Figure 3 compares the particle size distribution (PSD) of the three sample average of the test sediment to the PSD of the retained sediment at each of the tested surface loading rates. As expected, the capture efficiency for fine particles was generally found to decrease as surface loading rates increased.

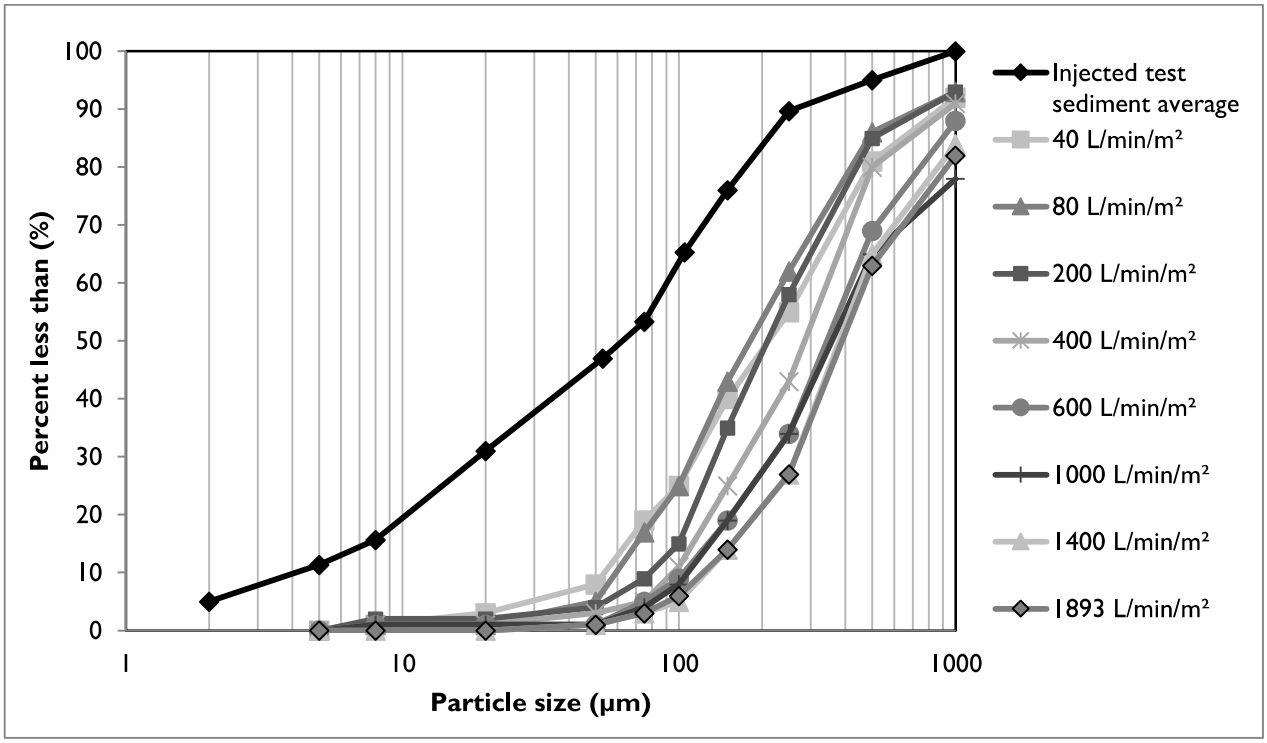


Figure 3. Particle size distribution of retained sediment in relation to the injected test sediment average.

Table 2 shows the results of the sediment scour and re-suspension test. This test involved preloading 10.2 cm of fresh test sediment into the sedimentation sump of the device. The sediment was placed on a false floor to mimic a device filled to 50% of the maximum recommended sediment storage depth. Sediment was also pre-loaded to the same depth on the separation slab (see Figure 1) since sediment was observed to have been deposited in this area during the sediment capture test. Clean water was run through the device at five surface loading rates over a 36 minute period. The test was stopped and started after the second flow rate in order to change flow meters. Each flow rate was maintained for 5 minutes with a one minute transition time between flow rates. Effluent samples were collected at one minute sampling intervals and analyzed for Suspended Sediment Concentration (SSC) and PSD by recognized methods. The effluent samples were subsequently adjusted based on the background concentration of the influent water and the smallest 5% of particles captured during the 40 L/min/m^2 sediment capture test, as per the method described in Bulletin # CETV 2016-09-0001.

Table 2. Scour test adjusted effluent sediment concentration.

Run	Surface loading rate (L/min/m^2)	Run time (min)	Background sample concentration (mg/L)	Adjusted effluent suspended sediment concentration (mg/L)[†]	Average (mg/L)
1	200	1.03	0.5	1.0	1.8
		2.03		1.6	
		3.03		1.8	
		4.03		1.8	
		5.03		2.6	
2	800	6.23	2.0	5.0	6.5
		7.23		6.7	
		8.23		9.4	
		9.23		5.4	
		10.23		5.9	
3	1400	11.43[‡]	2.0	3.1	8.2
		12.43		11.0	
		13.43		14.6	
		14.43		7.1	
		15.43		5.2	
4	2000	17.20	3.2	7.3	11.2
		18.20		22.8	
		19.20		6.9	
		20.20		6.8	
		21.20		12.1	
5	2600	22.40	8.5	248.5	309.3
		23.40		83.0	
		24.40		438.9	
		25.40		338.7	
		26.40		437.5	

[†] The adjusted effluent suspended sediment concentration represents the actual measured effluent concentration minus the smallest 5% of sediment particles (i.e. d5) removed during the 40 L/min/m^2 capture test, minus the background concentration. For more information see Bulletin # CETV 2016-09-0001.

[‡] See variance #1 in "Variances from testing procedure" section below.

The results of the light liquid re-entrainment test used to evaluate the unit's capacity to prevent re-entrainment of light liquids are reported in Table 3. The test involved preloading 58.3 L (corresponding to a 5 cm depth over the collection sump area of 1.17m^2) of surrogate low-density polyethylene beads within the oil collection skirt and running clean water through the device at five surface loading rates (200, 800, 1400, 2000, and 2600 L/min/m^2) over a 38 minute period. As with the sediment scour test, flow was stopped and started after the second flow rate to change flow meters. Each flow rate was maintained for 5 minutes with approximately 1 minute transition time between flow rates. The effluent flow was screened to capture all re-entrained pellets throughout the test.

Table 3. Light liquid re-entrainment test results.

Target Flow (L/min/m^2)	Time Stamp	Collected Volume (L)	Collected Mass (g)	Percent re-entrained by volume	Percent retained by volume
200	10:48:42	27 pellets	0.8	0.01	99.99
800	10:55:09	0.07	41	0.12	99.88
1400	11:06:59	0.8	439	1.37	98.63
2000	11:13:00	0.31	177	0.53	99.47
2600	11:19:00	0.18	98	0.31	99.69
Interim Collection Net		0.025	14.2	0.04	99.96
Total Loaded		58.3	33398	--	--
Total Re-entrained		1.385	770	--	--
Percent Re-entrained and retained		--	--	2.38	97.62

Variances from testing Procedure

The following minor deviations from the *Procedure for Laboratory Testing of Oil-Grit Separators* (Version 3.0, June 2014) have been noted:

1. It was necessary to change flow meters during the scour and light liquid re-entrainment test, as the required flows exceeded the minimum and/or maximum range of any single meter. After the loading rate of 800 L/min/m^2, the flow was gradually shut down and re-initiated through the larger meter immediately after closing the valve controlling flows to the small meter. The transition time of 1-minute for each target flow was followed, resulting in an elapsed time of 3 minutes to reach the next target flow of 1400 L/min/m^2. This procedure was approved by CETV prior to testing, in recognition that most particles susceptible to scour at low flows would not be in the sump at higher flows. Similarly, re-entrainment of the oil beads was not expected to be significantly affected by the flow meter change.

2. As part of the capture test, evaluation of the 40 L/min/m^2 surface loading rate was split into 3 parts due to the long duration needed to feed the required minimum of 11.3 kg of test sediment into the unit. At the end of the first and second parts of the test, the flow rates were gradually shutdown to prevent capture of particles that would have been washed out under normal circumstances. The amended procedure was reviewed and approved by the verifier prior to testing.

3. Inflow concentrations during the 40 L/min/m^2 surface loading rate varied from 162 mg/L to 246 mg/L, which is wider than specified ±25 mg/L range in the Procedure.

Verification

This verification was first completed in March 2017 and is considered valid for subsequent renewal periods every three (3) years thereafter, subject to review and confirmation of the original performance and performance claims. The original verification was completed by the Toronto and Region Conservation Authority of Mississauga, Ontario, Canada using the Canadian ETV Program's General Verification Protocol (June 2012) and taking into account ISO 14034:2016. This ETV renewal is considered to meet the equivalency of an ETV verification completed using the International Standard ***ISO 14034:2016 Environmental management -- Environmental technology verification (ETV)***.

Data and information provided by Contech Engineered Solutions to support the performance claim included the following: Performance test report prepared by Alden Research Laboratory, Inc of Holden, Massachusetts, USA and dated February 2015; the report is based on testing completed in accordance with the Procedure for Laboratory Testing of Oil-Grit Separators (Version 3.0, June 2014).

What is ISO14034:2016 Environmental management – Environmental technology verification (ETV)?

ISO 14034:2016 specifies principles, procedures and requirements for environmental technology verification (ETV) and was developed and published by the International Organization for Standardization (ISO). The objective of ETV is to provide credible, reliable and independent verification of the performance of environmental technologies. An environmental technology is a technology that either results in an environmental added value or measures parameters that indicate an environmental impact. Such technologies have an increasingly important role in addressing environmental challenges and achieving sustainable development.

For more information on the CDS Stormwater Treatment System please contact:

CONTECH Engineered Solutions LLC
71 US Route 1, Suite F
Scarborough, ME
04074 USA
Tel: 207-885-9830
info@conteches.com
www.conteches.com

For more information on ISO 14034:2016 / ETV please contact:

GLOBE Performance Solutions
404 – 999 Canada Place
Vancouver, BC
V6C 3E2 Canada
Tel: 604-695-5018 / Toll Free: 1-855-695-5018
etv@globeperformance.com
www.globeperformance.com

CONTECH®
ENGINEERED SOLUTIONS

CDS® Inspection and Maintenance Guide

CDS TECHNOLOGIES

Maintenance

The CDS system should be inspected at regular intervals and maintained when necessary to ensure optimum performance. The rate at which the system collects pollutants will depend more heavily on site activities than the size of the unit. For example, unstable soils or heavy winter sanding will cause the grit chamber to fill more quickly but regular sweeping of paved surfaces will slow accumulation.

Inspection

Inspection is the key to effective maintenance and is easily performed. Pollutant transport and deposition may vary from year to year and regular inspections will help ensure that the system is cleaned out at the appropriate time. At a minimum, inspections should be performed twice per year (e.g. spring and fall) however more frequent inspections may be necessary in climates where winter sanding operations may lead to rapid accumulations, or in equipment washdown areas. Installations should also be inspected more frequently where excessive amounts of trash are expected.

The visual inspection should ascertain that the system components are in working order and that there are no blockages or obstructions in the inlet and separation screen. The inspection should also quantify the accumulation of hydrocarbons, trash, and sediment in the system. Measuring pollutant accumulation can be done with a calibrated dipstick, tape measure or other measuring instrument. If absorbent material is used for enhanced removal of hydrocarbons, the level of discoloration of the sorbent material should also be identified during inspection. It is useful and often required as part of an operating permit to keep a record of each inspection. A simple form for doing so is provided.

Access to the CDS unit is typically achieved through two manhole access covers. One opening allows for inspection and cleanout of the separation chamber (cylinder and screen) and isolated sump. The other allows for inspection and cleanout of sediment captured and retained outside the screen. For deep units, a single manhole access point would allows both sump cleanout and access outside the screen.

The CDS system should be cleaned when the level of sediment has reached 75% of capacity in the isolated sump or when an appreciable level of hydrocarbons and trash has accumulated. If absorbent material is used, it should be replaced when significant discoloration has occurred. Performance will not be impacted until 100% of the sump capacity is exceeded however it is recommended that the system be cleaned prior to that for easier removal of sediment. The level of sediment is easily determined by measuring from finished grade down to the top of the sediment pile. To avoid underestimating the level of sediment in the chamber, the measuring device must be lowered to the top of the sediment pile carefully. Particles at the top of the pile typically offer less resistance to the end of the rod than consolidated particles toward the bottom of the pile. Once this measurement is recorded, it should be compared to the as-built drawing for the unit to determine weather the height of the sediment pile off the bottom of the sump floor exceeds 75% of the total height of isolated sump.

Cleaning

Cleaning of a CDS systems should be done during dry weather conditions when no flow is entering the system. The use of a vacuum truck is generally the most effective and convenient method of removing pollutants from the system. Simply remove the manhole covers and insert the vacuum hose into the sump. The system should be completely drained down and the sump fully evacuated of sediment. The area outside the screen should also be cleaned out if pollutant build-up exists in this area.

In installations where the risk of petroleum spills is small, liquid contaminants may not accumulate as quickly as sediment. However, the system should be cleaned out immediately in the event of an oil or gasoline spill should be cleaned out immediately. Motor oil and other hydrocarbons that accumulate on a more routine basis should be removed when an appreciable layer has been captured. To remove these pollutants, it may be preferable to use absorbent pads since they are usually less expensive to dispose than the oil/water emulsion that may be created by vacuuming the oily layer. Trash and debris can be netted out to separate it from the other pollutants. The screen should be power washed to ensure it is free of trash and debris.

Manhole covers should be securely seated following cleaning activities to prevent leakage of runoff into the system from above and also to ensure that proper safety precautions have been followed. Confined space entry procedures need to be followed if physical access is required. Disposal of all material removed from the CDS system should be done in accordance with local regulations. In many jurisdictions, disposal of the sediments may be handled in the same manner as the disposal of sediments removed from catch basins or deep sump manholes.

CDS Model	Diameter		Distance from Water Surface to Top of Sediment Pile		Sediment Storage Capacity	
	ft	m	ft	m	y^3	m^3
CDS1515	3	0.9	3.0	0.9	0.5	0.4
CDS2015	4	1.2	3.0	0.9	0.9	0.7
CDS2015	5	1.3	3.0	0.9	1.3	1.0
CDS2020	5	1.3	3.5	1.1	1.3	1.0
CDS2025	5	1.3	4.0	1.2	1.3	1.0
CDS3020	6	1.8	4.0	1.2	2.1	1.6
CDS3025	6	1.8	4.0	1.2	2.1	1.6
CDS3030	6	1.8	4.6	1.4	2.1	1.6
CDS3035	6	1.8	5.0	1.5	2.1	1.6
CDS4030	8	2.4	4.6	1.4	5.6	4.3
CDS4040	8	2.4	5.7	1.7	5.6	4.3
CDS4045	8	2.4	6.2	1.9	5.6	4.3
CDS5640	10	3.0	6.3	1.9	8.7	6.7
CDS5653	10	3.0	7.7	2.3	8.7	6.7
CDS5668	10	3.0	9.3	2.8	8.7	6.7
CDS5678	10	3.0	10.3	3.1	8.7	6.7

Table 1: CDS Maintenance Indicators and Sediment Storage Capacities

Support

- Drawings and specifications are available at www.contechstormwater.com.
- Site-specific design support is available from our engineers.

Contech Engineered Solutions LLC provides site solutions for the civil engineering industry. Contech's portfolio includes bridges, drainage, sanitary sewer, stormwater, earth stabilization and wastewater treament products. For information, visit www.ContechES.com or call 800.338.1122

The product(s) described may be protected by one or more of the following US patents: 5,322,629; 5,624,576; 5,707,527; 5,759,415; 5,788,848; 5,985,157; 6,027,639; 6,350,374; 6,406,218; 6,641,720; 6,511,595; 6,649,048; 6,991,114; 6,998,038; 7,186,058; 7,296,692; 7,297,266; 7,517,450 related foreign patents or other patents pending.

CONTECH
ENGINEERED SOLUTIONS
800.925.5240
www.ContechES.com

CDS Inspection & Maintenance Log

CDS Model: _____ Location: _____

Date	Water depth to sediment[1]	Floatable Layer Thickness[2]	Describe Maintenance Performed	Maintenance Personnel	Comments

1. The water depth to sediment is determined by taking two measurements with a stadia rod: one measurement from the manhole opening to the top of the sediment pile and the other from the manhole opening to the water surface. If the difference between these measurements is less than the values listed in table 1 the system should be cleaned out. Note: to avoid underestimating the volume of sediment in the chamber, the measuring device must be carefully lowered to the top of the sediment pile.

2. For optimum performance, the system should be cleaned out when the floating hydrocarbon layer accumulates to an appreciable thickness. In the event of an oil spill, the system should be cleaned immediately.

Appendix G

Hydrogeological Assessment, Azimuth Environmental Consulting Inc., August 2023

REVISED

Hydrogeological Assessment

181 Burton Avenue

Barrie, Ontario

Prepared for:
Monolite Holdings Inc.

Prepared by:
Azimuth Environmental
Consulting, Inc.

August 2023

AEC 21-492

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

August 23, 2023 AEC 21-492

Monolite Holdings Inc.
343 Sugar Maple Lane,
Richmond Hill, ON
L4C 4C3

Attn: Maria Rozentsvayg

Re: REVISED Hydrogeological Assessment
181 Burton Avenue, Barrie ON

Dear Maria:

Azimuth Environmental Consulting, Inc. (Azimuth) is pleased to provide our Revised Hydrogeological Assessment for the property located at 181 Burton Avenue within the City of Barrie, ON (the "Site"). This evaluation focused on the existing soil and ground water regime underlying the Site and the potential for the proposed development to impact the existing conditions. The report revisions include updating the dewatering assessment and inclusion of a water balance assessment.

Should you have any questions or wish to discuss the report in greater detail, please do not hesitate to contact the undersigned.

Yours truly,

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Colin Ross, B.Sc., P.Geo.
Senior Hydrogeologist

M:\Projects3\21 Projects\21-492 RSC and Hydrogeology (181 Burton Ave)\05.0 - Reporting\05.1 - Working\June 2023\230704 181 Burton Ave REVISED HydroG Report - FINAL.docx

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1.0 INTRODUCTION

Azimuth Environmental Consulting Inc. (Azimuth) has been retained by Monolite Holdings Inc. to conduct a Hydrogeological Assessment for the property located at 181 Burton Avenue within the City of Barrie, Ontario (the "Site")(Figure 1). The Site is approximately 1,995 square meters (m^2) in size and is bound by Burton Avenue to the north, commercial properties to the east and west and vacant land to the north (Figure 2).

The proposed development is comprised of a four storey residential building (Appendix B). Access to the Site is from Burton Avenue, while all parking for the Site will be at grade north of the building.

The purpose of this assessment is to characterize the hydrogeological conditions at the Site and the potential for the proposed development to cause impact.

2.0 ENVIRONMENTAL SETTING

2.1 Soil

The soils at the Site are classified as Sargent Series gravelly sandy loam (Hoffman *et al*, 1962). This material has good drainage and is classified within hydrologic soil group "AB". Group A soils have low runoff potential and high infiltration rates even when thoroughly wet, and consist of deep, well to excessively drained sand or gravel. Group B soils have moderate infiltration rates when thoroughly wet and consist of moderately fine to moderately coarse textures.

2.2 Physiography

According to Chapman and Putnam (1984) the Site falls within the Simcoe Lowlands physiographic region. It lies on one of the numerous glacial shorelines that define the Lake Simcoe basin. These lowlands are considered to be the former Lake Algonquin shoreline features. The lowland soils are described as being composed of sands, silt and clay.

2.3 Topography and Drainage

The topographic relief at the Site is quite limited with elevations ranging between approximately 229 masl at the south and 232 masl at the north along Burton Avenue. The current Site drainage is expected to follow the local topographic dip to the north, although any surface runoff exiting the Site is expected to be captured within the local municipal stormwater system along Cumberland Street to the north. Run on to the Site is not expected from the south due to the presence of curb and gutters along Burton Avenue. The only surface water feature that is present in proximity to the Site is a small wetland

area immediately north of the Site (Figure 2) as identified in the Cambium, 2022 Environmental Impact Study (EIS). This feature is described as a small wetland pocket that is not connected to any mapped watercourses.

2.4 Bedrock Geology

The underlying bedrock geology has been described by the Ontario Geologic Survey (OGS) as being composed of interbedded bioclastic to very-fine grained limestone and grey-green calcareous shale of the Verulam Formation of the Simcoe Group (OGS, 2022). The Simcoe Group is Middle Ordovician in age. The entire overburden profile beneath the Site is estimated to be over 100 m in depth before encountering the bedrock contact based on local MECP well records for the area.

2.5 Quaternary Geology

According to Barnett *et al.* (1991), the surficial material at the Site consists of glaciofluvial ice-contact stratified deposits consisting of gravel and sand. The stratigraphy is dominated by sands and gravels inter-bedded with silts and clays. As a result, the overburden is characterized by a complex of layered, coarse-grained sediments with interbedded with fine-grained sediments that are not regionally extensive.

The Site soils as defined in the Site Geotechnical Assessment (WSP, 2021) and Phase II ESA (Envision, 2022) were that approximately 2 to 3 m of silty sand fill are present at the Site overlying native sand to silty sand. The native soils are consistent with what is reported in the OGS mapping. For reference, the borehole logs from the Geotechnical Assessment and Phase II ESA have been provided in Appendix D.

2.6 Well Records

The Ontario Ministry of Environment, Conservation, and Parks (MECP) Water Well Records were referenced for any recorded well information within the vicinity of the Site (300 m) (MECP, 2022). The area has been historically municipally serviced; however well records can be used to gain subsurface information which can provide insight into shallow geological formation within the area. The well records found in the vicinity of the Site that are pertinent to this assessment are summarized in Table 1 and are shown on Figure 3.

Table 1: MECP Water Well Database Summary (300 m radius from Site)

MECP Well Record No.	Drill Date	Status	Well Type	Borehole Depth (mbgs)	Ground Elevation (masl)
5700255	11-Oct-60	Unknown	Municipal Water Supply	86.6	227.4
5700265	22-Nov-62	Unknown	Municipal Water Supply	91.7	219.9
5709345	21-Nov-72	Unknown	Municipal Water Supply	87.2	227.0
5711799	28-Oct-74	Decommissioned	Municipal Water Supply	71.6	227.2
7264481 / A162243	25-Apr-16	Active	Observation Well	10.7	238.0
7278306 / A208627	22-Dec-16	Active	Observation Well	1.9	237.0
7278307 / A208628	22-Dec-16	Active	Observation Well	1.9	237.0
7045815 / A058556	26-Jun-07	Abandoned	Unknown	4.1	232.4
7045817 / A058557	26-Jun-07	Abandoned	Unknown	19.7	232.1
7337101	15-Jun-18	Unknown	Unknown	-	232.3
7310630	15-Mar-18	Unknown	Unknown	-	233.0

The surrounding wells in the MECP well record database were drilled for monitoring and municipal water supply. The wells were drilled to depths between 1.9 and 91.7 m. Not all actual well records were available online, but those that were available for download have been included in Appendix C. The soils identified in these records were primarily sand, which matches the geological literature outlined above, as well as the Site specific soils identified at the Site through the Site geotechnical drilling program.

3.0 SOURCE WATER PROTECTION

A review of the Source Water Protection Areas as identified on the MECP Source Protection Information Atlas website indicates the Site is partially located within a Wellhead Protection Area (WHPA-C). The Site is also located within a Significant Ground Water Recharge Area (SGRA), a Highly Vulnerable Aquifer Area (HVA), a Wellhead Protection Area (WHPA Q1/2) for quantity threat and an Issues Contributing Area (ICA) for sodium and chloride and is also considered an Intake Protection Zone (IPZ) 3.

4.0 MONITORING

4.1 Ground Water Level Monitoring

Two ground water monitoring wells were installed as part of the 2021 WSP geotechnical assessment with depths of 4.6 to 5.0 mbgs, while two additional monitoring wells were installed by Envision in April 2022 to depths of 6.1 mbgs as part of their Phase II ESA. For reference, borehole logs have been included in Appendix D. Water levels were measured as part of the geotechnical assessment in February 2021 and monthly by

Azimuth between March and June 2022 to establish seasonally high water table conditions, along with additional measurements in July 2023. The ground water levels at the Site have shown variation over time with the most elevated conditions observed in April, 2022 and the lowest in February, 2021. The high ground water condition is shown on Figure 4. Ground water flow direction is interpreted to be to the northeast, following a local topographic decline towards Lake Simcoe. The ground water level and elevation details have been included in Appendix D.

4.2 Hydraulic Conductivity Testing

In order to understand the hydraulic characteristics of the underlying overburden, a transient slug test can be performed within monitoring wells to determine the average hydraulic conductivity of the screened interval. A slug test involves the instantaneous injection or withdrawal of a volume or slug of water or solid cylinder of known volume. This is accomplished by adding or displacing a known volume to/from a well and measuring water level response time to return to equilibrium.

Hydraulic conductivity testing was completed at the Site by Azimuth staff within BH21-1 and BH21-4 on March 16th and April 14th, 2022. Water level measurements were recorded both manually and with a datalogger, which were programmed to record the pressure of water above the data logger every five seconds. Data was analyzed using the Hvorslev Method (1951) for unconfined aquifers, which assumes a homogeneous, isotropic medium in which soil and water are incompressible. Hydraulic testing results are summarized in Table 2, and within Appendix E.

Table 2: Hydraulic Testing Results

Monitoring Well	Screen Depth (mbgs)	Hydraulic Conductivity (m/s)	Soil Description
BH21-1	3.1 - 4.6	2.3×10^{-6}	Sand
BH21-4	3.5 – 5.0	1.5×10^{-6}	Silty Sand

Slug test data indicates that the hydraulic conductivity of the deposits is between 1.5×10^{-6} and 2.3×10^{-6} m/s. The measured hydraulic conductivity is within the published range for a sandy material (Freeze & Cherry, 1979).

4.3 Infiltration Testing

The current Infiltration Assessment focused on the proposed subsurface infiltration chamber, which is sized to capture up to the 28 mm precipitation event runoff from the entire rooftop area. The purpose of this assessment was to assess the existing soil beneath the proposed LID location, and determine a suitable infiltration rate for use in detailed design.

4.3.1 Methodology

A field program was conducted by Azimuth staff on July 20th, 2023 between the hours of 8:00 am and 12:00 pm during which the weather was 22°C and overcast. One test pit was advanced by an excavating contractor at the western side of the Site in the area of the proposed LID (Figure 2). The test pit base elevation was therefore determined based on the ground elevation and test pit depth.

The Infiltration Assessment was completed in accordance with Appendix C of the *Low Impact Development Stormwater Management Planning and Design Guide* (TRCA 7 CVC, 2010). The test pits were advanced to an elevation approximately 0.2 m above the base of the LID (230.26 masl). A hand auger was then used within the test pit to remove approximately 0.2 m of additional soil. The infiltration assessment was therefore completed at the base of the proposed LID. Information on the proposed LID design in included in Appendix B and contained within the Stormwater Management & Servicing Report (Pearson, 2023). The test pit was approximately about 1.5 m wide and 4 m long. An additional 0.5 m was excavated after the testing was complete to confirm the underlying material for each test pit.

The Guelph Permeameter Model 2800K1 (Soil Moisture Equipment Corp.) was used to measure the in-situ hydraulic conductivity as per the *Guelph Permeameter Operating Instructions* (Soil Moisture, 2012). Due to the dominance of granular material encountered, the single head method using the combined reservoir was utilized. Two tests were completed within each end at the base of the TP-1 to assess potential variability in the soils. Each test was within an independent augered hole. The value from each of the two tests for each location were averaged to determine a representative value for the soil type.

Table 3: Summary of Test Pit Location Details

Test Pit ID (masl) [1]	Base of Test Pit Elevation (masl)[1]	Depth (mbgs)[2]
TP-1 (231.5)	230.2	1.3

NOTES:

[1] Ground surface elevation taken from site survey information and includes the depth of the augered holes
[2] Depth below surface level is the target depth of proposed LID system.

A soil sample was collected from the test pit in the area of GP-1 at the approximate LID base elevation of infiltration testing for laboratory grain size and T-Time analysis. The soil sample analysis was used to confirm the in-situ results. After the infiltration tests

were completed, the test pits were advanced an additional 0.5 m to confirm the underlying material, and then backfilled with the original soil material.

4.3.2 Test Results

The material encountered within the test pits was composed of 1.1 m of fill in TP-1 underlain by native sand to a depth of >1.6 mbgs. Ground water was not encountered in TP-1. The complete test pit logs, grain size analysis and infiltration testing summary tables have been included in Appendix I.

The Guelph Permeameter generates a result as a hydraulic conductivity (K_{fs}) value. As per Table C1 from CVC & TRCA (2010), the K_{fs} values from the Guelph Permeameter and percolation rate (T-Time) values from the grain size analysis have been converted to an infiltration rate (1/T).

Based on the information provided in Table 4, the measured in-situ infiltration rate at the Site ranged between 99 and 93 mm/hr. These rates are consistent with values expected from a silty sand to sand material. The in-situ testing results and the estimate based on the grain size analysis appear to be lower than the measured rates, which could be a function of variability in silt content of the unit or limitations in relating grain size distribution to actual infiltration rates. Given the consistency between the two Guelph Permeameter values, it is felt that these values are most representative for use in establishing infiltration capacity of the Site.

Table 4: Results of Infiltration Assessment

Test Pit ID	Soil Type at Depth[1]	Guelph Permeameter Results			Estimated Infiltration Rate from Soil Sample [1,3] (mm/hr)
		Test # 1 Infiltration Rate[2] (mm/hr)	Test # 2 Infiltration Rate[2] (mm/hr)	Geometric Mean Infiltration Rate (mm/hr)	
TP-1	Silty Sand	99	93	96	20

NOTES:

1 As per GEI Letter Report dated July 31st, 2023 titled T-Time Analyses, Ref. No. 21-492

2 Guelph Permeameter results are converted from K_{fs} to 1/T according to Table C1 from TRCA & CVC (2010)

3 Soil sample collection results are converted from T-Time to 1/T according to Table C1 from TRCA & CVC (2010)

4.3.3 Recommendations

As per TRCA & CVC (2010), the infiltration rate used to design infiltration LIDs must incorporate a safety correction factor that compensates for potential reductions in soil permeability due to compaction or smearing during construction, gradual accumulation of fine sediments over the lifespan of the LID, and an uncertainty in measured values when less permeable soil horizons exist. A safety correction factor of 2.5 was used along with

the geometric mean for infiltration rate as per TRCA & CVC (2010). Table 5 summarizes the recommended design infiltration rate for the location investigated:

Table 5: Summary of Design Infiltration Rate

Geometric Mean Infiltration Rate* (mm/hr)	Safety Correction Factor	Design Infiltration Rate (mm/hr)
96	2.5	39

* - geometric mean of tested soil beneath the LID facility

After applying a correction factor of 2.5, the design infiltration rate for the LID area is 39 mm/hr. The results for the Site indicate that the infiltration rate for the material at the base of the LID is variable but feasible given the mean infiltration values.

5.0 WATER BALANCE

In order to determine the potential changes to the natural ground water recharge conditions, a pre- and post-development water balance assessment has been completed using the Thornthwaite and Mather method (1957). This method evaluates evapotranspiration based on precipitation and temperature. Residual soil saturation is a function of topography and soil type. Monthly data are tabulated from daily average temperature and precipitation, and the water budget is a continuous calculation over the period of record. To clarify, the method and the approach used by many individuals in examining infiltration resets annual conditions (moisture deficit, snow storage, etc) over the winter months because of the general lack of infiltration during the frost period. However, we maintain those records and carry them forward from month to month during the entire period of record.

Values were determined on a monthly basis, compiled from daily Environment Canada meteorological data station located in Barrie, Ontario between 1970 and 2021 (Barrie Climate Station – Station ID 6110557 / 6110556). The calculations are based on the average conditions during this period. The average precipitation was 907 millimeters (mm), rainfall was 654 mm, evapotranspiration was 479 mm, and the surplus was 428 mm per year.

5.1 Land Use

5.1.1 Pre-Development

The pre-development Site area was classified according to land use/vegetation type. Land within the pre-development area is provided in Table 6.

Table 6: Pre Development Area Classification

Land Use	Land Area (m^2)
Forest	1,248
Bare Ground	750
TOTAL	1,998

Land within the pre-development scenario is considered 0% impervious. The pre-development areas are shown on Figure 2.

5.1.2 Post-Development

The land classification in the post-development scenario was classified based on the Site Plan (Appendix B / Figure 2). Land within the post-development Site is summarized in the below Table 7:

Table 7: Post Development Area Classification

Land Use	Land Area (m^2)
Landscaped Grass	658
Rooftop	448
Paved Surface	892
TOTAL	**1,998**

(LID) – areas represent catchments 201 & 209 (including all subcatchments), which is being directed into LID infiltration gallery

Land within the post-development scenario is considered 67% impervious.

5.2 Infiltration

Infiltration is generated one of two ways: (1) directly from rainfall impact or snowmelt on pervious surfaces; and (2) indirectly when runoff from impervious surfaces is diverted into adjacent naturalized areas.

Infiltration factors for the Site were estimated based on the underlying soil, local topography, and ground cover as per Table 2 of the Ministry of Environment and Energy (MOEE) Hydrogeological Technical Information Requirements for Land Development Applications (1995).

The soil variable factor was determined by taking into account information obtained from the regional geologic mapping and the geotechnical program completed for the Site. This information suggests that the surficial material at the Site is primarily composed of silty sand to sand, however some areas with surficial silt to silt and clay was noted. The infiltration factors utilized in the water balance assessment are summarized in Table 8 below.

Table 8: Summary of Pervious Land Infiltration Factor

Scenario	Land Use	Infiltration Factor	Assumption
Pre-Development	Forest	0.70	Rolling land (0.2), silty sand to sand soil (0.3), treed (0.2)
	Landscaped / Grassed	0.60	Rolling land (0.2), silty sand to sand soil (0.3), grassed (0.1)
Post-Development	Landscaped / Grassed	0.60	Rolling land (0.2),silt sand to sand soil (0.3), lawn (0.1)

5.2.1 Pre-Development Infiltration

Pre-development direct infiltration was determined by multiplying the annual average surplus amount, the area of each land use, and the infiltration factor for each land use. The pre-development annual infiltration is therefore 545 m^3/year (Appendix H).

5.2.2 Post-Development Infiltration

Post-development infiltration (without mitigation) was determined by multiplying the annual average surplus amount, the area of each land use, and the infiltration factor for each land use. The post-development annual direct infiltration is therefore 169 m^3/year. There is therefore a decrease in infiltration of 376 m^3/year from pre- to post-development without mitigation measures employed.

The post-development drainage plan includes low impact development (LID) to promote infiltration. An infiltration gallery will be included in the storm water design to collect runoff from the rooftop area. The details and calculations associated with this feature are outlined in the Pearson (2023) Storm Water Management & Servicing Report, which indicate a storage volume of 12.6 m^3. This translates to an annual capture volume of 376 m^3/year, creating a mitigated water balance for the Site.

5.3 Water Balance Summary

Using the climate model data and calculations mentioned above, the water balance was completed for pre-development, post-development, and post-development with mitigation (Appendix H).

The pre-development infiltration volume is 545 m^3/year. This assumes the Site is composed of treed and grassed areas. The post-development without mitigation infiltration volume is 169 m^3/year, which is a deficit of 376 m^3/year. This assumes the Site is composed of the above noted residential development. An additional 376 m^3/year of infiltration can be obtained through LID capture (infiltration gallery), which creates an overall water balance between pre and post development with use of mitigation measures.

As all post development surface runoff will be directed into the existing stormwater infrastructure along Burton Avenue, there will be a reduction in surface water contributions of 399 m^3/year to the wetland to the north of the Site, the maintenance of ground water infiltration through the ground water infiltration chambers and additional infiltration in the shallow soil profile through the permeable pavers will offset the surface runoff reductions such that there is not expected to be a meaningful reduction of water contributions to the adjacent feature.

6.0 DEWATERING ASSESSMENT

A review of the Site servicing details indicated that the storm sewer infrastructure and potable water connection is all above the high water table at the Site, while the sanitary servicing connections at Burton Avenue will potentially intrude into the water table at the Burton Avenue connection by 0.7 m such that limited dewatering may be required if service connections are installed during high water table period (March – May). As such, calculations were completed to assess potential dewatering volumes under these conditions. However, if construction is completed during the summer / fall seasonal low water table conditions, water table is expected to be below the servicing connection elevations, as per the February, 2021 measurements (Appendix D).

A review of these items indicated that the maximum depths for the sanitary connections at Burton Avenue was at 228.44 masl, which are all below the maximum water table elevation of 229.39 masl for the Site in this location (BH21-1).

The following details and assumptions are included in this assessment:

- Construction ground water lowering will target a depth of 0.5 m below the base of the inverts to ensure dry working conditions;
- Water table depths are at or below the most elevated level observed at the Site, which is in close proximity to Burden Ave; and
- The entire length of sanitary servicing will be done at once which is 10 m in length and the width is 3 m.

The actual drawdown will depend on construction timing. It is therefore recommended that excavation / construction is completed in the dry summer months to avoid the need for dewatering.

6.1 Approximate Dewatering Volumes

For trench dewatering, the steady state method from Powers *et al*. (2007) used for rectangular excavations, where the length / width ratio is >1.5:

$$Q = \{[(\pi * K) * (H^2 - h^2)] / [\ln(R_o/r_e)] + 2 * [a * K * (H^2 - h^2)/(2R_o)]\}$$

(Ref: Powers *et al*. (2007)

The full dewatering assessment can be found in Appendix F. The dewatering details for the sanitary servicing connections are provided in Table 9 below.

Based on the information provided in Table 3, only very minimal ground water lowering will be required for the sanitary servicing. The dewatering volume is 2,500 L/day, while a 3x safety factor can then be applied which would make the volume 7,500 L/day. These values are based on worst case spring season ground water values. The dewatering volume is anticipated to not be required during dry summer months.

Any construction dewatering between 50,000 L/day and 400,000 L/day can be completed after registration under the Environmental Activity and Sector Registry (EASR). Any active construction dewatering above 400,000 L/day requires a Permit to Take Water (PTTW). As noted above, the magnitude of dewatering required will vary on the timing of construction and less or no dewatering could be needed in the summer drought conditions. Based on the limited dewatering volumes, no permitting is required and any ground water encountered can likely be handled relatively informally, such as discharge and containment on site if required.

Table 9: Summary of Dewatering Conditions (Appendix F)

Variable	Sanitary Sewer Connection
Estimate of Equivalent Radius **[r_e]** (m)	4
Hydraulic Conductivity **[K]** (m/s)	2.3×10^{-6}
Maximum Required Drawdown **[H-h]** (m)	1.2
Saturated Thickness Before Pumping **[H]** (m)	1.7
Depth of Water During Pumping **[h]** (m)	0.5
length of excavation **[a]** (m)	10
width of excavation **[b]** (m)	3
Radius of Influence **[R]** (m) [1]	10
Discharge **[Q]** (L/day)	2,500
Discharge [Q] (L/day) 3 X Safety Factor Applied	**7,500**

6.2 Impact Assessment

Based on the information provided in Table 9, the largest zone of influence is 10 m, while the overall decline in water levels is quite limited due to the shallow intrusion in the water table. As such, no off-site impacts are expected as a result of any Site dewatering.

Given the potential for dewatering has shown to be limited, the small volumes potentially handled would not necessitate a formal dewatering discharge plan. It is assumed that all potential discharge can either be handled on-site. Mitigation measures would likely just be a tank or enviro-bag prior to discharge off-site storm sewer (if required).

6.3 Water Quality

A water sample was collected from BH21-1 on May 27th, 2020 to determine the on-site ground water quality in preparation for potential dewatering activities, while water quality results are also available from the Phase II ESA completed by Envision. The Azimuth results are included in Appendix D and have been compared to the Provincial Water Quality Objectives (PWQO), while the lab report from the Envision results has been included un-edited. All parameters met the PWQO with the exception of total phosphorus and aluminum.

The aluminum exceedance (0.08 mg/L), which is only marginally above PWQO (0.075 mg/L) is not seen as a concern as is commonly elevated in ground water due to the fact it is a naturally abundant earth element. The total phosphorus concentrations is more significantly elevated, but is interpreted to be sourced to the elevated sediment load in the sample as evidenced by the elevated turbidity (1,180 NTU). The nutrient analysis was completed on water that was unfiltered, and therefore contained a high concentration of sediment particles. The increased phosphorus is therefore likely attributed to the excess nutrients that are bound to the sediment grains in suspension and dissolved within the acidified nutrients bottle. Sodium (150 – 1,000 mg/L) and chloride (800 – 1,320 mg/L) concentrations were noted to be elevated, which is likely associated with road salt application on Burton Avenue. The nitrate concentrations are also elevated (4.9 mg/L), which could be the result of leaky sewer infrastructure along Burton Avenue.

Finally, a suite of volatile organic compounds (VOCs) and Petroleum Hydrocarbons (PHCs) were analyzed for at the Site monitoring wells. The results indicated only a single trace detection of toluene at BH21-4 (0.48 ug/L), which given the lack of any other measurable organic parameter concentration would indicate that the results may be anomolous. This was confirmed with an additional sample collected on July 20th, 2023, which indicated no detection for toluene.

Overall, the water quality would not be detrimental if maintained on-site or discharged to the storm sewers as all parameters are noted to meet City of Barrie Storm Sewer Bylaw criteria if required.

7.0 SUMMARY AND CONCLUSIONS

Azimuth was retained by Monolite Holdings Inc. to conduct a Hydrogeological Assessment for the property located at 181 Burton Avenue, within the City of Barrie, Ontario. The Site is rectangular in shape and is approximately 1,995 m^2 in size and is accessed via Burton Avenue. The Site is bound by Burton Avenue to the north, commercial properties to the east and west and vacant land to the north. The Site is at an elevation of 232 masl along Burton Avenue sloping down to 229 masl at the north end of the Site which directs existing surface runoff towards a small isolated wetland area immediately north of the Site. The Site will be developed as a single multi unit residential building with at grade parking at the north end of the Site.

Boreholes logs from the Site show the subsurface is composed of approximately 3 m silty sand fill overlying a native sand or silty sand material. The inferred ground water flow direction is generally to the north following local topography towards Lake Simcoe. Ground water elevations at the Site were measured between 227.57 and 229.39 masl. Hydraulic conductivity testing was completed within the monitoring well BH21-1 & 21-4 at the Site by Azimuth staff. Slug test data indicates that the hydraulic conductivity of the deposits is ~$2x10^{-6}$ m/s.

The pre-development infiltration volume is 545 m^3/year. This assumes the Site is composed of treed and grassed areas. The post-development without mitigation infiltration volume is 169 m^3/year, which is a deficit of 376 m^3/year. This assumes the Site is composed of the above noted residential development. An additional 376 m^3/year of infiltration can be obtained through LID capture (infiltration gallery). As a result of this mitigation measure, the post-development with mitigation volume matches pre-development conditions such no deficit results from the proposed development.

As all post development surface runoff will be directed into the existing stormwater infrastructure along Burton Avenue, there will be a reduction in surface water contributions of 399 m^3/year to the wetland to the north of the Site, the maintenance of ground water infiltration through the ground water infiltration chambers and additional infiltration in the shallow soil profile through the permeable pavers will offset the surface runoff reductions such that there is not expected to be a meaningful reduction of water contributions to the adjacent feature.

Based on the ground water elevations and details related outlined on the development plan, all foundations and infrastructure will be located above the water table with the exception of the sanitary sewer connections at Burton Avenue. However, the intrusion is considered limited (~0.7 m) and of limited length (~10 m). It is also noted that this intrusion is only present during spring high water table conditions such that if the

connections are completed during the summer and fall low water table conditions, dewatering will not be required. Despite this, a dewatering assessment was completed to assess requirements if these connections were completed during the spring high water table conditions. The daily water taking volume estimate is quite limited at 2,500 L/day or 7,500 L/day with a 3x safety factor. As such, no permitting would be required for any dewatering and it is likely that any ground water could be dealt with relatively informally with a sump and discharge on-site. The largest zone of influence is 10 m from the dewatering zone such that all drawdown will be maintained within the Site boundaries or road alignment.

Azimuth completed in-situ percolation testing at the site in July 2023 targeting the proposed LID location. The assessment was focused on the existing soil beneath the previously proposed LID locations to determine suitable infiltration rate for use in detailed design. The design infiltration rates for the Site are 93 to 99 mm/hr. After applying a correction factor of 2.5, the design infiltration rates for the Site is 39 mm/hr. The results for the Site indicate that the infiltration rate for the material at the base of the LID is considered moderate to high.

8.0 REFERENCES

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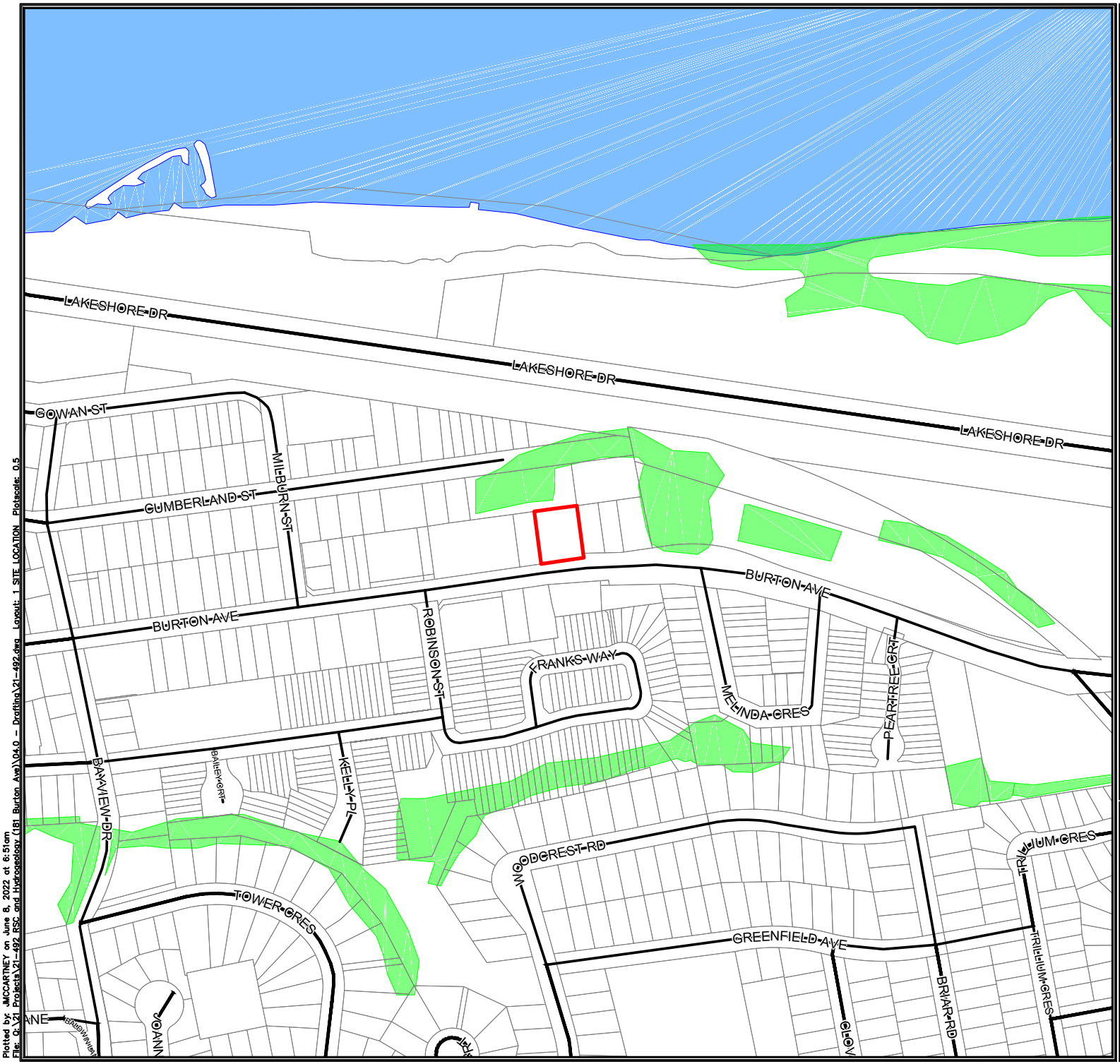
APPENDICES

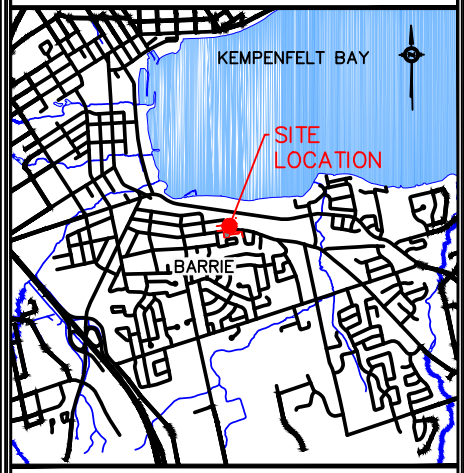
APPENDIX A

Figures



LEGEND:

APPROX. PROPERTY BOUNDARY



REGIONAL MAP

SCALE 1: 75000

0 125.0 250.0

HORIZONTAL SCALE 1: 5000

AZIMUTH ENVIRONMENTAL CONSULTING, INC.

ENVIRONMENTAL ASSESSMENTS & APPROVALS

SITE AREA LOCATION

181 BURTON AVE,
BARRIE, ON

DATE ISSUED: *JUE 2022*	Figure No.
CREATED BY: *JM*	
PROJECT NO.: *21-492*	1
REFERENCE: *SIMCOE COUNTY*	

Plotted by: JMCCARTNEY on June 8, 2022 at 8:51am
File: G:\21 Projects\21-492 RSC and Hydrogeology (181 Burton Ave)\04.0 - Drafting\21-492.dwg Layout: 1 SITE LOCATION Plotscale: 0.5

LEGEND:

- APPROX. PROPERTY BOUNDARY
- EXISTING MONITORING WELL LOCATIONS
- EXISTING BOREHOLE LOCATIONS
- WETLAND
- GP-# GUELPH PERMEAMETER TEST LOCATION
- TEST PIT LOCATION

0 12.50 25.0

HORIZONTAL SCALE 1:500

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

SITE PLAN

181 BURTON AVE.,
BARRIE, ON

DATE ISSUED:	AUGUST 2023	Figure No.
CREATED BY:	JM	2
PROJECT NO.:	21-492	
REFERENCE:	SIMCOE COUNTY	

Plotted by: AUU on July 28, 2023 at 11:24am
File: \\Azimuthenv\DATA\Projects\21-492_RSC and Hydrogeology (181 Burton Ave)\04.0 - Drafting\21-492.dwg Layout: 2 SITE PLAN Plotscale: 0.5

LEGEND:

- APPROX. PROPERTY BOUNDARY
- 300m STUDY AREA
- WATER WELL LOCATIONS
- 10m OBM CONTOURS

0 62.50 125.0

HORIZONTAL SCALE 1:2500

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

WELL RECORDS

181 BURTON AVE., BARRIE, ON

DATE ISSUED:	AUGUST 2023	Figure No. 3
CREATED BY:	JM	
PROJECT NO.:	21-492	
REFERENCE:	SIMCOE COUNTY	

LEGEND:

- APPROX. PROPERTY BOUNDARY
- EXISTING MONITORING WELL LOCATIONS
- EXISTING BOREHOLE LOCATIONS
- GP-# GUELPH PERMEAMETER TEST LOCATION
- TEST PIT LOCATION
- 229.14 GROUND WATER LEVEL (April 28, 2022)
- 0.1m GROUND WATER CONTOURS
- 0.1m INFERRED GROUND WATER CONTOURS

0 12.50 25.0

HORIZONTAL SCALE 1:500

AZIMUTH ENVIRONMENTAL CONSULTING, INC.
ENVIRONMENTAL ASSESSMENTS & APPROVALS

GROUND WATER INFORMATION

181 BURTON AVE.,
BARRIE, ON

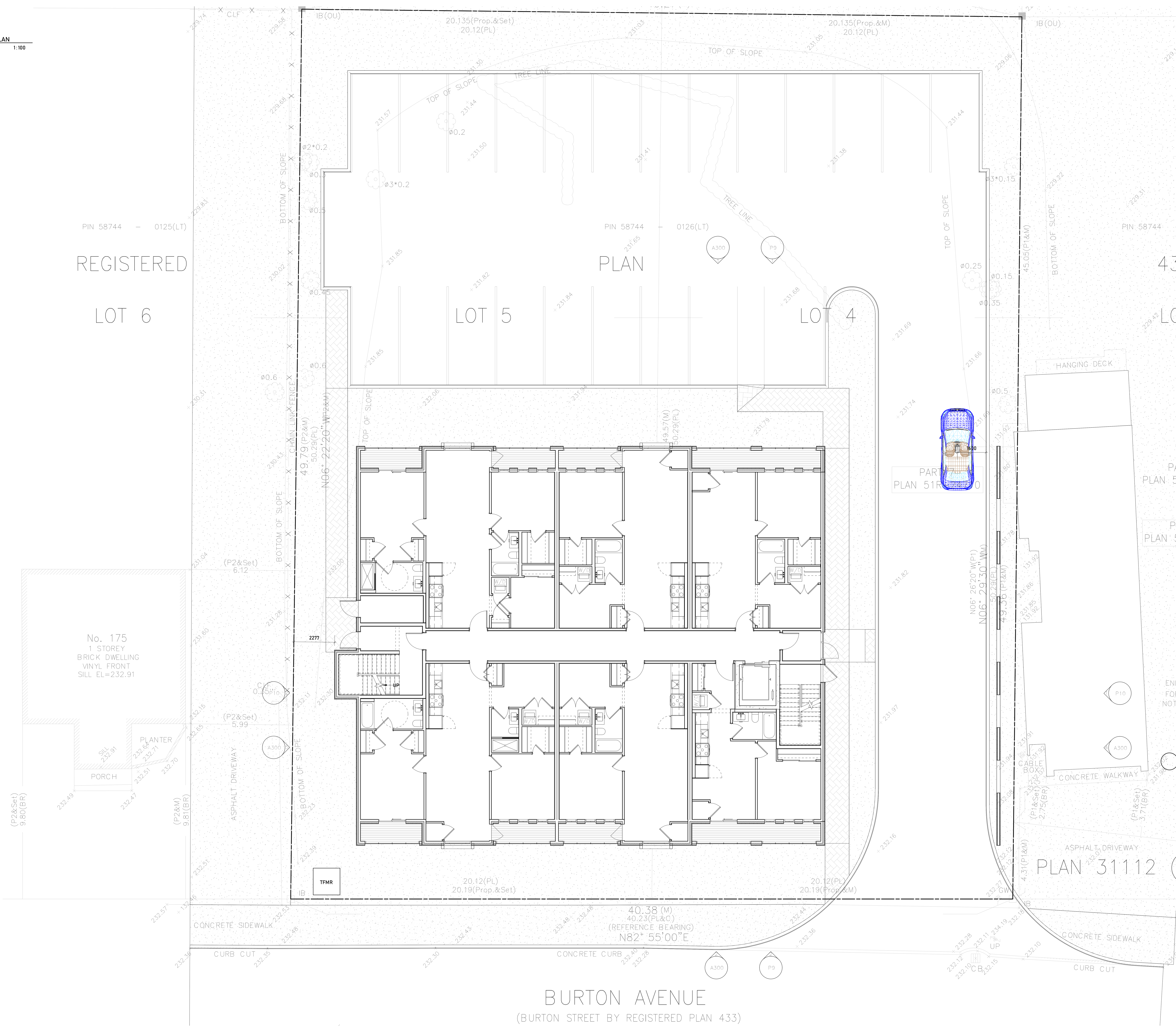
DATE ISSUED:	AUGUST 2023	Figure No.
CREATED BY:	JM	4
PROJECT NO.:	21-492	
REFERENCE:	SIMCOE COUNTY	

APPENDIX B

Development Plan

SITE PLAN

SCALE: 1:100



STANDARDS			
	REQUIRED BY BY-LAW (CURRENT - C4)	REQUIRED BY BY-LAW (REZONING - MU2)	PROPOSED
LOT AREA (min.)	450 m^2	- m^2	1,998.94 m^2
LOT FRONTAGE (min.)	15 m	- m	40.38 m
FRONT YARD (min.)	6 m	1m(75%)-5m(25%)	3.00 m
WEST INTERIOR SIDE YARD (min.)	3 m	13.25 m	2.27 m
EAST EXTERIOR SIDE YARD (min.)	3 m	3 m (max.)	3.15 m - WALL 0.85 m - COLUMN
REAR YARD (min.)	7 m	7 m	24.13 m
NUMBER OF UNITS	-	-	22
GROUND FLOOR AREA	-	-	556.71 m^2
GROSS FLOOR AREA	-	-	1,787.03 m^2
COMMERCIAL AREA	20%	50% GFA main floor	0% - 0 m^2
DWELLING UNIT AREA (min.)	35m^2 + 10m^2/bedroom	35m^2 + 10m^2/bedroom	One Bedroom: 55m^2 Two Bedroom: 62m^2 Three Bedroom: 94m^2
LOT COVERAGE (max.)	50%	-%	37.5%-750.46m^2
LANDSCAPING (min.)	-	35%	48.7% - 77777m^2
G.F.A. (max.)	-%	-%	1,787.03m^2 - 89.4%
AMENITY AREA (min.)	12m^2/unit (216m^2)	12m^2/unit (1272m^2)	balcony (- m^2) + ground (- m^2) = - m^2
BUILDING HEIGHT (min.)	14 m	7.5-25.5 m	12.6 m
PARKING (min.)	1 spaces per unit @ 2.7mx5.5m = 18 spaces 1/30m^2 = 12	1 space/unit @2.7mx5.5m = 18 spaces 1 space/24m^2 commercial gfa = 14	22 spaces = 1/unit
DRIVE AISLE WIDTH (min.)	6.4 m	6.4 m	6.4m
BARRIER FREE (min.)	1 Type A @ 3.4mx5.5m & Each B.F. space shall contain a 1.5m access aisle	1 Type A @ 3.4mx5.5m & Each B.F. space shall contain a 1.5m access aisle	1 Type A @ 3.4mx5.5m C/W a B.F. access aisle of 1.5m in width
LANDSCAPED BUFFER STRIP	-	3 m landscaped buffer side and rear lot line	-
DENSITY (max.)	-	-	110 units/hectare

Zoning Standard

SCALE: 1:1

KEY MAP nts

ISM ARCHITECTS Inc.

97 Toronto Street
Barrie, ON, L4N 1V1
Tel: 705-726-2342
Email: ian@ismarchitects.ca
Website: www.ismarchitects.ca

#	Description	Date
1	CLIENT REVIEW	APR 23,19
2		
3		
4		
5		
6		

Stamp

Orientation

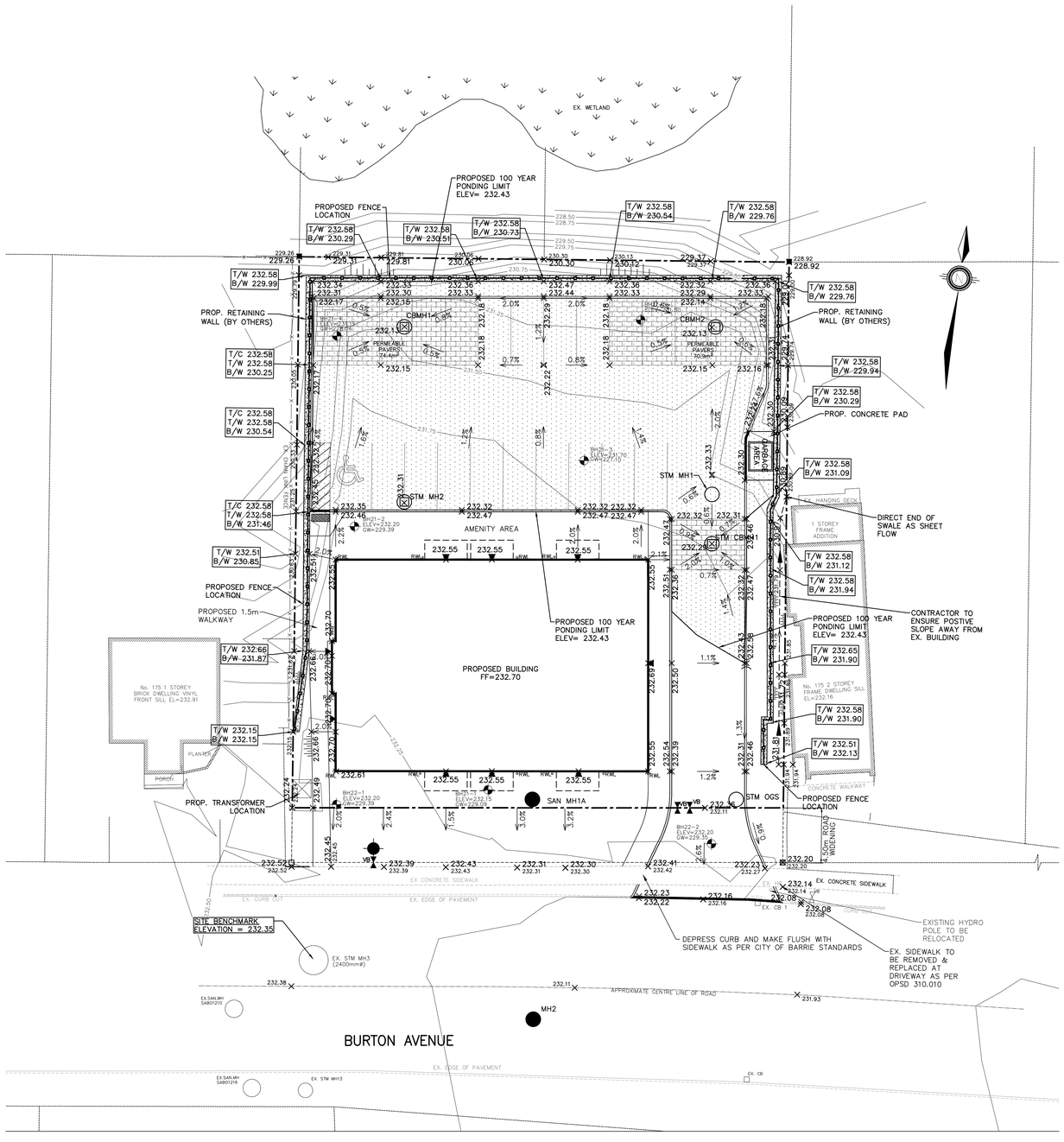
Client Information: MARIA ROZENTS

Project: 181 BURTON – RESIDENTIAL

Project Information
Project No.: 194060
Drawn by: JB
Checked by: ISM
Date: APRIL 16, 2019
Scale: As indicated

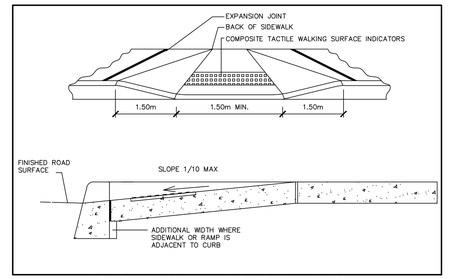
Drawing: SITE PLAN

Drawing No.: A100

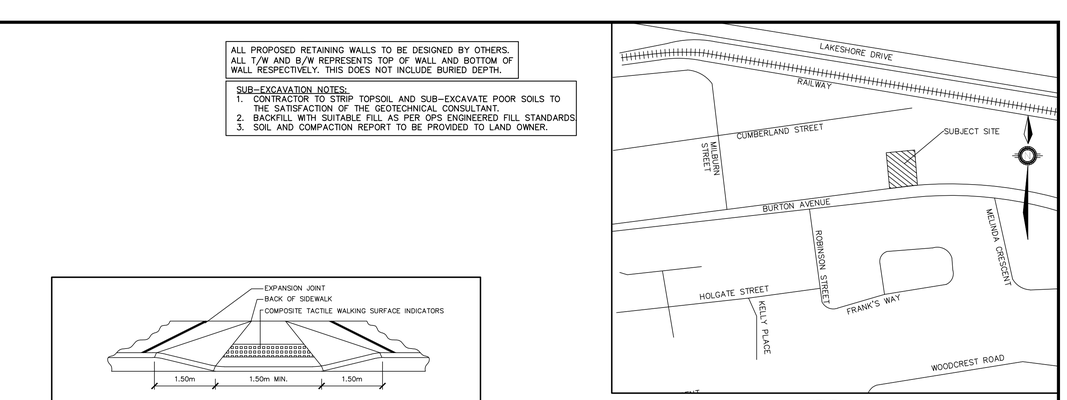


ALL PROPOSED RETAINING WALLS TO BE DESIGNED BY OTHERS. ALL T/W AND B/W REPRESENTS TOP OF WALL AND BOTTOM OF WALL RESPECTIVELY. THIS DOES NOT INCLUDE BURIED DEPTH.

SUB-EXCAVATION NOTES:
1. CONTRACTOR TO STRIP TOPSOIL AND SUB-EXCAVATE POOR SOILS TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT.
2. BACKFILL WITH SUITABLE FILL AS PER OPS ENGINEERED FILL STANDARDS.
3. SOIL AND COMPACTION REPORT TO BE PROVIDED TO LAND OWNER.



DEPRESSED CURB & TACTILE RAMP DETAIL
N.T.S.

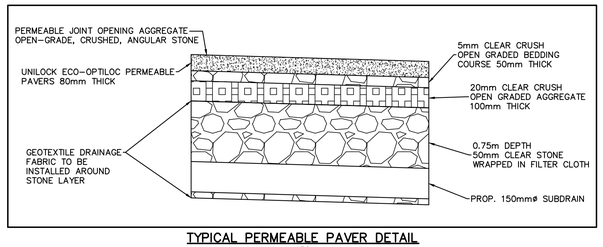


KEYPLAN
N.T.S.

LEGEND

- CB — CATCH BASIN
- DCB — DOUBLE CATCH BASIN
- CBMH — CATCH BASIN
- MH — STORM MANHOLE
- MH — SANITARY MANHOLE
- SERVICE CAP
- HYD. — FIRE HYDRANT
- VB — WATER VALVE
- 254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
-) (— HIGH POINT
- RWL — PROP. RAINWATER LEADER
- MANDOOR
- PROP. RETAINING WALL (BY OTHERS)
- PROP. PERMEABLE PAVERS
- PROP. FENCE LOCATION
- 100 YEARS PONDING LIMITS ELEV. 232.43
- BH20-1 ELEV=232.20 GW=229.59 — BOREHOLE NUMBER / EXISTING GRADE ELEVATION / GROUNDWATER ELEVATION

GROUNDWATER ELEVATIONS AS PER AZIMUTH HYDRO G REPORT DATED JUNE 2022



TYPICAL PERMEABLE PAVER DETAIL
N.T.S

NO.	REVISION NOTE	DATE	BY
1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

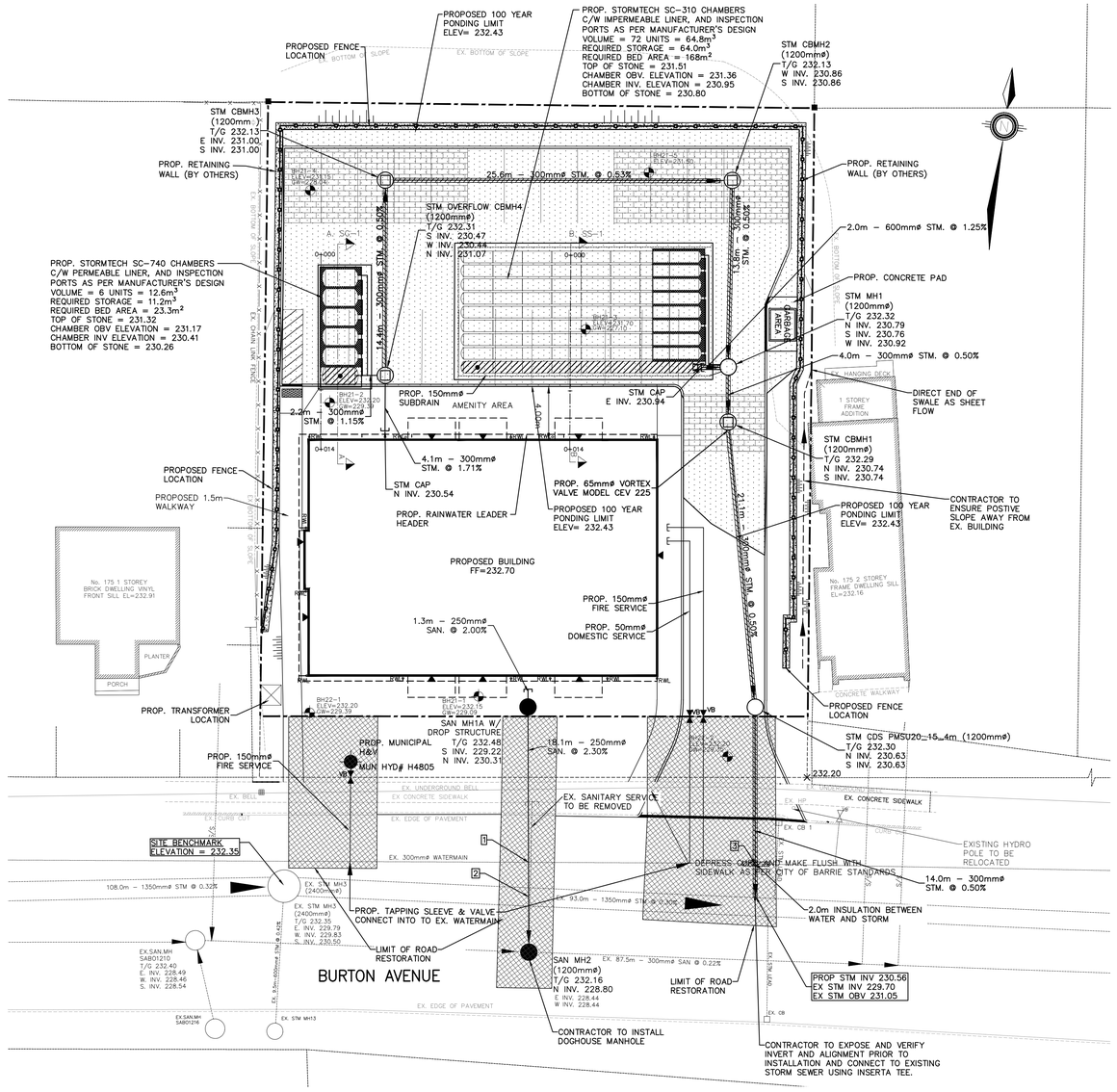
LICENCED PROFESSIONAL ENGINEER — M.W. DEJEAN — May 12, 2023 — PROVINCE OF ONTARIO

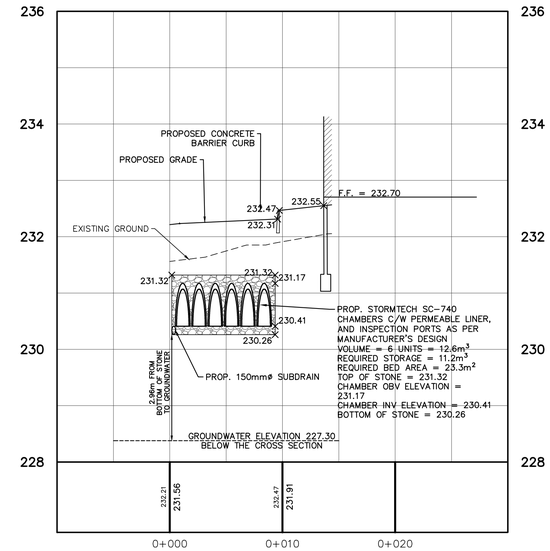
APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

SITE GRADING PLAN

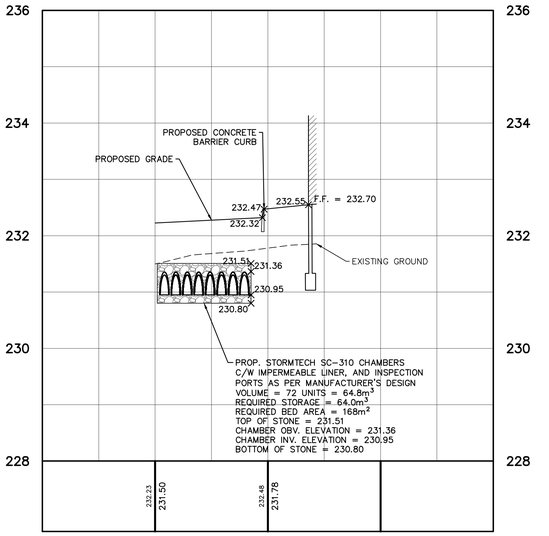
PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	PG/MWD	HORIZ SCALE	1: 200
DRAWN BY	PG	VERT SCALE	
CHECKED BY	GMP	DATE	OCTOBER 2021
PROJECT #	19100		
DRAWING #	SG-1		
REVISION #	1		

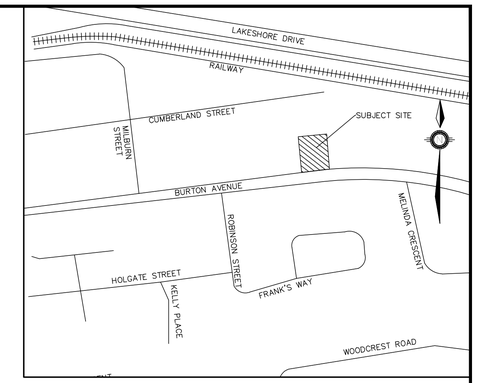




SECTION A–A
SCALE H 1:250
V 1:50



SECTION B–B
SCALE H 1:250
V 1:50



KEYPLAN
N.T.S.

LEGEND

- CB — CATCH BASIN
- DCB — DOUBLE CATCH BASIN
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- MH — STORM MANHOLE
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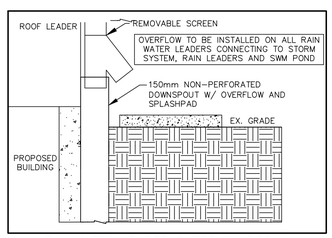
- HYD. — FIRE HYDRANT
- VB — WATER VALVE
- 254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
-) (— HIGH POINT
- RWL — PROP. RAINWATER LEADER
- MANDOOR
- PROP. RETAINING WALL (BY OTHERS)
- PROP. PERMEABLE PAVERS
- LIMIT OF ROAD & BOULEVARD RESTORATION
- 100 YEARS PONDING LIMITS
- PIPE INSULATION AS PER DETAIL ON SS–1

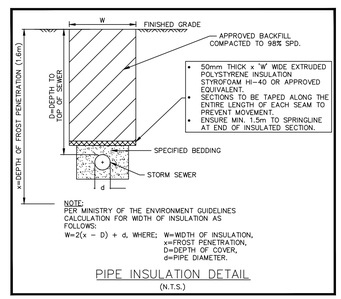


RAINWATER LEADER OVERFLOW DETAIL
N.T.S

CONTRACTOR TO LOCATE AND DECOMMISSION EX. WATER SERVICE AS PER CITY STANDARDS.

CONTRACTOR TO CONFIRM ADEQUATE SEPARATION BETWEEN ANY APPLICABLE HYDRO, GAS, AND BELL UTILITIES PRIOR TO ORDERING STORM, SANITARY AND WATERMAIN MATERIALS

PIPE CROSSING			
LOCATION	INV.	OBV.	SEPARATION
1	W/M 230.22	SAN 229.13	1.09m
2	STM 229.74	SAN 229.08	0.50m
3	STM 230.57	W/M 230.27	0.30m



PIPE INSULATION DETAIL
(N.T.S.)

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

NO.	REVISION NOTE	DATE	BY
1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP

M.W. DEJEAN
May 12, 2023
LICENCED PROFESSIONAL ENGINEER
PROVINCE OF ONTARIO

APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

SITE SERVICING PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY PG/MWD	HORIZ SCALE 1:200	PROJECT #	19100
DRAWN BY PG	VERT SCALE	DRAWN #	SS–1
CHECKED BY GMP	DATE OCTOBER 2021	REVISION #	1

APPENDIX C

MECP Well Records

UTM 17 E 604835 E
19 R 4913901 N

Elev. 9 R 0 8 0 5 1 0

Basin 2 1 INTERNATIONAL WATER SUPPLY LIMITED

ANS.

57 No 255

GROUND WATER BRANCH
JAN 17 1961
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act, 1957

WATER WELL RECORD

County or District: Simcoe   Township, Village, Town or City: Barrie

Con. —   Lot —   Date completed: 11 (day) 10 (month) 60 (year)

Owner: Barrie P.U.C. (print in block letters)   Address: —

Casing and Screen Record

Inside diameter of casing: 2" "Rotary" (5" hole)

Total length of casing: 213'

Type of screen: Slotted pipe

Length of screen: 15-3

Depth to top of screen: 213'

Diameter of finished hole: 5"

Pumping Test

Static level: flow

Test-pumping rate: 75 I G.P.M.

Pumping level: 1' - 15/8"

Duration of test pumping: 6 hrs.

Water clear or cloudy at end of test: Clear.

Recommended pumping rate .... G.P.M.

with pumping level of ....

Well Log 2/60 — Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
Sand & gravel	0	4			
Sand	4	13			
Sand gravel boulders streaked	13	26			
Blue clay	26	28			
Silty clay	28	33			
Blue clay	33	40			
Blue clay & gravel hard packed	40	49			
Gravel sand & boulders	49	55			
Sandy blue clay & odd gravel streak	55	65			
Hard blue clay	65'	74'			
Sandy blue clay	74'	99			
Hard silty blue clay	99	133	213-284	213+	FRESH
Sandy clay	133	150'			
Packed fine sand & fine gravel and clay streaks	150	206	W-bearing	See above.	

For what purpose(s) is the water to be used?
T.H. for Mun. W-S.

Is well on upland, in valley, or on hillside? upland

Drilling Firm: International Water Supply Ltd

Address: 12 Maitland St London Ont

Licence Number: 121

Name of Driller: C. C. Magee

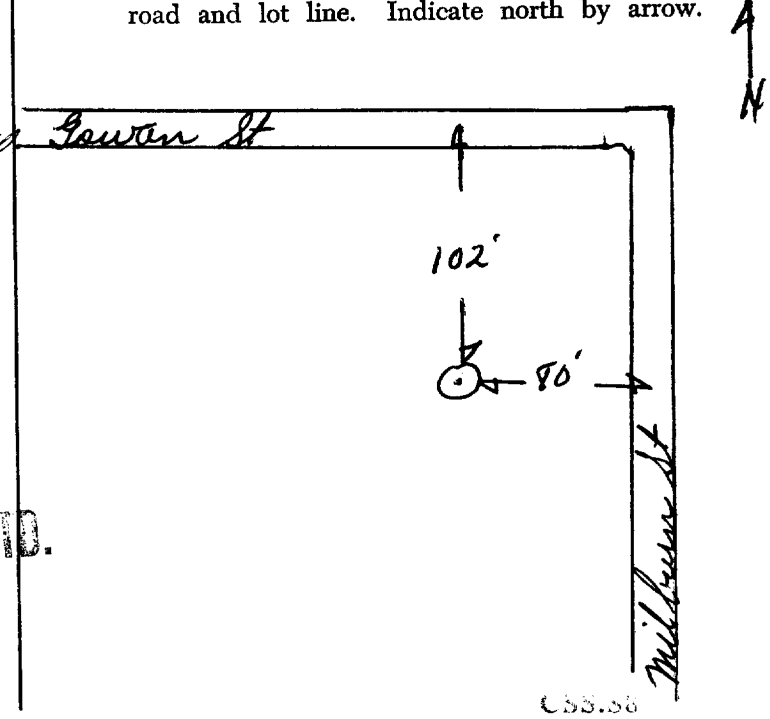
Address: Same

Date: Oct 24-60

D.W. Harvey
INTERNATIONAL WATER SUPPLY LTD.
LONDON - ONTARIO
(Signature of Licensed Drilling Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



Form 5
15M-58-4149

C55.56

B Test 52-60

Page 28

RECEIVED
NOV 25 1960
INTERNATIONAL WATER SUPPLY LIMITED

GROUND WATER BRANCH
JAN 17 1961
ONTARIO WATER RESOURCES COMMISSION

The Ontario Water Resources Commission Act, 1957

WATER WELL RECORD

ANS.

County or District Simcoe Township, Village, Town or City Barrie

Con. Lot Date completed 11 (day) 10 (month) 60 (year)

Owner Barrie PUC (print in block letters) Address

Casing and Screen Record

Inside diameter of casing

Total length of casing

Type of screen

Length of screen

Depth to top of screen

Diameter of finished hole

Pumping Test

Static level

Test-pumping rate G.P.M.

Pumping level

Duration of test pumping

Water clear or cloudy at end of test

Recommended pumping rate G.P.M.

with pumping level of

Well Log 2/60

Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	No. of feet water rises	Kind of water (fresh, salty, sulphur)
Sandy blue clay	206	210'			
Packed fine sand & fine gravel	210	228'	W-bearing		
Blue clay	228'	244'			
Sandy blue clay & gravel	244	245			
Blue clay	245	253			
Sandy blue clay & gravel stks	253	264			
Gravel sand & boulders & clay	264	272'	Possible W-bearing stks.		
Sandy gray clay hard packed	272	284'			

For what purpose(s) is the water to be used?

Is well on upland, in valley, or on hillside?

Drilling Firm International Water Supply Ltd

Address 12 Maitland St

London Ont

Licence Number

Name of Driller C. L. Magee

Address Same

Date Oct 24-60

INTERNATIONAL WATER SUPPLY LTD.
LONDON ONTARIO

(Signature of Licensed Drilling Contractor)

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.

Form 5
15M-58-4149

A TEST #3-62

UTM 17 6052730 E

9 R 4914097 N

Elev. 9 R 0725

Basin 22

57 No 265 B

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District SIMCOE Township, Village, Town or City BARRIE

Con. — Lot — Date completed 22 (day) 11 (month) 1962 (year)

Owner BARRIE PUC (print in block letters) Address BARRIE ONT

Casing and Screen Record — NEGATIVE TEST WELL

Inside diameter of casing NA

Total length of casing NA — NO CASING

Type of screen NA

Length of screen NA — ROTARY

Depth to top of screen NA

Diameter of finished hole 5½" DIAM. OPEN HOLE

Pumping Test

Static level NA

Test-pumping rate NA G.P.M.

Pumping level NA

Duration of test pumping NA

Water clear or cloudy at end of test NA

Recommended pumping rate NA G.P.M.

with pump setting of NA feet below ground surface

Well Log / Water Record

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
SAND	0	9		
SAND & GRAVEL STREAKS	9	27	NA	NA
SANDY CLAY + GRAVEL	27	58	↓	↓
BLUE CLAY "HARD"	58	77		
FINE SAND & GRAVEL STREAKS & SANDY CLAY STREAKED	77	87		
BLUE CLAY SANDY & GRAVEL STREAKS	87	96		
BLUE CLAY	96	105		
FINE SAND & CLAY & GRAVEL	105	119		
BLUE CLAY	119	149		
FINE SAND	149	162		

For what purpose(s) is the water to be used? NA

Is well on upland, in valley, or on hillside? UPLAND

Drilling or Boring Firm INTERNATIONAL WATER SUPPLY LTD

Address ~~BOX 2493 LONDON ONT~~ BOX 535 OAKVILLE ONT

Licence Number

Name of Driller or Borer C. MAGEE

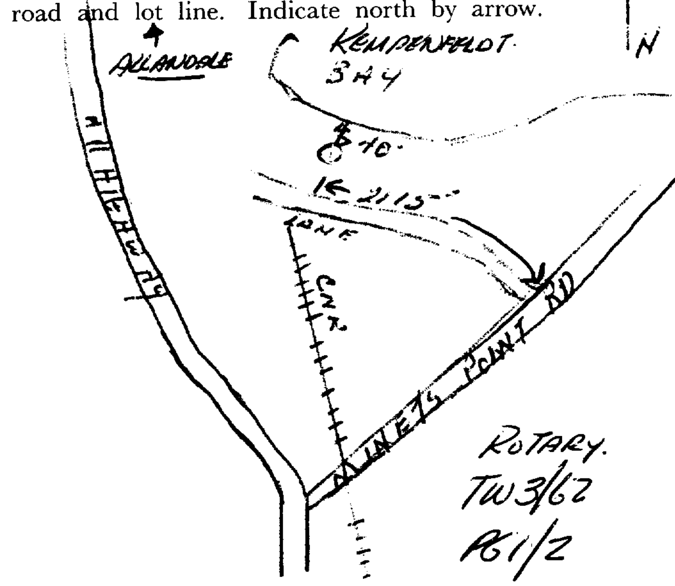
Address

Date DEC 6 62

(Signature of Licensed Drilling or Boring Contractor) IWS LTD OAKVILLE

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



ROTARY. TW3/62 AG1/2

Form 7 15M Sets 60-5930

OWRC COPY

CSS.S8

A TEST #3-62

UTM 17 Z 6 0 5 2 7 3 E

9 R 4 9 1 4 0 9 7 N

Elev. 9 R 0 7 2 5

Basin 2 2

57 No ~~265~~ B

The Ontario Water Resources Commission Act

WATER WELL RECORD

County or District SIMCOE ... Township, Village, Town or City BARRIE

Con. —— Lot —— Date completed 22 (day) 11 month 1962 year)

Owner BARRIE PUC (print in block letters) Address BARRIE ONT

NEGATIVE TEST WELL

Casing and Screen Record		Pumping Test	
Inside diameter of casing	NA	Static level	NA
Total length of casing	NA NO CASING	Test-pumping rate	NA G.P.M.
Type of screen	NA	Pumping level	NA
Length of screen	ROTARY NA	Duration of test pumping	NA
Depth to top of screen	NA	Water clear or cloudy at end of test	NA
Diameter of finished hole	5½" DIAM. OPEN HOLE	Recommended pumping rate	NA G.P.M.
		with pump setting of	NA feet below ground surface

Well Log / **Water Record**

Overburden and Bedrock Record	From ft.	To ft.	Depth(s) at which water(s) found	Kind of water (fresh, salty, sulphur)
SAND	0	9		
SAND & GRAVEL STREAKS	9	27	NA	NA
SANDY CLAY + GRAVEL	27	58	↓	↓
BLUE CLAY "HARD"	58	77		
FINE SAND & GRAVEL STREAKS & SANDY CLAY STREAKED	77	87		
BLUE CLAY SANDY & GRAVEL STREAKS	87	96		
BLUE CLAY	96	105		
FINE SAND & CLAY & GRAVEL	105	119		
BLUE CLAY	119	149		
FINE SAND	149	162		

For what purpose(s) is the water to be used? NA

Is well on upland, in valley, or on hillside? UPLAND

Drilling or Boring Firm INTERNATIONAL WATER SUPPLY LTD

Address ~~BOX 2413 LONDON ONT~~ BOX 535 OAKVILLE ONT.

Licence Number

Name of Driller or Borer C. MAGEE

Address

Date DEC 6-62

[signature]

(Signature of Licensed Drilling or Boring Contractor)

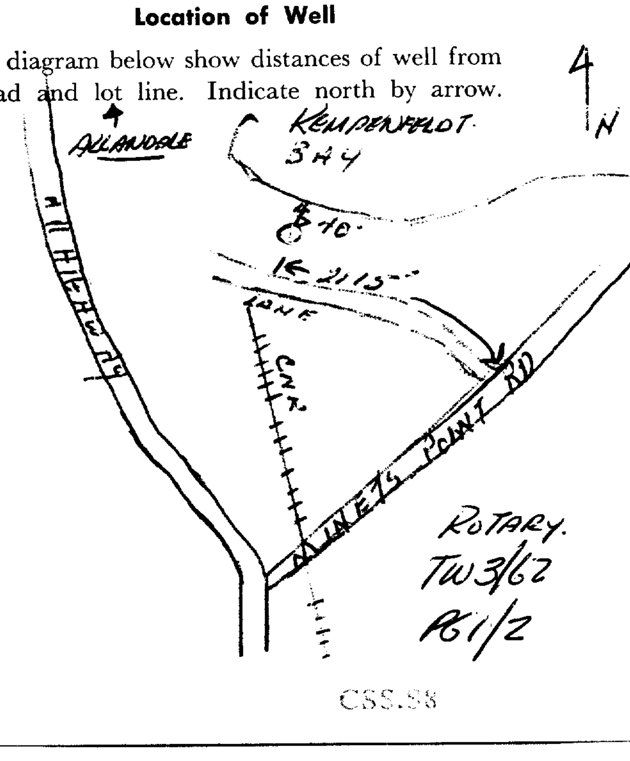
IWS LTD OAKVILLE

Form 7 15M Sets 60-5930

OWRC COPY

Location of Well

In diagram below show distances of well from road and lot line. Indicate north by arrow.



ROTARY.
TW3/62
A61/2

CSS.S8

31D/5E

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5709345 | MUNICIP. 57501 | CON.

COUNTY OR DISTRICT	CITY	CON., BLOCK, TRACT, SURVEY, ETC.	LOT
SIMCOE	BARRIE	Gowan ST	

OWNER (SURNAME FIRST): BARRIE PUC
ADDRESS: BARRIE ONTARIO
DATE COMPLETED: DAY 21 MO. 11 YR. 72

	ZONE	EASTING	NORTHING	RC.	ELEVATION	RC.	BASIN CODE		
5709345	17	604690	4913883	4	750 (950)	5	23	MAY 05, 1975	66

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
				0	1
Black	muck		Loose	1	4
Brown	Sand &	gravel.	Loose	4	9
Brown	Sand			9	27
Brown	Sand	gravel & Brown Clay	Layered	27	53
Grey	clay	some stones	Soft	53	67
	Gravel	& sand.	Layered	67	81
Grey	Clay	& gravel	Layered	81	83
	Sand	gravel & Boulders	hard	83	150
Grey	Clay	~~hard~~	packed	150	176
Grey	Sand fine	& sand	packed	176	178
Grey	sand	fine gravel.		178	208
Grey	fine sand	sand fine gravel	layers & packed		

31 | 0001803 | 00046281111 | 0004628 | 00276281105 | 00532051112 | 00671112811
32 | 00812051111 | 00831281113 | 01502051 | 01762082811 | 01782281111 | 02082081111

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.) | DIAMETER INCHES | LENGTH FEET
MATERIAL AND TYPE | DEPTH TO TOP OF SCREEN FEET

61 PLUGGING & SEALING RECORD

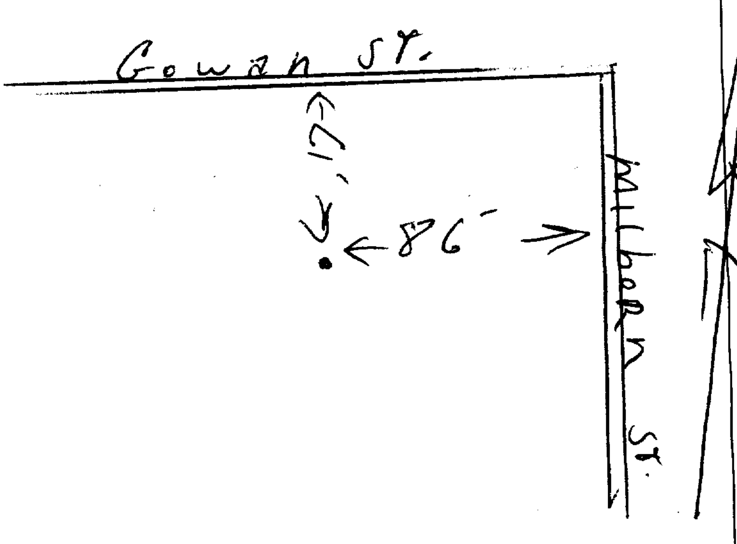
DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☐ PUMP 2 ☐ BAILER
PUMPING RATE: GPM.
DURATION OF PUMPING: HOURS MINS.
STATIC LEVEL | WATER LEVEL END OF PUMPING | WATER LEVELS DURING 1 ☐ PUMPING 2 ☐ RECOVERY: 15 MINUTES | 30 MINUTES | 45 MINUTES | 60 MINUTES (FEET)
IF FLOWING, GIVE RATE: See Sheet #2 GPM. | PUMP INTAKE SET AT FEET | WATER AT END OF TEST 1 ☐ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE ☐ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING FEET | RECOMMENDED PUMPING RATE GPM.
GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL
1 ☐ WATER SUPPLY 2 ☐ OBSERVATION WELL 3 ☐ TEST HOLE 4 ☐ RECHARGE WELL 5 ☐ ABANDONED, INSUFFICIENT SUPPLY 6 ☐ ABANDONED, POOR QUALITY 7 ☐ UNFINISHED

WATER USE
1 ☐ DOMESTIC 2 ☐ STOCK 3 ☐ IRRIGATION 4 ☐ INDUSTRIAL ☐ OTHER 5 ☐ COMMERCIAL 6 ☐ MUNICIPAL 7 ☐ PUBLIC SUPPLY 8 ☐ COOLING OR AIR CONDITIONING 9 ☐ NOT USED

METHOD OF DRILLING
1 ☐ CABLE TOOL 2 ☐ ROTARY (CONVENTIONAL) 3 ☐ ROTARY (REVERSE) 4 ☐ ROTARY (AIR) 5 ☐ AIR PERCUSSION 6 ☐ BORING 7 ☐ DIAMOND 8 ☐ JETTING 9 ☐ DRIVING

CONTRACTOR
NAME OF WELL CONTRACTOR: INTERNATIONAL WATER | LICENCE NUMBER
ADDRESS: Barrie Ont
NAME OF DRILLER OR BORER | LICENCE NUMBER
SIGNATURE OF CONTRACTOR | SUBMISSION DATE DAY 18 MO. 12 YR. 72

OFFICE USE ONLY
DATA SOURCE | CONTRACTOR | DATE RECEIVED 181272
DATE OF INSPECTION Nov. 3/74 | INSPECTOR
REMARKS: CSS.S8
P/J.B.
WI

OWRC COPY

(1)

Page 2 of # 5709345
31D/SE

The Ontario Water Resources Commission Act

WATER WELL RECORD

Water management in Ontario

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11

MUNICIP. | CON.

COUNTY OR DISTRICT: Simcoe | TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE | CON., BLOCK, TRACT, SURVEY, ETC. | LOT 25-27

OWNER (SURNAME FIRST): Barrie Pot P.U.C | ADDRESS | DATE COMPLETED DAY 21 MO. 11 YR. 72

21 T.W. 4/72 B | ZONE | EASTING | NORTHING | RC. | ELEVATION | RC. | BASIN CODE

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH – FEET FROM	TO
Grey	clay	sand & fine gravel	Layered	208	213
Grey	fine gravel	sand	packed Layered	213	230
Grey	Clay		hard	230	243
Grey	Clay	& gravel	Layered & hard packed	243	244
Grey	Clay		hard	244	264
	Gravel	sand & clay	Layered	264	273
Grey	sandy clay & gravel		hard packed	273	284
Brown	lime stone			284	286

31 0213205281 | 0230211128 | 0243205 | 0244205 | 0264205 | 0273 1128 05

32 0284205281 | 02861 5

41 WATER RECORD

WATER FOUND AT – FEET	KIND OF WATER
0206 ~~230~~	1 ☒ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM. INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH – FEET FROM	TO
02"	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE		0	0213
08	1 ☒ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE	.264	0	045-7
	1 ☐ STEEL 2 ☐ GALVANIZED 3 ☐ CONCRETE 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.): 020 | DIAMETER: 02.000 INCHES | LENGTH: 16 FEET

MATERIAL AND TYPE: T.&C. Block | DEPTH TO TOP OF SCREEN: 0213 FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT – FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT, LEAD PACKER, ETC.)

71 PUMPING TEST

PUMPING TEST METHOD: 1 ☒ PUMP 2 ☐ BAILER | PUMPING RATE: 0037 GPM. | DURATION OF PUMPING: 06 HOURS 00 MINS.

WATER LEVELS DURING: 1 ☐ PUMPING 2 ☒ RECOVERY

STATIC LEVEL	WATER LEVEL END OF PUMPING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
002 ~~+1.77~~ FEET	003 ~~2.63~~ FEET	001 ~~+0.23~~ FEET	001 ~~+0.65~~ FEET	— FEET	001 ~~0.54~~ FEET

IF FLOWING, GIVE RATE: GPM. | PUMP INTAKE SET AT: FEET | WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY

RECOMMENDED PUMP TYPE: ☐ SHALLOW ☐ DEEP | RECOMMENDED PUMP SETTING: — FEET | RECOMMENDED PUMPING RATE: — GPM.

037.0 GPM./FT. SPECIFIC CAPACITY

LOCATION OF WELL

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.

4 N

Gowan St ~~Milburn St~~

61'

86'

Milburn St

DRILLERS' REMARKS:

FINAL STATUS OF WELL

1 ☐ WATER SUPPLY
2 ☐ OBSERVATION WELL
3 ☒ TEST HOLE
4 ☐ RECHARGE WELL
5 ☐ ABANDONED, INSUFFICIENT SUPPLY
6 ☐ ABANDONED, POOR QUALITY
7 ☐ UNFINISHED

WATER USE 01

1 ☒ DOMESTIC
2 ☐ STOCK
3 ☐ IRRIGATION
4 ☐ INDUSTRIAL
☐ OTHER
5 ☐ COMMERCIAL
6 ☐ MUNICIPAL
7 ☐ PUBLIC SUPPLY
8 ☐ COOLING OR AIR CONDITIONING
9 ☐ NOT USED

METHOD OF DRILLING

1 ☐ CABLE TOOL
2 ☒ ROTARY (CONVENTIONAL)
3 ☐ ROTARY (REVERSE)
4 ☐ ROTARY (AIR)
5 ☐ AIR PERCUSSION
6 ☐ BORING
7 ☐ DIAMOND
8 ☐ JETTING
9 ☐ DRIVING

NAME OF WELL CONTRACTOR: International Water Supply Ltd | LICENCE NUMBER: 2801

ADDRESS: 342 Bayview Barrie Ont

NAME OF DRILLER OR BORER: C. Magee | LICENCE NUMBER

SIGNATURE OF CONTRACTOR: [signature] | SUBMISSION DATE DAY 24 MO. Nov YR. 72

OFFICE USE ONLY

DATA SOURCE: 1 | CONTRACTOR: 2801 | DATE RECEIVED: 181272

DATE OF INSPECTION: Nov. 13/74 | INSPECTOR

REMARKS: CSS.S8

P / J.B.

WI

(2)

WRC COPY

Ontario

MINISTRY OF THE ENVIRONMENT
The Ontario Water Resources Act

WATER WELL RECORD

310/5E

1. PRINT ONLY IN SPACES PROVIDED
2. CHECK ☒ CORRECT BOX WHERE APPLICABLE

11 | 5711799 | MUNICIP. 57501 | CON.

COUNTY OR DISTRICT	TOWNSHIP, BOROUGH, CITY, TOWN, VILLAGE	CON., BLOCK, TRACT, SURVEY, ETC.	LOT 25-27
Simco	Barrie		

OWNER (SURNAME FIRST)	ADDRESS	DATE COMPLETED
City of Barrie P.U.C.	Barrie Ontario	DAY 28 MO. 000 YR. 74

	ZONE	EASTING	NORTHING	RC	ELEVATION	RC	BASIN CODE		
2 5711799	17	604880	4913766	4	750	5	23	NOV 07, 1975	104

LOG OF OVERBURDEN AND BEDROCK MATERIALS (SEE INSTRUCTIONS)

GENERAL COLOUR	MOST COMMON MATERIAL	OTHER MATERIALS	GENERAL DESCRIPTION	DEPTH - FEET FROM	DEPTH - FEET TO
Brown	Top Soil			0	1
Brown	clay		Loose	1	3
Brown	Sand	Gravel, clay	Loose	3	26
Grey	clay	Gravel	Firm	26	46
Brown	Gravel	Sand clay	Loose	46	59
Grey	clay	Gravel	firm	59	77
Grey	Gravel	Sand clay	Loose	77	82
Grey	clay	Gravel	Hard	82	135
Grey	Sand	fine to course	Loose	135	195
Grey	Sand	Gravel clay	Loose	195	211
Grey	Sand course	Gravel	Loose	211	229
Grey	clay		Firm	229	235

31 | 000 | 16 | 02 | | 000 | 36 | 05 | | 002 | 66 | 28 | 1 | 1 | 05 | | 004 | 62 | 05 | 1 | 1 | | 005 | 96 | 1 | 28 | 05 | | 007 | 72 | 05 | 1 | 1 | | 1

32 | 008 | 22 | 1 | 1 | 28 | 05 | | 013 | 52 | 05 | 1 | 1 | | 019 | 52 | 09 | | | 021 | 12 | 28 | 1 | 1 | 05 | | 022 | 92 | 10 | 1 | 1 | | 023 | 52 | 05 | | |

41 WATER RECORD

WATER FOUND AT - FEET	KIND OF WATER
0003	1 ☒ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
0135	1 ☒ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL
	1 ☐ FRESH 3 ☐ SULPHUR; 2 ☐ SALTY 4 ☐ MINERAL

51 CASING & OPEN HOLE RECORD

INSIDE DIAM INCHES	MATERIAL	WALL THICKNESS INCHES	DEPTH - FEET FROM	DEPTH - FEET TO
24	1 ☒ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE	.320	0	0135
12	1 ☒ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE	.375	0	0153
	1 ☐ STEEL; 2 ☐ GALVANIZED; 3 ☐ CONCRETE; 4 ☐ OPEN HOLE			

SCREEN

SIZE(S) OF OPENING (SLOT NO.)	DIAMETER INCHES	LENGTH FEET
050	10.000	15

MATERIAL AND TYPE: Cook SS
DEPTH TO TOP OF SCREEN: 0153' FEET

61 PLUGGING & SEALING RECORD

DEPTH SET AT - FEET FROM	TO	MATERIAL AND TYPE (CEMENT GROUT LEAD PACKER, ETC.)
		10" S.S. Plug

71 PUMPING TEST

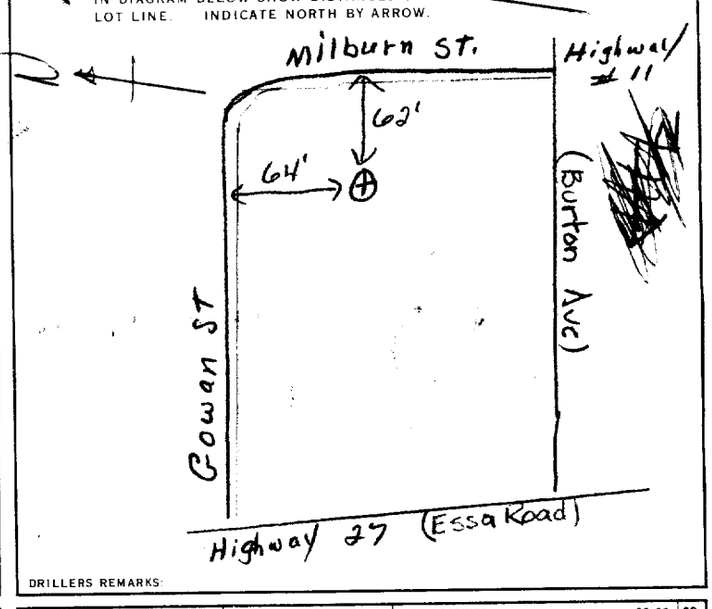
PUMPING TEST METHOD	PUMPING RATE	DURATION OF PUMPING
1 ☒ PUMP 2 ☐ BAILER	0800 GPM	24 HOURS 00 MINS

STATIC LEVEL	WATER LEVEL END OF PUMPING	WATER LEVELS DURING	15 MINUTES	30 MINUTES	45 MINUTES	60 MINUTES
005 FEET	061 FEET	1 ☒ PUMPING 2 ☐ RECOVERY	039 FEET	043 FEET	046 FEET	046 FEET

IF FLOWING GIVE RATE: GPM
PUMP INTAKE SET AT: FEET
WATER AT END OF TEST: 1 ☒ CLEAR 2 ☐ CLOUDY
RECOMMENDED PUMP TYPE: ☐ SHALLOW ☒ DEEP
RECOMMENDED PUMP SETTING: 150 FEET
RECOMMENDED PUMPING RATE: 0800 GPM
50-53: 001.4

LOCATION OF WELL #8 0413

IN DIAGRAM BELOW SHOW DISTANCES OF WELL FROM ROAD AND LOT LINE. INDICATE NORTH BY ARROW.



DRILLERS REMARKS:

FINAL STATUS OF WELL

1 ☒ WATER SUPPLY; 2 ☐ OBSERVATION WELL; 3 ☐ TEST HOLE; 4 ☐ RECHARGE WELL; 5 ☐ ABANDONED, INSUFFICIENT SUPPLY; 6 ☐ ABANDONED, POOR QUALITY; 7 ☐ UNFINISHED

WATER USE

1 ☐ DOMESTIC; 2 ☐ STOCK; 3 ☐ IRRIGATION; 4 ☐ INDUSTRIAL; 5 ☐ COMMERCIAL; 6 ☐ MUNICIPAL; 7 ☐ PUBLIC SUPPLY; 8 ☐ COOLING OR AIR CONDITIONING; 9 ☐ NOT USED; ☐ OTHER

63 SWO 2-9

METHOD OF DRILLING

1 ☐ CABLE TOOL; 2 ☐ ROTARY (CONVENTIONAL); ☐ ROTARY (REVERSE); ☐ AIR (AIR); 5 ☐ PERCUSSION; 6 ☐ BORING; 7 ☐ DIAMOND; 8 ☐ JETTING; 9 ☐ DRIVING

CONTRACTOR

NAME OF WELL CONTRACTOR: I.W.S. — LICENCE NUMBER: 2801
ADDRESS: Box 310 Barrie ONT.
NAME OF DRILLER OR BORER: J G GRAY — LICENCE NUMBER:
SIGNATURE OF CONTRACTOR:
SUBMISSION DATE: DAY 6 MO Jan. YR. 75

OFFICE USE ONLY

DATA SOURCE 58: 1 — CONTRACTOR 59-62: 2801 — DATE RECEIVED 63-68: 130175
DATE OF INSPECTION: APR. 14/75 — INSPECTOR: J.B.
REMARKS: CSS.58

MINISTRY OF THE ENVIRONMENT COPY

FORM

Ontario Ministry of the Environment

Well Tag No. A 058556 (v) / A058556

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name	E-mail Address	☐ Well Constructed by Well Owner
SOUTHVIEW	AUTO CENTRE LTD		

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
188 BURTON AVE	BARRIE	ONT	L4N 2S1	7052737282826

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
188 BURTON AVE	CITY OF BARRIE	3 TO 5	

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE	BARRIE	Ontario	

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation
NAD 83	17	605248	4911396		GARMEN	☐ Undifferentiated ☐ Averaged ☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To

Annular Space/Abandonment Sealing Record

Depth Set at (~~Metres~~) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed *(Cubic Metres)*
0	13'4	1/2 BAG OF 3/8 HOLE PLUG	

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method

Pump intake set at *(Metres)*

Pumping rate *(Litres/min)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(Metres)*

Recommended pump type ☐ Shallow ☐ Deep

Recommended pump depth ____ Metres

Recommended pump rate *(Litres/min)*

If flowing give rate *(Litres/min)*

	Draw Down		Recovery	
	Time *(Min)*	Water Level *(Metres)*	Time *(Min)*	Water Level *(Metres)*
Static Level			Static Level	
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, *specify* _____

Water Use

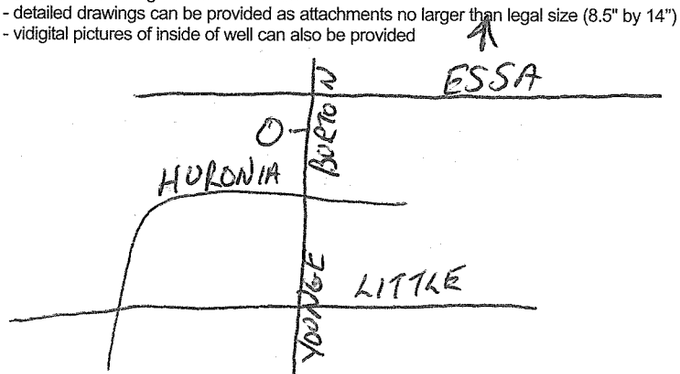
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* _____

Status of Well

☐ Water Supply ☐ Dewatering Well ☒ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, *specify* _____
☐ Recharge Well ☐ Abandoned, other, *specify* _____

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Date Well Completed *(yyyy/mm/dd)*	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner *(yyyy/mm/dd)*
2007/06/26	☐ Yes ☒ No	~~Mar~~ 2007/06/27

Water Details

Water found at Depth	Kind of Water
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Casing Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete

Screen Used

☐ Galvanized ☐ Steel ☐ Fibreglass ☐ Plastic ☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☐ Yes ☐ No

Casing and Well Details

Diameter of the Hole *(Centimetres)*

Depth of the Hole *(Metres)*

Wall Thickness *(Metres)*

Inside Diameter of the Casing (~~Metres~~) 2"

Depth of the Casing (~~Metres~~) 13'4"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
LONE STAR WELL DIGGING LTD	3413

Business Address (Street No./Name, number, RR)	Municipality
P.O. Box 280	KEFROY

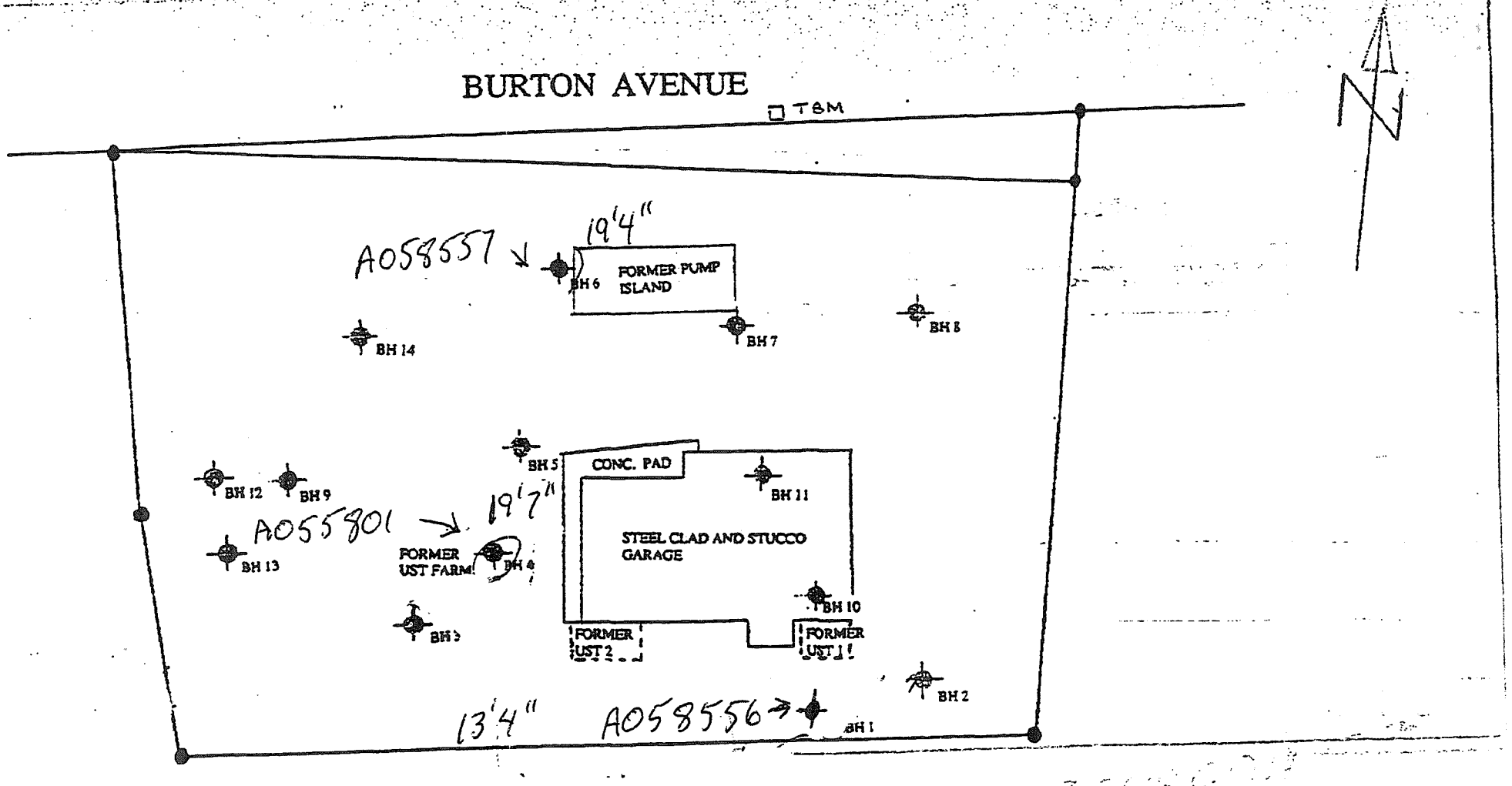
Province	Postal Code	Business E-mail Address
ONT	N0N 1W0	

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
7054364359	MOORE, JAMES

Well Technician's Licence No.	Signature of Technician	Date Submitted *(yyyy/mm/dd)*
T4011	Jim Moore	2007/06/27

Ministry Use Only

Audit No.	Well Contractor No.
Z63963	3413
Date Received *(yyyy/mm/dd)* JUN 29 2007	Date of Inspection *(yyyy/mm/dd)*
Remarks	



LEGEND

BH 1 — Borehole by Trow - October, 2006

Trow Associates Inc.
1595 Clark Boulevard
Brampton, Ontario
L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

		DWG. TITLE AND PROJECT: BOREHOLE LOCATION PLAN, 188 BURTON AVENUE, BARRIE
DATE: NOVEMBER 2006		
DWN.:	CHKD.:	PROJECT NO.: BRGE001417298B / DWG. NO.: 1

Ontario Ministry of the Environment

Well Tag No. A 058557 (N)
A 058551

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

First Name	Last Name	E-mail Address	☐ Well Constructed by Well Owner
SOUTHVIEW AUTO CENTRE LTD			

Mailing Address (Street Number/Name, RR)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
188 BURTON AVE	BARRIE	ONT	L4N2S1	7057372826

Part A Construction and/or Major Alteration of a Well

Address of Well Location (Street Number/Name, RR)	Township	Lot	Concession
188 BURTON AVE	CITY OF BARRIE	3 TO 5	

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE	BARRIE	Ontario	L4N2S1

UTM Coordinates	Zone	Easting	Northing	GPS Unit Make	Model	Mode of Operation: ☐ Undifferentiated ☐ Averaged
NAD 83	17	605230	4911979		GARMEN	☐ Differentiated, specify

Overburden and Bedrock Materials *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (Metres) From	Depth (Metres) To

Annular Space/Abandonment Sealing Record

Depth Set at (Metres) From	To	Type of Sealant Used (Material and Type)	Volume Placed (Cubic Metres)
0	19'4"	3/4 BAG OF 3/8 HOLE PLUG	

Results of Well Yield Testing

Check box if after test of well yield, water was:
☐ Clear and sand free
☐ Cannot develop to sand-free state

If pumping discontinued, give reason:

Pumping test method

Pump intake set at *(Metres)*

Pumping rate *(Litres/min)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(Metres)*

Recommended pump type ☐ Shallow ☐ Deep

Recommended pump depth ____ Metres

Recommended pump rate *(Litres/min)*

If flowing give rate *(Litres/min)*

	Draw Down		Recovery	
	Time (Min)	Water Level (Metres)	Time (Min)	Water Level (Metres)
Static Level			Static Level	
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Rotary (Air) ☐ Digging
☐ Air percussion ☐ Boring
☐ Other, *specify* ____

Water Use

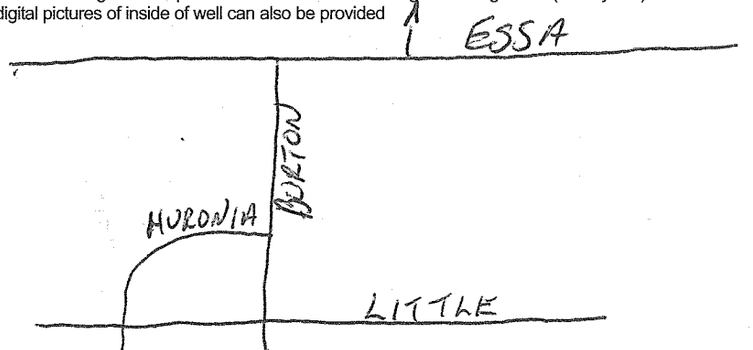
☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* ____

Status of Well

☐ Water Supply ☐ Dewatering Well ☒ Observation and/or Monitoring Hole
☐ Replacement Well ☐ Abandoned, Insufficient Supply ☐ Alteration (Construction)
☐ Test Hole ☐ Abandoned, Poor Water Quality ☐ Other, *specify* ____
☐ Recharge Well ☐ Abandoned, other, *specify* ____

Location of Well

Please provide a map below showing:
- all property boundaries, and measurements sufficient to locate the well in relation to fixed points,
- an arrow indicating the North direction
- detailed drawings can be provided as attachments no larger than legal size (8.5" by 14")
- vidigital pictures of inside of well can also be provided



Water Details

Water found at Depth	Kind of Water
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals
____ Metres ☐ Gas	☐ Fresh ☐ Salty ☐ Sulphur ☐ Minerals

Date Well Completed (yyyy/mm/dd)	Was the well owner's information package delivered?	Date the Well Record and Package Delivered to Well Owner (yyyy/mm/dd)
2007/06/26	☐ Yes ☐ No	

Casing Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☒ Plastic
☐ Concrete

Screen Used

☐ Galvanized
☐ Steel
☐ Fibreglass
☐ Plastic
☐ Concrete

No Casing and Screen Used

☐ Open Hole

Disinfected? ☐ Yes ☐ No

Casing and Well Details

Diameter of the Hole *(Centimetres)*

Depth of the Hole *(Metres)*

Wall Thickness *(Metres)*

Inside Diameter of the Casing (Metres) 2"

Depth of the Casing (Metres) 19'4"

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
LONE STAR WELL DIGGING LTD	3413

Business Address (Street No./Name, number, RR)	Municipality
P.O. Box 280	LEFROY

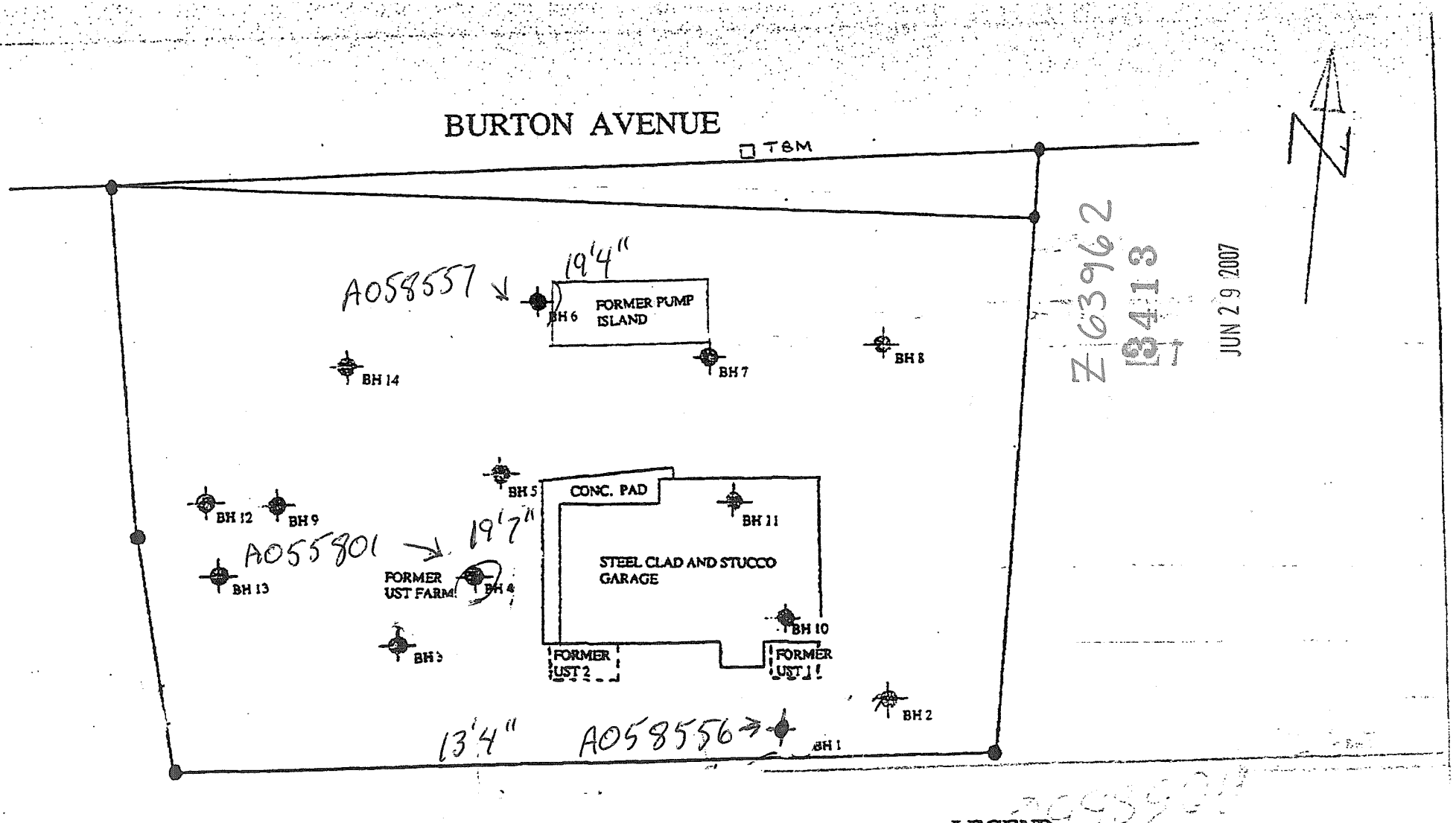
Province	Postal Code	Business E-mail Address
ONT	N0L1W0	LONESTAR@MCW.net

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
7054364359	JAMES MOORE MOORE, JAMES

Well Technician's Licence No.	Signature of Technician	Date Submitted (yyyy/mm/dd)
T4011	Jim Moore	2007/06/27

Ministry Use Only

Audit No.	Well Contractor No.
Z 63962	3413
Date Received (yyyy/mm/dd) JUN 29 2007	Date of Inspection (yyyy/mm/dd)
Remarks	



LEGEND

BH 1 — Borehole by Trow - October, 2006

Trow Associates Inc.
1595 Clark Boulevard
Brampton, Ontario
L6T 4V1
Telephone: (905) 793-9800
Fax: (905) 793-0641

		DWG. TITLE AND PROJECT: BOREHOLE LOCATION PLAN, 188 BURTON AVENUE, BARRIE	
DATE: NOVEMBER 2006			
DWN.:	CHKD.:	PROJECT NO.: BRGE001417298B	DWG. NO.: 1

Ontario — Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☑ Imperial

Well Tag No. *(Place Sticker and/or Print Below)* A162243

Well Record

Regulation 903 Ontario Water Resources Act

Page 1 of 1

Well Owner's Information

ATTN: MR. JOHN VELLINGA

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed ☐ Well Owner
	MELCHOIR DEVELOPMENT INC.	johnvellinga@sympatico.ca	

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. (inc. area code)
299 LAKESHORE DRIVE	BARRIE	ON	L4N 7Y9	705 722 6706

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
196 BURTON AVENUE			

County/District/Municipality	City/Town/Village	Province	Postal Code
SIMCOE COUNTY	Barrie	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 8 3	17	605088	4913806		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Clay		Compact	0	20
Grey	Clay		Compact	20	35

"cluster of 5 monitoring wells"

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used (Material and Type)	Volume Placed (m³/ft³)
25	28	Sand	
28	0	Bentonite	

Method of Construction

☐ Cable Tool ☐ Diamond
☒ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☐ Other, *specify*

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	To
2	Plastic		30	+2.5

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	To
2	Plastic	010	35	30

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth (m/ft)	Kind of Water	
	☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*
	☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*
	☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify*

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	35	8.5

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at (m/ft)

Pumping rate (l/min / GPM)

Duration of pumping ____ hrs + ____ min

Final water level end of pumping (m/ft)

If flowing give rate (l/min / GPM)

Recommended pump depth (m/ft)

Recommended pump rate (l/min / GPM)

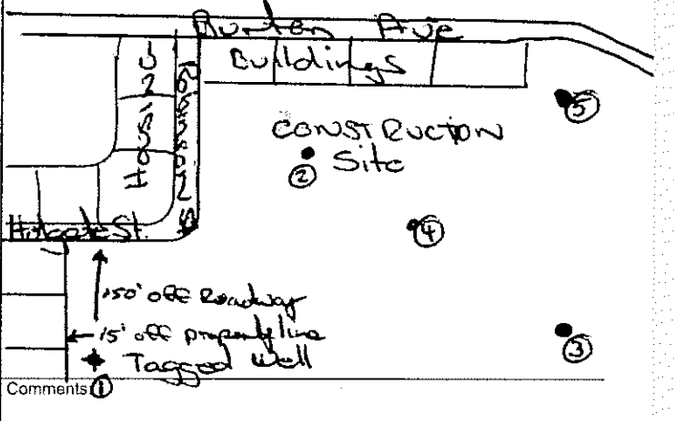
Well production (l/min / GPM)

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments ①

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
LONDON SOIL TEST LTD	7190

Business Address (Street Number/Name)	Municipality
R.R.6	DUNDALK

Province	Postal Code	Business E-mail Address
ON	N0C 1B0	info@londonsoil.com

Bus. Telephone No. (inc. area code)	Name of Well Technician (Last Name, First Name)
5194555777	BOSS, KYAN

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3576		2016 04 25

Well owner's information package delivered	Date Package Delivered	Ministry Use Only
☐ Yes ☒ No		Audit No. Z228535
	Date Work Completed 2016 04 25	Received JUN 09 2016

0506E (2014/11)

Ministry's Copy

Ontario

Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#: A 208627

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
	Melchior Management Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
299 Lakeshore Drive	Barrie	Ont	L4N7Y9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
196 Burton Ave			

County/District/Municipality	City/Town/Village	Province	Postal Code
Simcoe	Barrie	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	605174	4918354		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Course Sand			0	1.5
Brown	Course Sand	Fine Sand	Damp	1.5	3
Brown	Course Sand	Grey Fine Sand	Wet	3	5
Grey	Fine Sand	Brown Course Sand, Trace Clay	Wet	5	6.1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
0	3.7	Bentonite Holeplug	
3.7	6.1	Silica Sand	

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify* ____

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☒ Other, *specify* Dual Rotary

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☒ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify* ____

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5	Plastic	0.635	+0.9	5.2

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☒ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify* ____
☐ Other, *specify* ____

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5	Plastic	10	5.2	6.1

Water Details

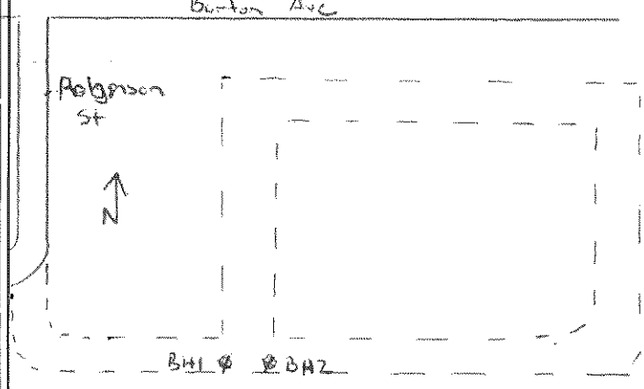
Water found at Depth	Kind of Water	
1.5-6.1 (m/ft) ☐ Gas	☒ Fresh ☒ Untested ☐ Other, *specify* ____	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify* ____	
(m/ft) ☐ Gas	☐ Fresh ☐ Untested ☐ Other, *specify* ____	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.1	15

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Proposed Layout of Subdivision *Record For BH1*

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Aquatech Dewatering	7141

Business Address (Street Number/Name)	Municipality
331 Rodinia Road	Vaughan

Province	Postal Code	Business E-mail Address
Ont	L6A4P5	info@aquatech.com

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
9059071700	McIntosh, Greg

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3510		2016/12/28

Well owner's information package delivered ☒ Yes ☐ No

Date Package Delivered: 2016/12/23

Date Work Completed: 2016/12/22

Ministry Use Only

Audit No. Z251699

DEC 29 2016

Received

0506E (2014/11)

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Ontario

Ministry of the Environment and Climate Change

Measurements recorded in: ☐ Metric ☐ Imperial

Well Tag No. *(Place Sticker and/or Print Below)*

Tag#: A 208628

Well Record

Regulation 903 Ontario Water Resources Act

Page ____ of ____

Well Owner's Information

First Name	Last Name / Organization	E-mail Address	☐ Well Constructed by Well Owner
Melchior	Mangement Corporation		

Mailing Address (Street Number/Name)	Municipality	Province	Postal Code	Telephone No. *(inc. area code)*
299 Lakeshore Drive	Barrie	Ont	L4N7Y9	

Well Location

Address of Well Location (Street Number/Name)	Township	Lot	Concession
196 Burton Ave			

County/District/Municipality	City/Town/Village	Province	Postal Code
Simcoe	Barrie	Ontario	

UTM Coordinates	Zone	Easting	Northing	Municipal Plan and Sublot Number	Other
NAD 83	17	605172	4918854		

Overburden and Bedrock Materials/Abandonment Sealing Record *(see instructions on the back of this form)*

General Colour	Most Common Material	Other Materials	General Description	Depth (m/ft) From	Depth (m/ft) To
Brown	Course Sand			0	1.5
Brown	Course Sand	Fine Sand	Damp	1.5	3
Brown	Course Sand	Grey Fine Sand	Wet	3	5
Grey	Fine Sand	Brown Course Sand	Wet	5	6.1

Annular Space

Depth Set at (m/ft) From	To	Type of Sealant Used *(Material and Type)*	Volume Placed (m^3/ft^3)
0	3.7	Bentonite Holeplug	
3.7	6.1	Silica Sand	

Method of Construction

☐ Cable Tool ☐ Diamond
☐ Rotary (Conventional) ☐ Jetting
☐ Rotary (Reverse) ☐ Driving
☐ Boring ☐ Digging
☐ Air percussion
☑ Other, *specify* Dual Rotary

Well Use

☐ Public ☐ Commercial ☐ Not used
☐ Domestic ☐ Municipal ☐ Dewatering
☐ Livestock ☐ Test Hole ☑ Monitoring
☐ Irrigation ☐ Cooling & Air Conditioning
☐ Industrial
☐ Other, *specify*

Construction Record - Casing

Inside Diameter (cm/in)	Open Hole OR Material (Galvanized, Fibreglass, Concrete, Plastic, Steel)	Wall Thickness (cm/in)	Depth (m/ft) From	Depth (m/ft) To
5	Plastic	0.635	+0.9	5.2

Construction Record - Screen

Outside Diameter (cm/in)	Material (Plastic, Galvanized, Steel)	Slot No.	Depth (m/ft) From	Depth (m/ft) To
5	Plastic	10	5.2	6.1

Status of Well

☐ Water Supply
☐ Replacement Well
☐ Test Hole
☐ Recharge Well
☐ Dewatering Well
☑ Observation and/or Monitoring Hole
☐ Alteration (Construction)
☐ Abandoned, Insufficient Supply
☐ Abandoned, Poor Water Quality
☐ Abandoned, other, *specify*
☐ Other, *specify*

Water Details

Water found at Depth	Kind of Water	
1.5-6.1 (m/ft) ☐ Gas	☑ Fresh ☑ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*	
(m/ft) ☐ Gas	Kind of Water: ☐ Fresh ☐ Untested ☐ Other, *specify*	

Hole Diameter

Depth (m/ft) From	To	Diameter (cm/in)
0	6.1	15

Results of Well Yield Testing

After test of well yield, water was:
☐ Clear and sand free
☐ Other, *specify*

If pumping discontinued, give reason:

Pump intake set at *(m/ft)*

Pumping rate *(l/min / GPM)*

Duration of pumping ____ hrs + ____ min

Final water level end of pumping *(m/ft)*

If flowing give rate *(l/min / GPM)*

Recommended pump depth *(m/ft)*

Recommended pump rate *(l/min / GPM)*

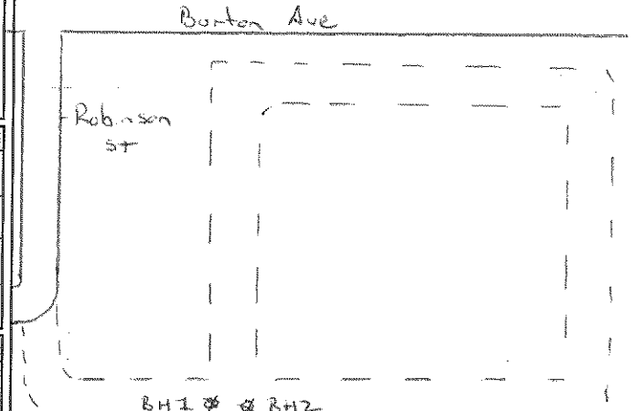
Well production *(l/min / GPM)*

Disinfected? ☐ Yes ☐ No

	Draw Down Time (min)	Draw Down Water Level (m/ft)	Recovery Time (min)	Recovery Water Level (m/ft)
Static Level				
1			1	
2			2	
3			3	
4			4	
5			5	
10			10	
15			15	
20			20	
25			25	
30			30	
40			40	
50			50	
60			60	

Map of Well Location

Please provide a map below following instructions on the back.



Comments: Proposed Layout of Subdivision
Record For BH2

Well Contractor and Well Technician Information

Business Name of Well Contractor	Well Contractor's Licence No.
Aquatech Dewatering	7314

Business Address (Street Number/Name)	Municipality
331 Rodinca Road	Vaughan

Province	Postal Code	Business E-mail Address
Ont	L6A4P5	info@aquatd.com

Bus. Telephone No. *(inc. area code)*	Name of Well Technician (Last Name, First Name)
9059071700	Matatash, Greg

Well Technician's Licence No.	Signature of Technician and/or Contractor	Date Submitted
3560		2016/12/28

Well owner's information package delivered	Date Package Delivered	Date Work Completed
☑ Yes ☐ No	2016/12/23	2016/12/22

Ministry Use Only

Audit No. Z251700

DEC 29 2016

Received

Ministry's Copy

APPENDIX D

Borehole Logs & Ground Water Elevations

LOG OF BOREHOLE BH21-1

PROJECT: 181 Burton Avenue
REF. NO.: 201-09517-00
CLIENT: Monolite Holdings Inc.
Method: Solid Stem Auger
ENCL NO.: 1
PROJECT LOCATION: Barrie, ON
Diameter: 100 mm
DATUM: Geodetic
Date: Jan-11-2021
BH LOCATION: See Figure 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m
232.2	Ground Surface			
0.0 / 232.1	**TOPSOIL** Dark brown silty sand, moist			
0.1	**SILTY SAND FILL** Brown, moist, very loose to compact	1	SS	12
		2	SS	2
		3	SS	1
230.3				
1.9	**TOPSOIL** Dark brown silty sand, moist			
229.8				
2.4	**SAND** Red brown to brown, some to trace silt, trace gravel, moist, loose	4	SS	10
229.5				
2.7	**SAND** Brown, some silt, moist, compact to dense	5	SS	14
	Wet	6	SS	32
227.2				
5.0	End of Borehole			

SPT & DYNAMIC CONE PENETRATION RESISTANCE PLOT
SHEAR STRENGTH (kPa)
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)

REMARKS AND GRAIN SIZE DISTRIBUTION (%)
GR SA SI CL

70 (30)

W. L. 228.1 m

Water level measured on February 10, 2021 at 4.08 mBGS

Silt layer

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-2

PROJECT: 181 Burton Avenue
REF. NO.: 201-09517-00
CLIENT: Monolite Holdings Inc.
Method: Solid Stem Auger
ENCL NO.: 2
PROJECT LOCATION: Barrie, ON
Diameter: 100 mm
DATUM: Geodetic
Date: Jan-11-2021
BH LOCATION: See Figure 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	"N" BLOWS / 0.3 m	ELEVATION
232.2	Ground Surface				
0.0 / 232.1	**TOPSOIL** Dark brown silty sand, some gravel, moist				
0.1	**SAND FILL** Brown sand to sandy silt fill, trace gravel, moist, very loose	1	SS	8	232
		2	SS	7	231
		3	SS	3	230
229.8					
2.4	**SILTY SAND** Brown, trace gravel, moist to wet, compact to dense	4	SS	4	
		5	SS	11	229
		6	SS	32	228
227.2					
5.0	End of Borehole - Upon completion of drilling the borehole was open with water measured at 4.9 meters below ground surface.				

SPT & DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100)
SHEAR STRENGTH (kPa): ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)
PLASTIC LIMIT w_P | NATURAL MOISTURE CONTENT w | LIQUID LIMIT w_L
WATER CONTENT (%) (10 20 30)
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (kN/m³)
REMARKS AND GRAIN SIZE DISTRIBUTION (%)

GR	SA	SI	CL
4	73	(23)	

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: +3, ×3: Numbers refer to Sensitivity; ○ε=3%: Strain at Failure

LOG OF BOREHOLE BH21-3

PROJECT: 181 Burton Avenue
REF. NO.: 201-09517-00
CLIENT: Monolite Holdings Inc.
Method: Solid Stem Auger
ENCL NO.: 3
PROJECT LOCATION: Barrie, ON
Diameter: 100 mm
DATUM: Geodetic
Date: Jan-11-2021
BH LOCATION: See Figure 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / 0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	SPT & DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.9	Ground Surface										
231.8	**TOPSOIL**										
0.1	Dark brown silty sand, some gravel, moist	1	SS	7		231	7				
	SILT AND SAND FILL Brown sand to silt and sand fill, trace gravel, moist, very loose	2	SS	10			10				
		3	SS	1		230	1				57 (43)
228.9		4	SS	1			1				
3.0	**SILTY SAND** Greenish grey, trace gravel, moist, compact	5	SS	11		229	11				
227.3						228					
4.6	**SILTY SAND** Brown, trace gravel, wet, dense to very dense	6	SS	30		227	30				
		7	SS	70		226	70				
225.3											
6.6	End of Borehole - Upon completion of drilling the borehole was open to 5.5 mBGS with water measured at 4.6 mBGS.										

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ ε=3% Strain at Failure

LOG OF BOREHOLE BH21-4

PROJECT: 181 Burton Avenue
REF. NO.: 201-09517-00
CLIENT: Monolite Holdings Inc.
Method: Solid Stem Auger
ENCL NO.: 4
PROJECT LOCATION: Barrie, ON
Diameter: 100 mm
DATUM: Geodetic
Date: Jan-11-2021
BH LOCATION: See Figure 2

(m) ELEV / DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS/0.3 m "N"	GROUND WATER CONDITIONS	ELEVATION	SPT & DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.6	Ground Surface										
231.5 / 0.1	**TOPSOIL** Dark brown silty sand, some gravel, moist										
	SAND FILL Brown, some silt, trace gravel, moist, loose to compact	1	SS	5		231	5	○			
		2	SS	5			5	○			
		3	SS	13		230	13	○			
		4	SS	bounce		229		○			
228.5 / 3.1	**SILTY SAND** Brown, trace gravel, trace clay, moist to wet, compact	5	SS	17	▽	228	17	○			Water level measured on February 10, 2021 at 4.03 mBGS
	- Brownish grey, wet	6	SS	28		227	28	○			
226.5 / 5.0	End of Borehole										

W. L. 227.5 m

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ 8=3% Strain at Failure

LOG OF BOREHOLE BH21-5

PROJECT: 181 Burton Avenue
REF. NO.: 201-09517-00
CLIENT: Monolite Holdings Inc.
Method: Solid Stem Auger
ENCL NO.: 5
PROJECT LOCATION: Barrie, ON
Diameter: 100 mm
DATUM: Geodetic
Date: Jan-11-2021
BH LOCATION: See Figure 2

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	SPT & DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH (kPa) ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE & Sensitivity × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.5	Ground Surface										
231.4 / 0.1	**TOPSOIL** Dark brown silty sand, some gravel, moist										
	SAND FILL Brown, some silt, trace gravel, moist, very loose to compact		1	SS	6		231	6	○		
			2	SS	6			6	○		
			3	SS	4		230	4	○		
			4	SS	7		229	7	○		
228.3 / 3.2	**TOPSOIL** Dark brown silty sand, some gravel, moist		5	SS	5			5	○		
	SILT AND SAND Brown, trace gravel, trace clay, moist, compact to dense						228				
			6	SS	32		227	32	○		3 53 (44)
226.4 / 5.0	End of Borehole - Upon completion of drilling the borehole was open and dry.										

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ 8=3% Strain at Failure

ENVISION
CONSULTANTS LTD

LOG OF BOREHOLE BH22-1

PROJECT: Phase Two Environmental Site Assessment
REF. NO.: 22-0127
CLIENT: Monolite Holdings Inc.
Method: Geo Probe
ENCL NO.:
PROJECT LOCATION: 181 Burton Avenue, Barrie, Ontario
Diameter:
ORIGINATED BY KH
DATUM: Geodetic
Date: Apr/08/2022 to Apr/08/2022
COMPILED BY FL
BH LOCATION: N 4914009.96 E 605206.01
CHECKED BY JA

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES: NUMBER	TYPE	"N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	Soil Head Space Vapors: PID (ppm) 10 20 30 40	CGD (ppm) 10 20 30 40	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.2	Ground Surface												
232.0	**TOPSOIL:** 100mm					Rising Up Casing	232						
0.1	**FILL:** silty sand, trace gravel, trace clay, trace organics, dark brown, moist.		1A	S									PAHs
	silty sand to sandy silt at 0.8m		1B	S			231						PHCs & BTEX
1						Holeplug							
			2A	S									M&ORPs
229.9							230						
2.3	**SILTY SAND:** trace clay, brown to grey, wet.		2B	S		W. L. 229.5 m Apr 11, 2022							
3							229						
			3A	S									PHCs & BTEX
	grey below 3.8m												
4			3B	S			228						
						Screen							
5			4A	S									VOCs
							227						
			4B	S									
226.1													
6.1	**END OF BOREHOLE:**												

Notes:
1) 50mm diameter monitoring well was installed upon completion, screened at 3.05-6.10m.
2) Water Level Readings:

Date:	Water Level(mbgl):
April 11, 2022	2.73

GROUNDWATER ELEVATIONS
Measurement 1st ▽ 2nd ▼ 3rd ▼ 4th ▼

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 6 =3% Strain at Failure

ENVISION
CONSULTANTS LTD

LOG OF BOREHOLE BH22-2

PROJECT: Phase Two Environmental Site Assessment
REF. NO.: 22-0127
CLIENT: Monolite Holdings Inc.
Method: Geo Probe
ENCL NO.:
PROJECT LOCATION: 181 Burton Avenue, Barrie, Ontario
Diameter:
ORIGINATED BY KH
DATUM: Geodetic
Date: Apr/08/2022 to Apr/08/2022
COMPILED BY FL
BH LOCATION: N 4914013.89 E 605235.91
CHECKED BY JA

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS 0.3 m	GROUND WATER CONDITIONS	ELEVATION	Soil Head Space Vapors PID (ppm)	Soil Head Space Vapors CGD (ppm)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT; WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
231.9	Ground Surface												
231.8 0.0	**TOPSOIL:** 100mm						Rising Up Casing						
0.1	**FILL:** silty sand, trace gravel, trace clay, trace organics, dark brown, moist.		1A	S									PAHs
1			1B	S			231						M&ORPs
							Holeplug						
2			2A	S			230						PHCs & BTEX
229.6 2.3	**SILTY SAND:** trace clay, grey, wet.		2B	S			W. L. 229.3 m Apr 11, 2022						
3			3A	S			Sand						PHCs & BTEX
4			3B	S			228						
							Screen						
5			4A	S			227	370					VOCs
			4B	S			226						
225.8 6.1	**END OF BOREHOLE:**												

Notes:
1) 50mm diameter monitoring well was installed upon completion, screened at 3.05-6.10m.
2) Water Level Readings:

Date:	Water Level(mbgl):
April 11, 2022	2.73

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES: + 3, × 3: Numbers refer to Sensitivity; ○ 3=3% Strain at Failure

ENVISION
CONSULTANTS LTD

LOG OF BOREHOLE BH22-3

PROJECT: Phase Two Environmental Site Assessment
REF. NO.: 22-0127
CLIENT: Monolite Holdings Inc.
Method: Geo Probe
ENCL NO.:
PROJECT LOCATION: 181 Burton Avenue, Barrie, Ontario
Diameter:
ORIGINATED BY KH
DATUM: Geodetic
Date: Apr/08/2022 to Apr/08/2022
COMPILED BY FL
BH LOCATION: N 4914031.41 E 605220.08
CHECKED BY JA

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	Soil Head Space Vapors PID (ppm) 10 20 30 40	Soil Head Space Vapors CGD (ppm) 10 20 30 40	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.5	Ground Surface												
232.4	**TOPSOIL:** 100mm												
0.1	**FILL:** silty sand, trace gravel, trace clay, trace organics, dark brown, moist.		1A	S			232						PAHs, PHCs&BTEX
1			1B	S									M&ORPs
	contains wood pieces at 1.5m						231						
2			2A	S									
230.2													
2.3	**FILL:** sand, trace gravel, trace silt, trace clay, brown, wet.		2B	S			230						
3 229.5													
3.1	**SILTY SAND:** trace clay, grey, wet.		3A	S			229						
4			3B	S									
227.9							228						
4.6	**END OF BOREHOLE:**												

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 8=3% Strain at Failure

ENVISION-SOIL-ROCK-OCTOBER-12-2021.GLB
ENVIRO PID(PPM) AND CGD(PPM)-2016-802 22-0127 181 BURTON AVE.GPJ 5/12/22

ENVISION
CONSULTANTS LTD

LOG OF BOREHOLE BH22-4

PROJECT: Phase Two Environmental Site Assessment
REF. NO.: 22-0127
CLIENT: Monolite Holdings Inc.
Method: Geo Probe
ENCL NO.:
PROJECT LOCATION: 181 Burton Avenue, Barrie, Ontario
Diameter:
ORIGINATED BY KH
DATUM: Geodetic
Date: Apr/08/2022 to Apr/08/2022
COMPILED BY FL
BH LOCATION: N 4914047.67 E 605222.53
CHECKED BY JA

(m) ELEV / DEPTH	DESCRIPTION	STRATA PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" BLOWS / 0.3 m	GROUND WATER CONDITIONS	ELEVATION	Soil Head Space Vapors PID (ppm)	Soil Head Space Vapors CGD (ppm)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT; WATER CONTENT (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (kN/m³)	REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
232.3	Ground Surface												
232.2	**TOPSOIL:** 100mm												
0.1	**FILL:** silty sand, trace gravel, trace clay, trace organics, dark brown, moist.		1A	S			232						PAHs
1			1B	S			231						PHCs&BTEX
2			2A	S									M&ORPs
			2B	S			230						
3			3A	S			229						
228.5													
3.8	**SILTY SAND:** trace gravel, trace clay, grey, wet.		3B	S			228						
4													
227.7													
4.6	**END OF BOREHOLE:**												

GROUNDWATER ELEVATIONS
Measurement 1st 2nd 3rd 4th

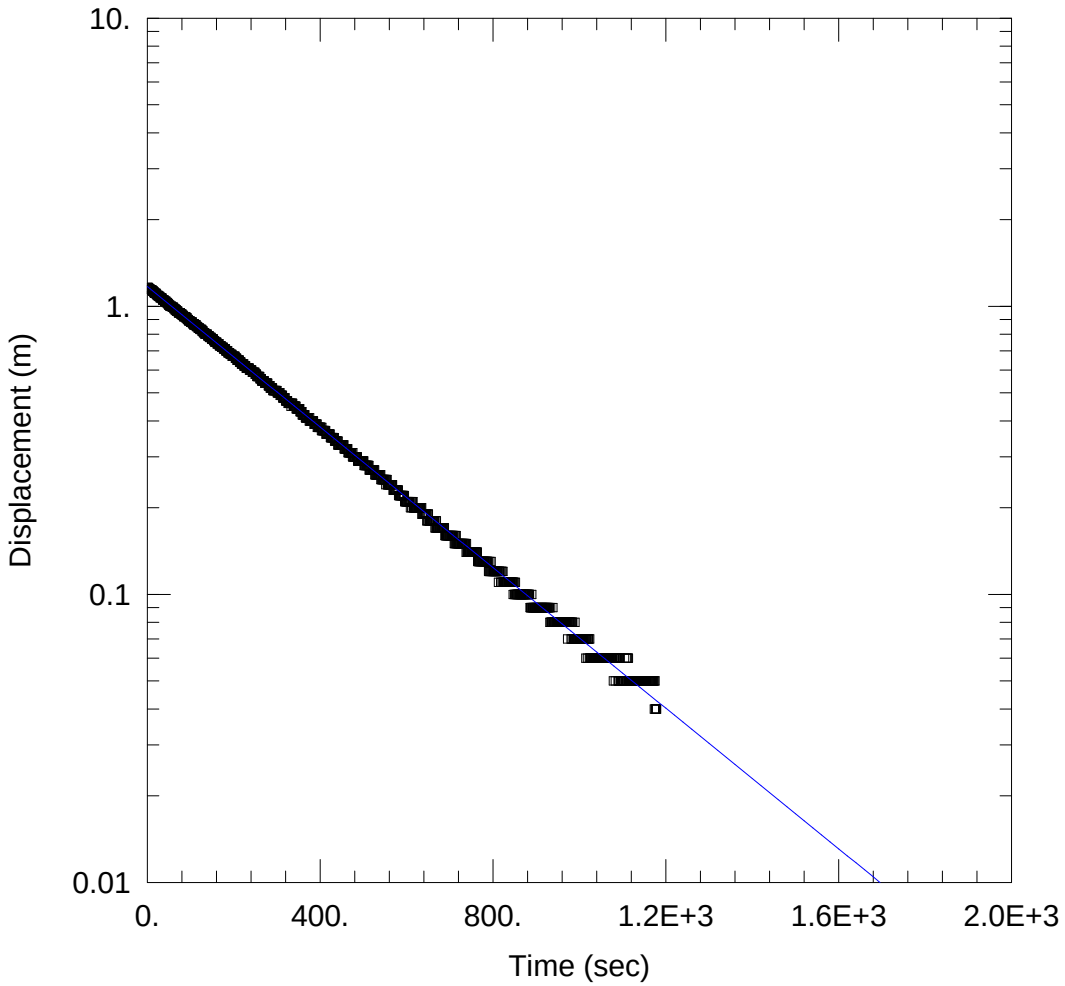
GRAPH NOTES
+ 3, × 3: Numbers refer to Sensitivity
○ 8=3% Strain at Failure

Monitoring Well Details & Ground Water Levels

Monitoring Well	Ground Elevation (masl)	Stickup (m)	Reference Elevation (masl)	Total Depth (mbgs)	Ground Water Level (mbgs)						Ground Water Elevation (masl)					
					10-Feb-21	16-Mar-22	28-Apr-22	12-May-22	06-Jun-22	20-Jul-23	10-Feb-21	16-Mar-22	28-Apr-22	12-May-22	06-Jun-22	20-Jul-23
BH21-1	232.20	0.80	233.00	4.60	4.08	3.14	3.06	3.12	3.25	3.13	228.12	229.06	229.14	229.08	228.95	229.07
BH21-4	231.60	0.81	232.41	5.00	4.03	3.09	3.06	3.10	3.22	3.15	227.57	228.51	228.54	228.50	228.38	228.45
BH22-1	232.2	0.95	233.15	6.13			2.81	2.87	3.01	2.84			229.39	229.33	229.19	229.36
BH22-2	231.9	1.07	232.97	5.86			2.85	2.88	2.97	2.83			229.05	229.02	228.93	229.07

APPENDIX E

Hydraulic Conductivity Testing Results



WELL TEST ANALYSIS

Data Set: M:\...\BH21-1 Slug Test.aqt
Date: 05/18/22 Time: 15:37:09

PROJECT INFORMATION

Company: Azimuth Environmental
Project: 21-492
Location: 181 Burton Street
Test Well: BH21-1
Test Date: May 12th 2022

AQUIFER DATA

Saturated Thickness: 1.58 m Anisotropy Ratio (Kz/Kr): 1.

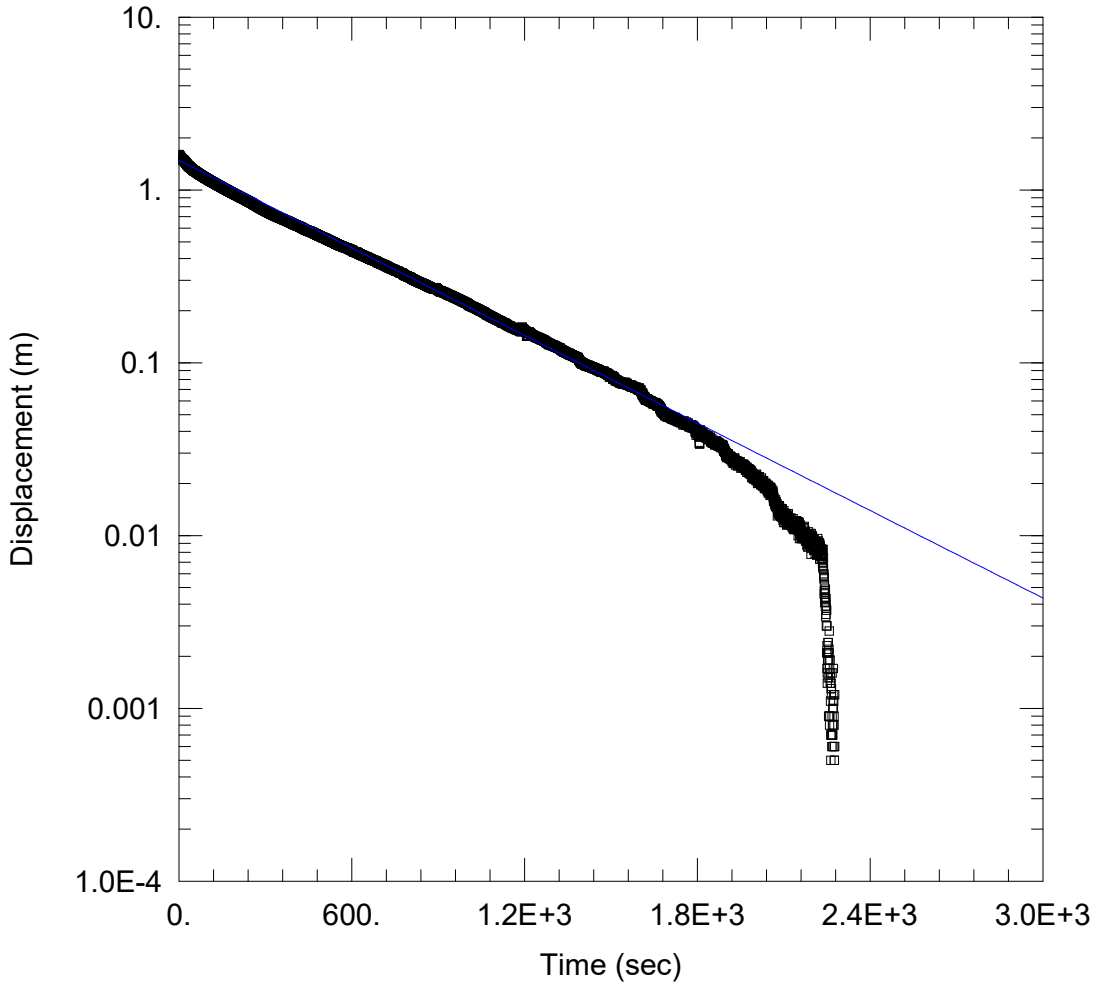
WELL DATA (BH 21-1)

Initial Displacement: 1.16 m
Total Well Penetration Depth: 1.58 m
Casing Radius: 0.0254 m
Static Water Column Height: 1.58 m
Screen Length: 1.52 m
Wellbore Radius: 0.1 m

SOLUTION

Aquifer Model: Unconfined Solution Method: Hvorslev

K = 2.036E-6 m/sec y0 = 1.17 m



181 BURTON

Data Set: M:\...\BH21-4 Slug Test.aqt
Date: 04/13/22 Time: 16:30:57

PROJECT INFORMATION

Company: Azimuth Environmental
Project: 21-492
Test Well: BH21-4
Test Date: Mar 16, 2022

AQUIFER DATA

Saturated Thickness: 1.91 m Anisotropy Ratio (Kz/Kr): 1.

WELL DATA (BH21-4)

Initial Displacement: 1.6 m
Total Well Penetration Depth: 1.91 m
Casing Radius: 0.0254 m
Static Water Column Height: 1.91 m
Screen Length: 1.5 m
Wellbore Radius: 0.075 m

SOLUTION

Aquifer Model: Unconfined
Solution Method: Hvorslev
K = 1.543E-6 m/sec
y0 = 1.484 m

APPENDIX F

Dewatering Analysis

Type	ID	Length (m)	Width (m)	Effecitve Radius[1] (m)	Hydraulic Conductivity (m/s)	Hydraulic Conductivity (m/day)	Initial Depth of Water (static head) prior to dewatering (m)	H^2	Depth of Water in the well while pumping (m)	h^2	H-h (m)	H^2-h^2	Radius of Influence[2] (m)	Discharge Into Ends [3] (m^3/day)	Plane Discharge [4] (m^3/day)	Total Discharge (m^3/day)	Total Discharge (L/day)	Total Discharge x 1.5 Safety Factor (L/day)
		a	b	re	k	k	H		h				Ro	Q	Q	Q	Q	Q
Servicing	Servicing Connection	10	3	4	2.30E-06	1.99E-01	1.70	3	0.5	0.3	3.0	3	10	2	0.5	2.5	2,500	7,500
Total Dewatering																	2,500	7,500

Notes

[1] $r_e = (a+b) / \pi$ - *assuming a/b >1.5, or re = √ ab / π (Powers et. al., 2007)*

[2] $Ro = r_e + 3000 * (H-h) * \sqrt{k}$ - *Sichardts Formula, (Cashman and Preene, 2001)*

[3] $Q = [(\pi * K) * (H^2 - h^2)] / [\ln(R_o / r)]$ *(Powers et al., 2007)*

[4] $Q = 2 * [a * K * (H^2 - h^2) / (2R_o)]$ *(Powers et al., 2007)*

* H & h are relative to base of active ground water levels

APPENDIX G

Water Quality Results

Summary of Water Quality Data

Parameter	Symbol	Units	O, Reg. 153/04 Table 2 Criteria	City of Barrie Storm Sewer By-law	Provincial Water Quality Objectives (1994)	BH21-1 Sampled on: 2022-03-16 Sampled by: SY Analyzed by: Caduceon
					Objective	
Saturation pH			-		-	6.51
pH (lab)			-	6.0-9.5	6.5-8.5	7.8
Langelier Saturation Index			-		-	1.29
Alkalinity (4.2) (as Calcium Carbonate)		mg/L	-		-	519
Bicarbonate	HCO_3^-	mg/L	-		-	519
Carbonate	CO_3^{-2}	mg/L	-		-	< 5
Hydroxide			-		-	< 5
Conductivity		µS/cm	-		-	4980
Fluoride	F^-	mg/L	-		-	< 0.1
Chloride	Cl^-	mg/L	790		-	***1320***
Nitrate (as Nitrogen)	NO_3-N	mg/L	-		-	4.9
Nitrite (as Nitrogen)	NO_2-N	mg/L	-		-	< 0.1
Bromide	Br^-	mg/L	-		-	< 0.4
Sulphate	SO_4^{-2}	mg/L	-		-	48
Calcium	Ca	mg/L	-		-	197
Magnesium	Mg	mg/L	-		-	15.7
Sodium	Na	mg/L	490		-	***825***
Potassium	K	mg/L	-		-	3.1
Total Ammonia (as Nitrogen)	NH_3-N	mg/L	-		-	0.07
Phosphate (ortho)	PO_4^{-3}	mg/L	-		-	0.019
Phosphorus	P	mg/L	-		0.02	**0.95**
Reactive Silica	Si	mg/L	-		-	8.58
Dissolved Organic Carbon	DOC	mg/L	-		-	2.1
Colour			-		-	3
Turbidity			-		-	1180
Aluminum	Al	mg/L	-		0.075	**0.08**
Arsenic	As	mg/L	0.025		0.1	< 0.0005
Barium	Ba	mg/L	1		-	0.268
Boron	B	mg/L	5		0.2	0.06
Cadmium	Cd	mg/L	0.0027	0.001	0.0005	< 0.000059
Chromium	Cr	mg/L	0.05	0.08	0.0089	0.002
Copper	Cu	mg/L	0.087	0.01	0.005	< 0.002
Iron	Fe	mg/L	-		0.3	< 0.005
Lead	Pb	mg/L	0.01	0.05	0.005	0.00027
Manganese	Mn	mg/L	-		-	0.001
Molybdenum	Mo	mg/L	0.07		0.04	< 0.01
Nickel	Ni	mg/L	0.1	0.05	0.025	< 0.01
Selenium	Se	mg/L	0.01		0.1	0.004
Silver	Ag	mg/L	0.0015		0.0001	< 0.0002
Strontium	Sr	mg/L	-		-	2.06
Thallium	Tl	mg/L	0.002		0.0003	0.00005
Tin	Sn	mg/L	-		-	< 0.05
Titanium	Ti	mg/L	-		-	< 0.005
Uranium	U	mg/L	0.02		0.005	0.00065
Vanadium	V	mg/L	0.0062		0.006	< 0.0007
Zinc	Zn	mg/L	1.1		0.02	< 0.005
Total Dissolved Solids	TDS	mg/L	-		-	2745
Hardness (as Calcium Carbonate)		mg/L	-		-	557
% Difference / Ion Balanace			-		-	2.02

Bold and Highlighted indicates PWQO Exceedance

Bold and Italics indicates O.Reg. 153/04 Table 2 exceedance

Bold and Underlined indicates City of Barrie Storm Sewer Bylaw Exceedance

Bureau Veritas Job #: C296748
Report Date: 2022/11/29

EnVision Consultants Ltd.
Client Project #: 22-0127.120
Site Location: 181 BURTON AVE
Sampler Initials: KH

O.REG 153 METALS & INORGANICS PKG (WTR)

Bureau Veritas ID			SIO598			SIO598			SIO599		
Sampling Date			2022/04/12 11:20			2022/04/12 11:20			2022/04/12 11:40		
COC Number			873637-01-01			873637-01-01			873637-01-01		
	UNITS	Criteria	BH20-1	RDL	QC Batch	BH20-1 Lab-Dup	RDL	QC Batch	BH20-4	RDL	QC Batch
Inorganics											
WAD Cyanide (Free)	ug/L	66	<1	1	7938174	<1	1	7938174	<1	1	7938174
Dissolved Chloride (Cl-)	mg/L	790	**1400**	15	7939326				180	2.0	7939326
Metals											
Chromium (VI)	ug/L	25	1.0	0.50	7935665				<0.50	0.50	7935665
Mercury (Hg)	ug/L	0.29	<0.10	0.10	7937804				<0.10	0.10	7937804
Dissolved Antimony (Sb)	ug/L	6.0	<0.50	0.50	7940296				<0.50	0.50	7940296
Dissolved Arsenic (As)	ug/L	25	<1.0	1.0	7940296				<1.0	1.0	7940296
Dissolved Barium (Ba)	ug/L	1000	340	2.0	7940296				110	2.0	7940296
Dissolved Beryllium (Be)	ug/L	4.0	<0.40	0.40	7940296				<0.40	0.40	7940296
Dissolved Boron (B)	ug/L	5000	61	10	7940296				36	10	7940296
Dissolved Cadmium (Cd)	ug/L	2.7	<0.090	0.090	7940296				<0.090	0.090	7940296
Dissolved Chromium (Cr)	ug/L	50	<5.0	5.0	7940296				<5.0	5.0	7940296
Dissolved Cobalt (Co)	ug/L	3.8	<0.50	0.50	7940296				0.64	0.50	7940296
Dissolved Copper (Cu)	ug/L	87	2.0	0.90	7940296				1.7	0.90	7940296
Dissolved Lead (Pb)	ug/L	10	<0.50	0.50	7940296				<0.50	0.50	7940296
Dissolved Molybdenum (Mo)	ug/L	70	<0.50	0.50	7940296				<0.50	0.50	7940296
Dissolved Nickel (Ni)	ug/L	100	<1.0	1.0	7940296				1.4	1.0	7940296
Dissolved Selenium (Se)	ug/L	10	<2.0	2.0	7940296				<2.0	2.0	7940296
Dissolved Silver (Ag)	ug/L	1.5	<0.090	0.090	7940296				<0.090	0.090	7940296
Dissolved Sodium (Na)	ug/L	490000	**1000000**	500	7940296				150000	100	7940296
Dissolved Thallium (Tl)	ug/L	2.0	<0.050	0.050	7940296				<0.050	0.050	7940296
Dissolved Uranium (U)	ug/L	20	0.67	0.10	7940296				0.65	0.10	7940296
Dissolved Vanadium (V)	ug/L	6.2	<0.50	0.50	7940296				1.4	0.50	7940296
Dissolved Zinc (Zn)	ug/L	1100	<5.0	5.0	7940296				<5.0	5.0	7940296

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition
Potable Ground Water- All Types of Property Uses - Coarse Textured Soil

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C296748
Report Date: 2022/11/29

EnVision Consultants Ltd.
Client Project #: 22-0127.120
Site Location: 181 BURTON AVE
Sampler Initials: KH

O.REG 153 METALS & INORGANICS PKG (WTR)

Bureau Veritas ID			SIO600		SIO601		
Sampling Date			2022/04/12 11:00		2022/04/12 10:30		
COC Number			873637-01-01		873637-01-01		
	UNITS	Criteria	BH22-1	RDL	BH22-2	RDL	QC Batch
Inorganics							
WAD Cyanide (Free)	ug/L	66	1	1	<1	1	7938174
Dissolved Chloride (Cl-)	mg/L	790	**800**	7.0	**1200**	10	7939326
Metals							
Chromium (VI)	ug/L	25	<0.50	0.50	<0.50	0.50	7935665
Mercury (Hg)	ug/L	0.29	<0.10	0.10	<0.10	0.10	7937804
Dissolved Antimony (Sb)	ug/L	6.0	<0.50	0.50	<0.50	0.50	7940296
Dissolved Arsenic (As)	ug/L	25	<1.0	1.0	<1.0	1.0	7940296
Dissolved Barium (Ba)	ug/L	1000	200	2.0	270	2.0	7940296
Dissolved Beryllium (Be)	ug/L	4.0	<0.40	0.40	<0.40	0.40	7940296
Dissolved Boron (B)	ug/L	5000	52	10	58	10	7940296
Dissolved Cadmium (Cd)	ug/L	2.7	<0.090	0.090	<0.090	0.090	7940296
Dissolved Chromium (Cr)	ug/L	50	<5.0	5.0	<5.0	5.0	7940296
Dissolved Cobalt (Co)	ug/L	3.8	<0.50	0.50	<0.50	0.50	7940296
Dissolved Copper (Cu)	ug/L	87	1.7	0.90	1.3	0.90	7940296
Dissolved Lead (Pb)	ug/L	10	<0.50	0.50	<0.50	0.50	7940296
Dissolved Molybdenum (Mo)	ug/L	70	0.94	0.50	1.0	0.50	7940296
Dissolved Nickel (Ni)	ug/L	100	<1.0	1.0	<1.0	1.0	7940296
Dissolved Selenium (Se)	ug/L	10	<2.0	2.0	<2.0	2.0	7940296
Dissolved Silver (Ag)	ug/L	1.5	<0.090	0.090	<0.090	0.090	7940296
Dissolved Sodium (Na)	ug/L	490000	**570000**	100	**740000**	500	7940296
Dissolved Thallium (Tl)	ug/L	2.0	<0.050	0.050	<0.050	0.050	7940296
Dissolved Uranium (U)	ug/L	20	1.2	0.10	0.53	0.10	7940296
Dissolved Vanadium (V)	ug/L	6.2	1.0	0.50	0.50	0.50	7940296
Dissolved Zinc (Zn)	ug/L	1100	15	5.0	<5.0	5.0	7940296

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition
Potable Ground Water- All Types of Property Uses - Coarse Textured Soil

Bureau Veritas 6740 Campobello Road, Mississauga, Ontario, L5N 2L8 Tel: (905) 817-5700 Toll-Free: 800-563-6266 Fax: (905) 817-5777 www.bvna.com

Bureau Veritas Job #: C296748
Report Date: 2022/11/29

EnVision Consultants Ltd.
Client Project #: 22-0127.120
Site Location: 181 BURTON AVE
Sampler Initials: KH

O.REG 153 VOCS BY HS & F1-F4 (WATER)

Bureau Veritas ID			SIO598	SIO599	SIO600	SIO601	SIO602		
Sampling Date			2022/04/12 11:20	2022/04/12 11:40	2022/04/12 11:00	2022/04/12 10:30	2022/04/12 10:30		
COC Number			873637-01-01	873637-01-01	873637-01-01	873637-01-01	873637-01-01		
	UNITS	Criteria	BH20-1	BH20-4	BH22-1	BH22-2	GW22-1	RDL	QC Batch
Calculated Parameters									
1,3-Dichloropropene (cis+trans)	ug/L	0.5	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7936373
Volatile Organics									
Acetone (2-Propanone)	ug/L	2700	<10	<10	<10	<10	<10	10	7938140
Benzene	ug/L	5.0	<0.17	<0.17	<0.17	<0.17	<0.17	0.17	7938140
Bromodichloromethane	ug/L	16.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Bromoform	ug/L	25.0	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7938140
Bromomethane	ug/L	0.89	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Carbon Tetrachloride	ug/L	0.79	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Chlorobenzene	ug/L	30	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Chloroform	ug/L	2.4	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Dibromochloromethane	ug/L	25.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,2-Dichlorobenzene	ug/L	3.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,3-Dichlorobenzene	ug/L	59	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,4-Dichlorobenzene	ug/L	1.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Dichlorodifluoromethane (FREON 12)	ug/L	590	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7938140
1,1-Dichloroethane	ug/L	5	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
1,2-Dichloroethane	ug/L	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,1-Dichloroethylene	ug/L	1.6	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
cis-1,2-Dichloroethylene	ug/L	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
trans-1,2-Dichloroethylene	ug/L	1.6	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,2-Dichloropropane	ug/L	5.0	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
cis-1,3-Dichloropropene	ug/L	0.5	<0.30	<0.30	<0.30	<0.30	<0.30	0.30	7938140
trans-1,3-Dichloropropene	ug/L	0.5	<0.40	<0.40	<0.40	<0.40	<0.40	0.40	7938140
Ethylbenzene	ug/L	2.4	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Ethylene Dibromide	ug/L	0.2	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Hexane	ug/L	51	<1.0	<1.0	<1.0	<1.0	<1.0	1.0	7938140
Methylene Chloride(Dichloromethane)	ug/L	50	<2.0	<2.0	<2.0	<2.0	<2.0	2.0	7938140
Methyl Ethyl Ketone (2-Butanone)	ug/L	1800	<10	<10	<10	<10	<10	10	7938140

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition
Potable Ground Water- All Types of Property Uses - Coarse Textured Soil

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Bureau Veritas Job #: C296748
Report Date: 2022/11/29

EnVision Consultants Ltd.
Client Project #: 22-0127.120
Site Location: 181 BURTON AVE
Sampler Initials: KH

O.REG 153 VOCS BY HS & F1-F4 (WATER)

Bureau Veritas ID			SIO598	SIO599	SIO600	SIO601	SIO602		
Sampling Date			2022/04/12 11:20	2022/04/12 11:40	2022/04/12 11:00	2022/04/12 10:30	2022/04/12 10:30		
COC Number			873637-01-01	873637-01-01	873637-01-01	873637-01-01	873637-01-01		
	UNITS	Criteria	BH20-1	BH20-4	BH22-1	BH22-2	GW22-1	RDL	QC Batch
Methyl Isobutyl Ketone	ug/L	640	<5.0	<5.0	<5.0	<5.0	<5.0	5.0	7938140
Methyl t-butyl ether (MTBE)	ug/L	15	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Styrene	ug/L	5.4	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,1,1,2-Tetrachloroethane	ug/L	1.1	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
1,1,2,2-Tetrachloroethane	ug/L	1.0	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Tetrachloroethylene	ug/L	1.6	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Toluene	ug/L	24	<0.20	0.48	<0.20	<0.20	<0.20	0.20	7938140
1,1,1-Trichloroethane	ug/L	200	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
1,1,2-Trichloroethane	ug/L	4.7	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Trichloroethylene	ug/L	1.6	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Trichlorofluoromethane (FREON 11)	ug/L	150	<0.50	<0.50	<0.50	<0.50	<0.50	0.50	7938140
Vinyl Chloride	ug/L	0.5	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
p+m-Xylene	ug/L	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
o-Xylene	ug/L	-	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
Total Xylenes	ug/L	300	<0.20	<0.20	<0.20	<0.20	<0.20	0.20	7938140
F1 (C6-C10)	ug/L	750	<25	<25	<25	<25	<25	25	7938140
F1 (C6-C10) - BTEX	ug/L	750	<25	<25	<25	<25	<25	25	7938140
F2-F4 Hydrocarbons									
F2 (C10-C16 Hydrocarbons)	ug/L	150	<100	<100	<100	<100	<100	100	7941387
F3 (C16-C34 Hydrocarbons)	ug/L	500	<200	<200	<200	<200	<200	200	7941387
F4 (C34-C50 Hydrocarbons)	ug/L	500	<200	<200	<200	<200	<200	200	7941387
Reached Baseline at C50	ug/L	-	Yes	Yes	Yes	Yes	Yes		7941387
Surrogate Recovery (%)									
o-Terphenyl	%	-	99	99	100	99	98		7941387
4-Bromofluorobenzene	%	-	87	88	87	88	88		7938140
D4-1,2-Dichloroethane	%	-	106	106	107	105	106		7938140
D8-Toluene	%	-	91	92	92	92	91		7938140

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition
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O.REG 153 VOCS BY HS (WATER)

Bureau Veritas ID			SIO603		
Sampling Date			2022/04/12		
COC Number			873637-01-01		
	UNITS	Criteria	TRIP BLANK	RDL	QC Batch
Calculated Parameters					
1,3-Dichloropropene (cis+trans)	ug/L	0.5	<0.50	0.50	7936373
Volatile Organics					
Acetone (2-Propanone)	ug/L	2700	<10	10	7938148
Benzene	ug/L	5.0	<0.20	0.20	7938148
Bromodichloromethane	ug/L	16.0	<0.50	0.50	7938148
Bromoform	ug/L	25.0	<1.0	1.0	7938148
Bromomethane	ug/L	0.89	<0.50	0.50	7938148
Carbon Tetrachloride	ug/L	0.79	<0.19	0.19	7938148
Chlorobenzene	ug/L	30	<0.20	0.20	7938148
Chloroform	ug/L	2.4	<0.20	0.20	7938148
Dibromochloromethane	ug/L	25.0	<0.50	0.50	7938148
1,2-Dichlorobenzene	ug/L	3.0	<0.40	0.40	7938148
1,3-Dichlorobenzene	ug/L	59	<0.40	0.40	7938148
1,4-Dichlorobenzene	ug/L	1.0	<0.40	0.40	7938148
Dichlorodifluoromethane (FREON 12)	ug/L	590	<1.0	1.0	7938148
1,1-Dichloroethane	ug/L	5	<0.20	0.20	7938148
1,2-Dichloroethane	ug/L	1.6	<0.49	0.49	7938148
1,1-Dichloroethylene	ug/L	1.6	<0.20	0.20	7938148
cis-1,2-Dichloroethylene	ug/L	1.6	<0.50	0.50	7938148
trans-1,2-Dichloroethylene	ug/L	1.6	<0.50	0.50	7938148
1,2-Dichloropropane	ug/L	5.0	<0.20	0.20	7938148
cis-1,3-Dichloropropene	ug/L	0.5	<0.30	0.30	7938148
trans-1,3-Dichloropropene	ug/L	0.5	<0.40	0.40	7938148
Ethylbenzene	ug/L	2.4	<0.20	0.20	7938148
Ethylene Dibromide	ug/L	0.2	<0.19	0.19	7938148
Hexane	ug/L	51	<1.0	1.0	7938148
Methylene Chloride(Dichloromethane)	ug/L	50	<2.0	2.0	7938148
Methyl Ethyl Ketone (2-Butanone)	ug/L	1800	<10	10	7938148

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition
Potable Ground Water- All Types of Property Uses - Coarse Textured Soil

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O.REG 153 VOCS BY HS (WATER)

Bureau Veritas ID			SIO603		
Sampling Date			2022/04/12		
COC Number			873637-01-01		
	UNITS	Criteria	TRIP BLANK	RDL	QC Batch
Methyl Isobutyl Ketone	ug/L	640	<5.0	5.0	7938148
Methyl t-butyl ether (MTBE)	ug/L	15	<0.50	0.50	7938148
Styrene	ug/L	5.4	<0.40	0.40	7938148
1,1,1,2-Tetrachloroethane	ug/L	1.1	<0.50	0.50	7938148
1,1,2,2-Tetrachloroethane	ug/L	1.0	<0.40	0.40	7938148
Tetrachloroethylene	ug/L	1.6	<0.20	0.20	7938148
Toluene	ug/L	24	<0.20	0.20	7938148
1,1,1-Trichloroethane	ug/L	200	<0.20	0.20	7938148
1,1,2-Trichloroethane	ug/L	4.7	<0.40	0.40	7938148
Trichloroethylene	ug/L	1.6	<0.20	0.20	7938148
Trichlorofluoromethane (FREON 11)	ug/L	150	<0.50	0.50	7938148
Vinyl Chloride	ug/L	0.5	<0.20	0.20	7938148
p+m-Xylene	ug/L	-	<0.20	0.20	7938148
o-Xylene	ug/L	-	<0.20	0.20	7938148
Total Xylenes	ug/L	300	<0.20	0.20	7938148
Surrogate Recovery (%)					
4-Bromofluorobenzene	%	-	90		7938148
D4-1,2-Dichloroethane	%	-	112		7938148
D8-Toluene	%	-	93		7938148

No Fill	No Exceedance
Grey	Exceeds 1 criteria policy/level
Black	Exceeds both criteria/levels

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Criteria: Ontario Reg. 153/04 (Amended April 15, 2011)
Table 2: Full Depth Generic Site Condition Standards in a Potable Ground Water Condition
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CADUCEON ENVIRONMENTAL LABORATORIES
Client committed. Quality assured.

REPORT NO: 23-018389

COC #: -

Report To:
Azimuth Environmental
642 Welham Rd
Barrie, ON L4N9A1
Attention: Alan Turner

CADUCEON Environmental Laboratories
112 Commerce Park Dr Unit L
Barrie, ON L4N 8W8
Tel: 705-252-5743

DATE SUBMITTED:	20-Jul-23	CUSTOMER PROJECT:	21-492
DATE REPORTED:	28-Jul-23	P.O. NUMBER:	
SAMPLE MATRIX:	Ground Water	WATERWORKS NO:	

R153 Tbl. 2 - PGW

	Client ID:		MW 21-4	**R153 Table 2 - Potable Ground**
	Sample ID:		23-018389-1	
	Date Collected:		20-Jul-23	**Maximum Concentration**
Parameter	**Units**	**R.L.**		
Benzene	µg/L	0.5	<0.5	5
Ethylbenzene	µg/L	0.5	<0.5	2.4
Toluene	µg/L	0.5	<0.5	24
Xylene, m,p-	µg/L	1	<1	
Xylene, m,p,o-	µg/L	1.1	<1.1	300
Xylene, o-	µg/L	0.5	<0.5	

R.L. = Reporting Limit

APPENDIX H

Water Balance Summary

Table A: Pre-Development

Catchment Designation	Landscaped Grass	Forest	Total
Area (m^2)	1,248	750	1,998
Pervious Area (m^2)	1,248	750	1,998
Impervious Area (m^2)	0	0	0
Infiltration Factors			
Topography Infiltration Factor	0.2	0.2	
Soil Infiltration Factor	0.3	0.3	
Land Cover Infiltration Factor	0.1	0.2	
Infiltration Factor	0.6	0.7	
Run-Off Coefficient	0.4	0.3	
Run-Off From Impervious Surfaces	0.8	0.8	
Inputs (Per Unit Area)			
Precipitation (mm/yr)	907	907	907
Rainfall (mm/yr)	654	654	654
Run-On (mm/yr)	0	0	0
Other Inputs (mm/yr)	0	0	0
Total Inputs (mm/yr)	**907**	**907**	907
Outputs (Per Unit Area)			
Precipitation Surplus (mm/yr)	428	428	428
Net Surplus (mm/yr)	428	428	428
Evapotranspiration (mm/yr)	479	479	479
Infiltration (mm/yr)	257	300	273
Surplus Infiltration (mm/yr)	0	0	0
Total Infiltration (mm/yr)	257	300	273
Run-Off Pervious Areas (mm/yr)	171	128	155
Run-Off Impervious Areas (mm/yr)	0	0	0
Total Run-Off (mm/yr)	171	128	155
Total Outputs (mm/yr)	**907**	**907**	**907**
Difference (Inputs - Outputs)	**0**	**0**	**0**
Inputs (Volumes)			
Precipitation (m^3/yr)	1,132	680	1,812
Run-On (m^3/yr)	0	0	0
Other Inputs (m^3/yr)	0	0	0
Total Inputs (m^3/yr)	**1,132**	**680**	**1,812**
Outputs (Volumes)			
Precipitation Surplus (m^3/yr)	534	321	855
Net Surplus (m^3/yr)	534	321	855
Evapotranspiration (m^3/yr)	598	359	957
Infiltration (m^3/yr)	320	225	545
Surplus Infiltration (m^3/yr)	0	0	0
Total Infiltration (m^3/yr)	**320**	**225**	**545**
Run-Off Pervious Areas (m^3/yr)	214	96	310
Run-Off Impervious Areas (m^3/yr)	0	0	0
Total Run-Off (m^3/yr)	214	96	310
Total Outputs (m^3/yr)	1,132	680	1,812
Difference (Inputs - Outputs)	**0**	**0**	**0**

Table B: Post-Development (no mit)

Catchment Designation	Landscaped Grass	Paved Surface	Building	Total
Area (m^2)	658	892	448	1,998
Pervious Area (m^2)	658	0	0	658
Impervious Area (m^2)	0	892	448	1,340
Infiltration Factors				
Topography Infiltration Factor	0.2	0	0	
Soil Infiltration Factor	0.3	0	0	
Land Cover Infiltration Factor	0.1	0	0	
Infiltration Factor	0.6	0	0	
Run-Off Coefficient	0.4	1	1	
Run-Off From Impervious Surfaces	0.8	0.8	0.8	
Inputs (Per Unit Area)				
Precipitation (mm/yr)	907	907	907	907
Rainfall (mm/yr)	654	654	654	654
Run-On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	**907**	**907**	**907**	907
Outputs (Per Unit Area)				
Precipitation Surplus (mm/yr)	428	726	726	628
Net Surplus (mm/yr)	428	726	726	628
Evapotranspiration (mm/yr)	479	181	181	279
Infiltration (mm/yr)	257	0	0	85
Surplus Infiltration (mm/yr)	0	0	0	0
Total Infiltration (mm/yr)	257	0	0	85
Run-Off Pervious Areas (mm/yr)	171	0	0	56
Run-Off Impervious Areas (mm/yr)	0	726	726	487
Total Run-Off (mm/yr)	171	726	726	543
Total Outputs (mm/yr)	**907**	**907**	**907**	**907**
Difference (Inputs - Outputs)	**0**	**0**	**0**	**0**
Inputs (Volumes)				
Precipitation (m^3/yr)	597	809	406	1,812
Run-On (m^3/yr)	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0
Total Inputs (m^3/yr)	**597**	**809**	**406**	**1,812**
Outputs (Volumes)				
Precipitation Surplus (m^3/yr)	282	647	325	1,254
Net Surplus (m^3/yr)	282	647	325	1,254
Evapotranspiration (m^3/yr)	315	162	81	558
Infiltration (m^3/yr)	169	0	0	169
Surplus Infiltration (m^3/yr)	0	0	0	0
Total Infiltration (m^3/yr)	**169**	**0**	**0**	**169**
Run-Off Pervious Areas (m^3/yr)	113	0	0	113
Run-Off Impervious Areas (m^3/yr)	0	647	325	972
Total Run-Off (m^3/yr)	113	647	325	1,085
Total Outputs (m^3/yr)	597	809	406	1,812
Difference (Inputs - Outputs)	**0**	**0**	**0**	**0**

Table C: Post-Development (with mitigation)

Catchment Designation	Landscaped Grass	Paved Surface	Building	Total
Area (m^2)	658	892	448	1,998
Pervious Area (m^2)	658	0	0	658
Impervious Area (m^2)	0	892	448	1,340
Infiltration Factors				
Topography Infiltration Factor	0.2	0	0	
Soil Infiltration Factor	0.3	0	0	
Land Cover Infiltration Factor	0.1	0	0	
Infiltration Factor	0.6	0	0	
Run-Off Coefficient	0.4	1	1	
Run-Off From Impervious Surfaces	0.8	0.8	0.8	
Inputs (Per Unit Area)				
Precipitation (mm/yr)	907	907	907	907
Rainfall (mm/yr)	654	654	654	654
Run-On (mm/yr)	0	0	0	0
Other Inputs (mm/yr)	0	0	0	0
Total Inputs (mm/yr)	**907**	**907**	**907**	907
Outputs (Per Unit Area)				
Precipitation Surplus (mm/yr)	428	726	726	628
Net Surplus (mm/yr)	428	726	726	628
Evapotranspiration (mm/yr)	479	181	181	279
Infiltration (mm/yr)	257	0	0	85
Surplus Infiltration (mm/yr)	0	0	839	188
Total Infiltration (mm/yr)	257	0	839	273
Run-Off Pervious Areas (mm/yr)	171	0	0	56
Run-Off Impervious Areas (mm/yr)	0	726	-113	299
Total Run-Off (mm/yr)	171	726	-113	355
Total Outputs (mm/yr)	**907**	**907**	**907**	**907**
Difference (Inputs - Outputs)	**0**	**0**	**0**	**0**
Inputs (Volumes)				
Precipitation (m^3/yr)	597	809	406	1,812
Run-On (m^3/yr)	0	0	0	0
Other Inputs (m^3/yr)	0	0	0	0
Total Inputs (m^3/yr)	**597**	**809**	**406**	**1,812**
Outputs (Volumes)				
Precipitation Surplus (m^3/yr)	282	647	325	1,254
Net Surplus (m^3/yr)	282	647	325	1,254
Evapotranspiration (m^3/yr)	315	162	81	558
Infiltration (m^3/yr)	169	0	0	169
Surplus Infiltration (m^3/yr)	0	0	376	376
Total Infiltration (m^3/yr)	**169**	**0**	**376**	**545**
Run-Off Pervious Areas (m^3/yr)	113	0	0	113
Run-Off Impervious Areas (m^3/yr)	0	647	-51	596
Total Run-Off (m^3/yr)	113	647	-51	709
Total Outputs (m^3/yr)	597	809	406	1,812
Difference (Inputs - Outputs)	0	0	0	0

Table D: Water Balance Summary Table

Characteristic	Site						
	Pre-Development	Post-Development	Change (Pre to Post)		Post-Development with Mitigation	Change (Pre to Post with Mitigation)	
Inputs (Volume)							
Precipitation (m^3/yr)	1,812	1,812	0	0%	1,812	0	0%
Run-On (m^3/yr)	0	0	0	NA	0	0	NA
Other Inputs (m^3/yr)	0	0	0	NA	0	0	NA
Total Inputs (m^3/yr)	1,812	1,812	0	0%	1,812	0	0%
Outputs (Volume)							
Precipitation Surplus (m^3/yr)	855	1,254	399	47%	1,254	399	47%
Net Surplus (m3/yr)	855	1,254	399	47%	1,254	399	47%
Evapotranspiration (m^3/yr)	957	558	-399	-42%	558	-399	-42%
Infiltration (m^3/yr)	545	169	-376	-69%	169	-376	-69%
Rooftop Infiltration (m^3/yr)	0	0	0	NA	376	376	NA
Total Infiltration (m^3/yr)	**545**	**169**	**-376**	**-69%**	**545**	**0**	**0%**
Run-Off Pervious Areas (m^3/yr)	310	113	-197	-64%	113	-197	-64%
Run-Off Impervious Areas (m^3/yr)	0	972	972	NA	596	596	NA
Total Run-Off (m^3/yr)	310	1,085	775	250%	709	399	129%
Total Outputs (m^3/yr)	**1,812**	**1,812**	**0**	**0%**	**1,812**	**0**	**0%**

APPENDIX I

Guelph Permeameter Testing Results

Guelph Pereameter Infiltration Test Results

Investigator:	A Turner & J. Millington
Date:	20-Jul-23
Location:	181 Burton Ave. Barrie, ON
TP ID:	TP-1
Depth of Hole:	20 cm auger hole
Radius:	3 cm
Reserviors used during test:	Combined
(Combined or Inner)	
Reservior constant used:	35.22
Ground Surface Elevation:	231.5 masl

Water Level in Well: 10 cm

Time t (min)	Δt (min)	Water level in Reservoir h (cm)	Δh (cm)	Rate of Change $\Delta h / \Delta t$ (cm/ min)
0	--	2.0	--	--
0.25	0.25	2.7	0.7	2.80
0.5	0.25	3.5	0.8	3.20
0.75	0.25	4.4	0.9	3.60
1	0.25	5.1	0.7	2.80
1.5	0.5	6.5	1.4	2.80
2	0.5	7.9	1.4	2.80
2.5	0.5	9.1	1.2	2.40
3	0.5	10.2	1.1	2.20
3.5	0.5	11.5	1.3	2.60
4	0.5	12.6	1.1	2.20
4.5	0.5	13.7	1.1	2.20
5	0.5	14.7	1.0	2.00
			Steady rate for 3 consecutive readings (R_1):	2.80

Water Level in Well: 10 cm

Time t (min)	Δt (min)	Water level in Reservoir h (cm)	Δh (cm)	Rate of Change $\Delta h / \Delta t$ (cm/ min)
0	--	0	--	--
0.25	0.25	1.5	1.5	6.00
0.5	0.25	1.8	0.3	1.20
0.75	0.25	2.2	0.4	1.60
1	0.25	2.5	0.3	1.20
1.5	0.5	3.7	1.2	2.40
2	0.5	4.8	1.1	2.20
2.5	0.5	6.1	1.3	2.60
3	0.5	7.5	1.4	2.80
3.5	0.5	8.8	1.3	2.60
4	0.5	9.9	1.1	2.20
4.5	0.5	11.1	1.2	2.40
5	0.5	12	0.9	1.80
5.5	0.5	13	1.0	2.00
6	0.5	14	1.0	2.00
6.5	0.5	15.3	1.3	2.60
7	0.5	16.5	1.2	2.40
7.5	0.5	17.5	1.0	2.00
8	0.5	19	1.5	3.00
8.5	0.5	20.2	1.2	2.40
9	0.5	21.2	1.0	2.00
9.5	0.5	22.3	1.1	2.20
10	0.5	23.4	1.1	2.20
10.5	0.5	24.5	1.1	2.20
			Steady rate for 3 consecutive readings (R_2):	2.20

Guelph Permeameter Calculations

Input

Result

Support: ali@soilmoisture.com

Head #1

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min):	2.8000

Res Type	35.22
H	10
a	3
H/a	3.333
a*	0.12
C0.01	1.218
C0.04	1.29
C0.12	1.288
C0.36	1.288
C	1.288
R	2.800
Q	1.644
pi	3.142

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.287543

$Q =$ 1.6436

$K_{fs} =$	1.78E-03	cm/sec
	1.07E-01	cm/min
	1.78E-05	m/sec
	4.21E-02	inch/min
	7.01E-04	inch/sec

$\Phi_m =$ 1.48E-02 (cm^2/min)

Head #2

Reservoir Type (enter "1" for Combined and "2" for Inner reservoir):	1
Enter water Head Height ("H" in cm):	10
Enter the Borehole Radius ("a" in cm):	3
Enter the soil texture-structure category (enter one of the below numbers):	3

1. Compacted, Structure-less, clayey or silty materials such as landfill caps and liners, lacustrine or marine sediments, etc.
2. Soils which are both fine textured (clayey or silty) and unstructured; may also include some fine sands.
3. Most structured soils from clays through loams; also includes unstructured medium and fine sands. The category most frequently applicable for agricultural soils.
4. Coarse and gravely sands; may also include some highly structured soils with large and/or numerous cracks, macropors, etc

Steady State Rate of Water Level Change ("R" in cm/min):	2.2000

Res Type	35.22
H	10
a	3
H/a	3.333333
a*	0.12
C0.01	1.21841
C0.04	1.290234
C0.12	1.287543
C0.36	1.287543
C	1.287543
R	2.200
Q	1.2914
pi	3.1415

$\alpha^* =$ 0.12 (cm^{-1})

$C =$ 1.287543

$Q =$ 1.2914

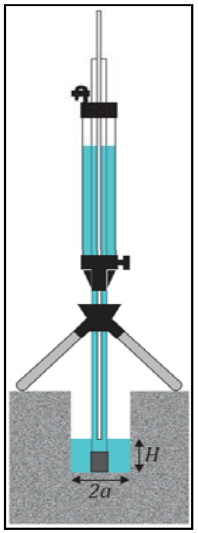
$K_{fs} =$	1.40E-03	cm/sec
	8.40E-02	cm/min
	1.40E-05	m/ses
	3.31E-02	inch/min
	5.51E-04	inch/sec

$\Phi_m =$ 1.17E-02 (cm^2/min)

Average

$K_{fs} =$	1.59E-03	cm/sec
	9.54E-02	cm/min
	1.59E-05	m/s
	3.76E-02	inch/min
	6.26E-04	inch/sec

$\Phi_m =$ 1.33E-02 (cm^2/min)



AZIMUTH ENVIRONMENTAL CONSULTING, INC.

Environmental Assessments & Approvals

TEST PIT LOG 1

Project Name/ Project Client	Guelph Permeameter Testing - Hydrogeological Assessment Monolite Holdings Inc.	**Project Address**	181 Burton Avenue, Barrie, Ontario	**Date**	July 20, 2023
Test Pit Number	1	**Contractor**	Mark St. John	**Elevation**	231.50 masl
Equipment	Rubber Track Mini-Excavator	**Test Pit Size**	1.2x4.0 m	**Datum**	17T E 605210 N 4914039
Temperature	22 °C	**Weather**	Sunny, partly cloudy	**Sample Type**	Soil

Depth		**Soil description**	**Samples**		**Screening Parameters**	**Remarks / Chemical Analysis**
From (m)	**To (m)**		**No.**	**Depth (mbgs)**		
0.00	0.22	TOPSOIL: Dark brown to black, sand, trace to some silt, some gravel, organics, moist				
0.22	1.10	FILL: Dark brown to black, sand, trace to some silt, some gravel to gravelly, organics, moist				
1.10	1.60	SAND: Compact to dense, brown, sand, trace to some silt, trace to some gravel, moist	1	1.3		Submitted for T-Time and grain size analysis
						Guelph Permeameter Test #1 completed at north side of test pit, Test #2 completed at south side of test pit. Both tests completed at 1.3 m depth
		Test Pit Terminated at ____1.6 m_____				

Comments	***Water Conditions in Test Pit***
No water seepage No sidewall sloughing	☐ Wet upon completion ☑ Dry upon completion

JOB No.	21-492
TEST PIT No.	1
FIELD STAFF	Alan Turner

July 31, 2023

Azimuth Environmental Consulting Inc.
642 Welham Road
Barrie, Ontario
L4N 9A1

Attn: Alan Turner

RE: Job No. 21-492
Determination of Estimated T-Time

Dear Mr. Turner

GEI Consultants (GEI) was provided with one (1) soil sample on July 20, 2023 to complete a grain size analysis to determine the percolation rate of the tested soil (T-Time analysis).

The delivered sample was identified as shown below.

- TP1 GS1, 1.3 m

A grain size distribution curve was developed by testing the above referenced soil sample in accordance with ASTM Standard Test Methods for Particle-Size Distribution D6913 (Gradation) of Soils Using Sieve Analysis and ASTM D7928 (Gradation) of Fine-Grained Soils using the Sedimentation (Hydrometer) Analysis. The result of the laboratory test and graphical representation of the grain size analysis is enclosed.

Determination of percolation rate is based on the "*Ministry of Municipal Affairs and Housing (MMAH) Supplementary Guidelines SB-6, Percolation Time and Soil Descriptions, September 14, 2012*". Based on this document, a summary of the result and the estimated percolation rate of the soil is as follows:

Client Ref.	GEI Lab No.	Soil Description (MIT)	USCS Soil Classification	Estimated Percolation Rate or "*T-Time*" (mins/cm)	Estimated Infiltration Rate (mm/hr)
TP1 GS1, 1.3 m	5932	SILTY SAND, Some Clay, Trace Gravel	S.M.	30 mins/cm	20 mm/hour

It is noted that the typical range for an S.M. classified soil is typically on the order 8 to 20 mins/cm. Due to the extremely well graded nature of the soil samples, and that soils such as these (glacial tills) are typically hard or very dense, it is recommended that 30 mins/cm be used for instead for TP1 GS1, 1.3 m as a more realistic and conservative estimate.

It is noted that percolation time not only varies based on the grain size distribution but is also influenced by other soil characteristics such as the density of the soil, the structure of the soil, the percentage/mineralogy of clay, the plasticity of the soil, the organic content of the soil, and the groundwater table level which are not expressly calculated as part of a grain size analysis.

No field investigation was conducted by GEI in conjunction with the above testing and did not witness the depth or location in which these samples were obtained. GEI is providing the percolation rates as factual information, to be used in design by a qualified professional with due regard to the limitations as indicated above.

We trust this information is sufficient for your present purposes. Should you have any questions concerning the above, or can be of any further assistance, please do not hesitate to contact the undersigned.

Yours truly,
GEI Consultants

Donna Davidson-Gorry
Laboratory Testing Services Practice Lead
(705) 718-6604
ddavidsongorry@geiconsultants.com

Andrew Jones
Materials Testing and Inspection Practice Lead
(705) 220-0060
ajones@geiconsultants.com

Enclosures (1)

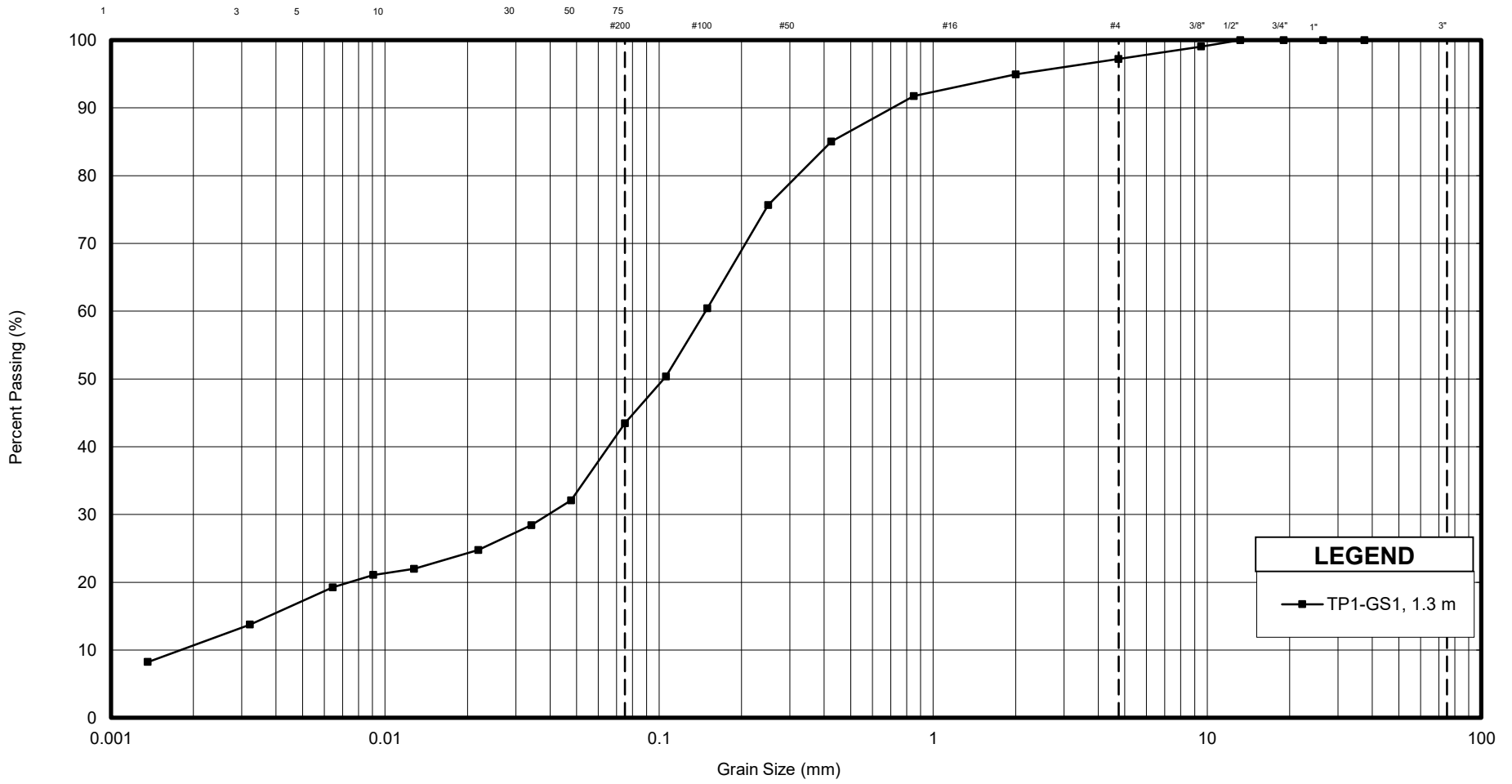
Grain Size Analysis (T-Time)

ENCLOSURE 1

Grain Size Analysis (T-Time)

UNIFIED SOIL CLASSIFICATION SYSTEM

CLAY AND SILT	SAND			GRAVEL	
	Fine	Medium	Coarse	Fine	Coarse



Sample	Description	Gr.	Sa.	Si.	Cl.	D_{10}	D_{30}	D_{60}	C_u	C_c
TP1-1, 1.3m	SILTY SAND, Some Clay, Trace Gravel	3	53	33	11	0.002	0.040	0.148	82.6	5.9

GEI Consultants

GRAIN SIZE DISTRIBUTION - 21-492

SILTY SAND

FIGURE No. -

REF. No. 2005133

DATE July 2023

Appendix H

City of Barrie As-Built Drawing
(Storm Drainage Plan North Half)

KEMPENFELT BAY

W.L. 219.15

EX. STORM OUTLET

CULVERT CROSSING

LAKESHORE DRIVE

NATIONAL RAILWAY

CANADIAN NATIONAL RAILWAYS

DRAINAGE CHANNEL

Q 5yr.=3.72cu.m/s
Q 100yr.=6.73cu.m/s

MILBURN STREET

CUMBERLAND STREET

BURTON AVENUE

ROBINSON ST.

MELINDA CRESCENT

ELEANOR CRESCENT

HWY. No. 11

YONGE STREET

GARDEN DRIVE

HOLGATE ST.

BAILEY CT.

KELLY PL.

WOODCREST ROAD

GREENFIELD AVENUE

TRILLIUM CRESCENT

LANE CRES.

17.0m–1800mmø STM SEWER @ 0.35%
18.5m–600mmø STM SEWER @ 0.90%
14.3m–1200mmø STM SEWER @ 0.30%
9.9m–600mmø STM SEWER @ 1.80%
13.5m–600mmø STM SEWER @ 0.90%
21.0m–525mmø STM SEWER @ 0.90%
24.0m–1200mmø STM @ 1.50%
28.5m–1200mmø STM @ 2.50%
7.0m–1050mmø STM @ 1.40%
18.0m–750mmø STM @ 1.20%
8.0m–750mmø STM @ 1.20%
6.5m–600mmø STM @ 1.20%
EX. 46.5m–1050mmø STM SEWER @ 1.15%
EX. 27.0m–1050mmø STM SEWER @ 0.50%
EX. 86.5m–975mmø STM SEWER @ 0.80%

Tc=19.21 min.
CA=0.42 (5 yr)

Q 5yr.=1.50cu.m/s
Q 100yr.=1.99cu.m/s

Q 5yr.=2.06cu.m/s
Q 100yr.=4.46cu.m/s

HU1 5.92

HU2 12.46

1 3.31 | 0.40

2.15 | 0.45

-N-

LEGEND

- POND DRAINAGE BOUNDARY
- DRAINAGE BOUNDARY
- EXTERNAL DRAINAGE BOUNDARY

PROPOSED CONDITIONS
1.25 / 0.45 — AREA IN HECTARES / IMPERVIOUS COEFFICIENT

EXTERNAL FLOWS (REFER TO DWG STM1)
HU2 / 12.46 — CATCHMENT NUMBER / AREA IN HECTARES

PROPOSED DIRECTION OF OVERLAND FLOW

NOTE: 5 YEAR AND 100 YEAR FLOWS INDICATED ON THIS PLAN ARE AS PER MASTER STORMWATER REPORT

GENERAL NOTES

RG ROBINSON AND ASSOCIATES (BARRIE) LTD CONSULTING ENGINEERS
10 High Street, Suite 200, Barrie, Ontario (705) 721-9222

REGISTERED PROFESSIONAL ENGINEER R.G. ROBINSON May 21/98 PROVINCE OF ONTARIO

BENCH MARKS

NO.	REVISIONS	DATE	APPROVED

CITY OF BARRIE APPROVED
DATE. 98/05/22
R.J. McArthur, P.Eng.
DIRECTOR OF MUNICIPAL WORKS

BURTON AVENUE RECONSTRUCTION
(GARDEN DRIVE TO MILBURN STREET)
PART A
CONTRACT 98-04

STORM DRAINAGE AREAS

CITY of BARRIE
MUNICIPAL WORKS DEPARTMENT

SCALE HOR.	1:1500	VERT.	----	DRAWING NO.	98-04
DESIGN	M.T.	DRAWN	M.T.	SHEET NO.	STM-2
REVIEWED	R.G.R.	DATE	98-04-13		

1996 004 004

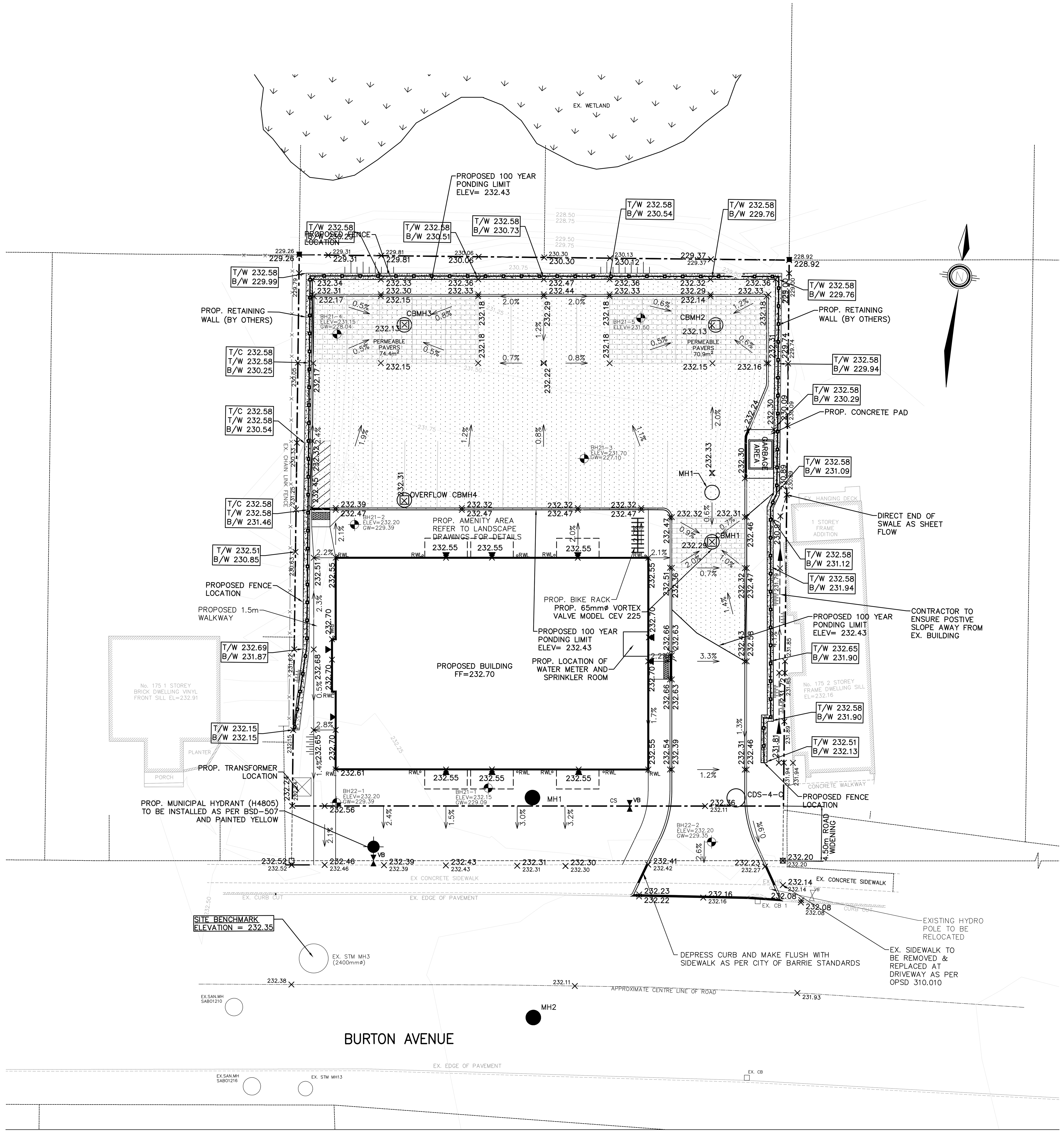
Appendix I

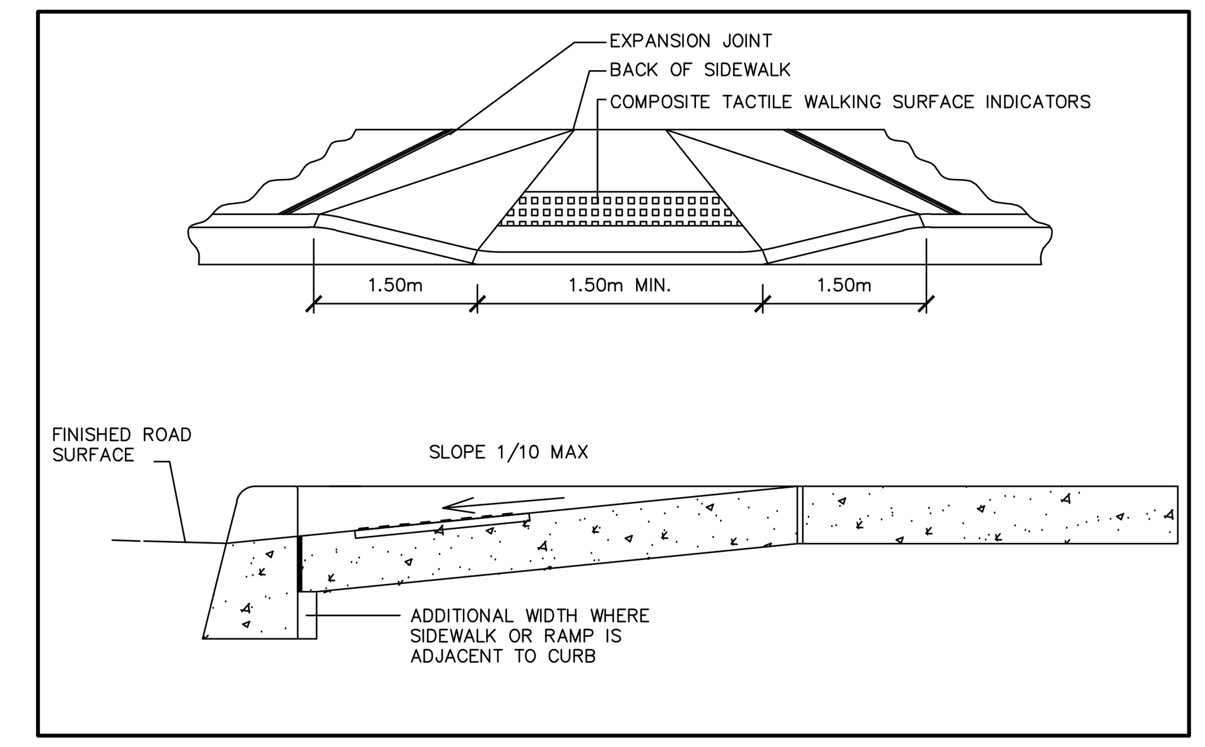
Pearson Engineering Drawing

ALL PROPOSED RETAINING WALLS TO BE DESIGNED BY OTHERS. ALL T/W AND B/W REPRESENTS TOP OF WALL AND BOTTOM OF WALL RESPECTIVELY. THIS DOES NOT INCLUDE BURIED DEPTH.

SUB-EXCAVATION NOTES:

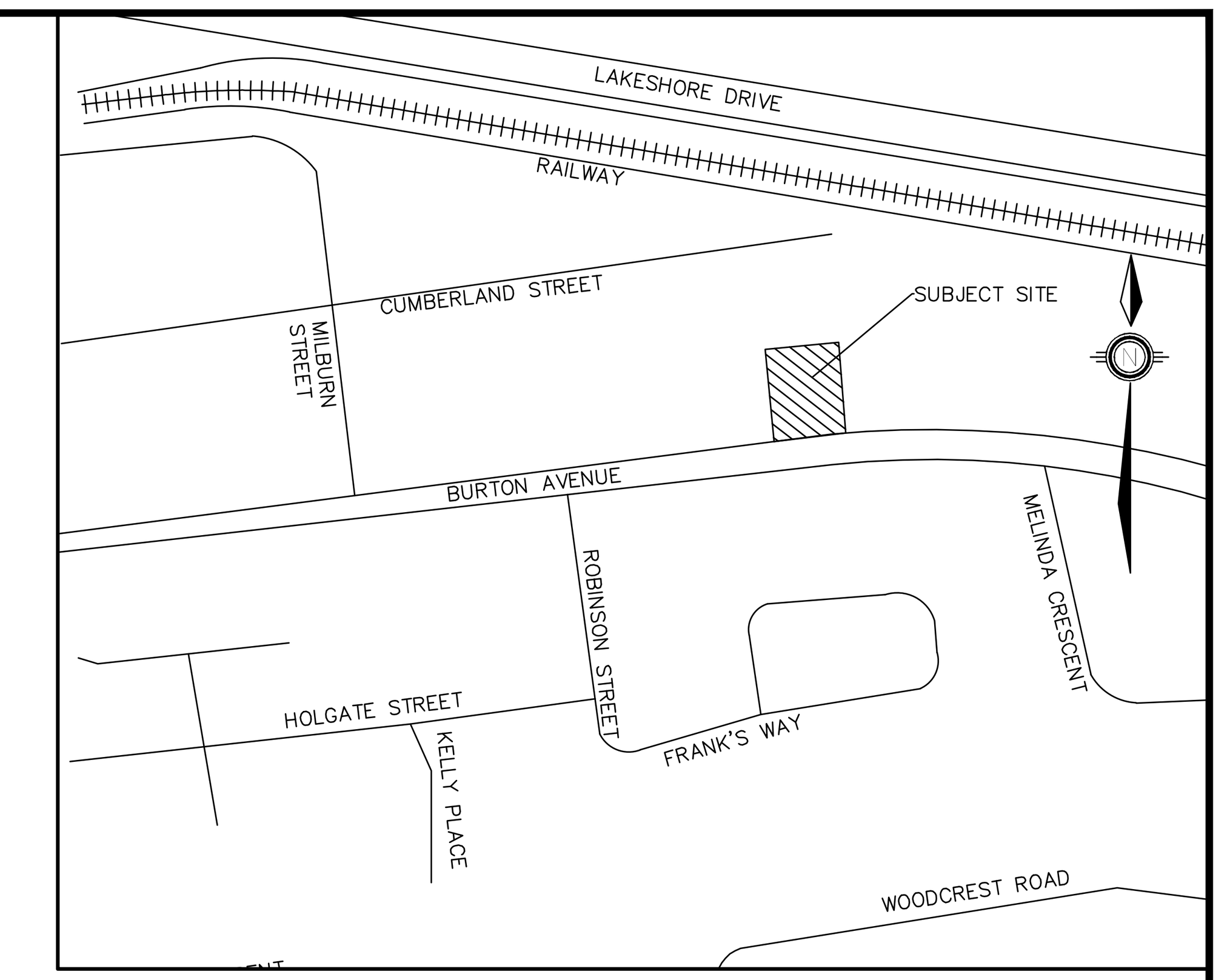
1. CONTRACTOR TO STRIP TOPSOIL AND SUB-EXCAVATE POOR SOILS TO THE SATISFACTION OF THE GEOTECHNICAL CONSULTANT.
2. BACKFILL WITH SUITABLE FILL AS PER OPS ENGINEERED FILL STANDARDS.
3. SOIL AND COMPACTION REPORT TO BE PROVIDED TO LAND OWNER.





DEPRESSED CURB & TACTILE RAMP DETAIL

N.T.S.



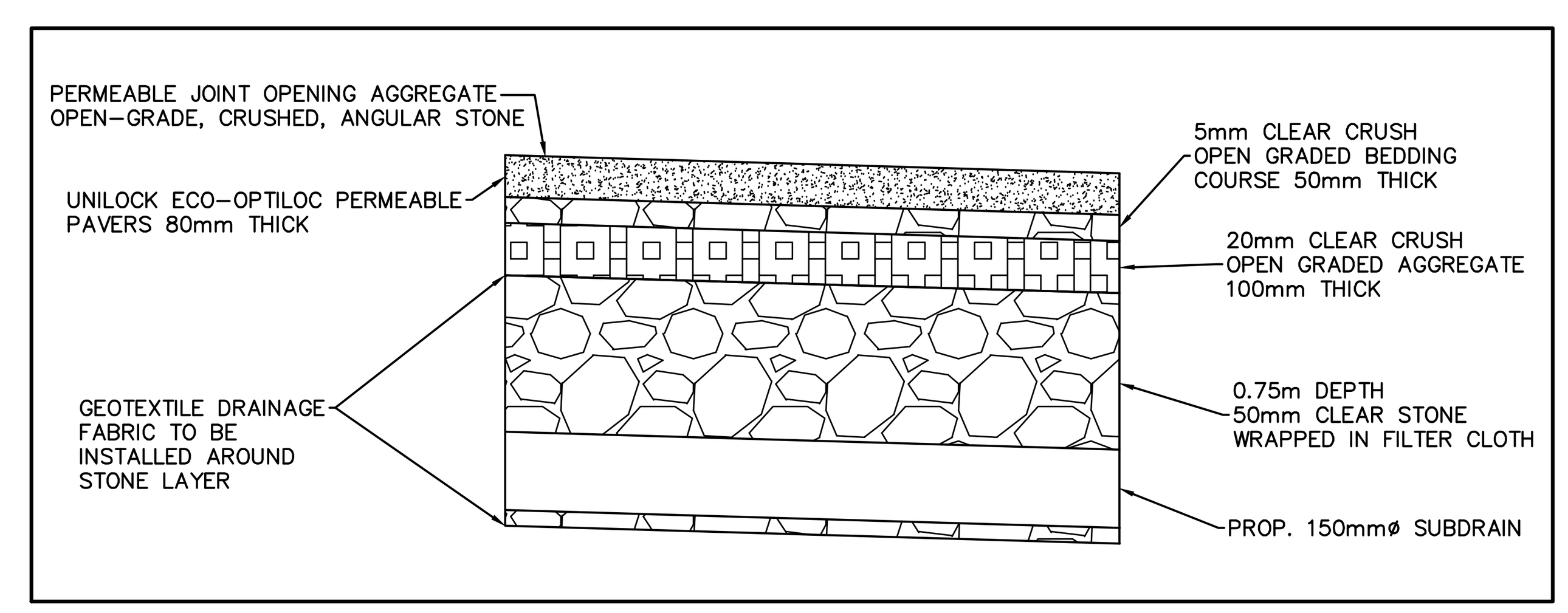
KEYPLAN

N.T.S.

LEGEND

- CB — CATCH BASIN
- DCB — DOUBLE CATCH BASIN
- CBMH — CATCH BASIN
- MH — STORM MANHOLE
- MH — SANITARY MANHOLE
- SERVICE CAP
- HYD. — FIRE HYDRANT
- VB — WATER VALVE
- 254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
- HIGH POINT
- RWL — PROP. RAINWATER LEADER
- MANDOOR
- PROP. RETAINING WALL (BY OTHERS)
- PROP. PERMEABLE PAVERS
- PROP. FENCE LOCATION
- 100 YEARS PONDING LIMITS
- BH21-2 ELEV=232.20 GW=229.39 — BOREHOLE NUMBER / EXISTING GRADE ELEVATION / GROUNDWATER ELEVATION

GROUNDWATER ELEVATIONS ARE AS PER AZIMUTH HYDRO G REPORT DATED JUNE 2022



TYPICAL PERMEABLE PAVER DETAIL

N.T.S

NO.	REVISION NOTE	DATE	BY
3	AS PER CITY OF BARRIE COMMENTS	12/18/23	JP
2	AS PER CITY OF BARRIE COMMENTS	08/29/23	JP
1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

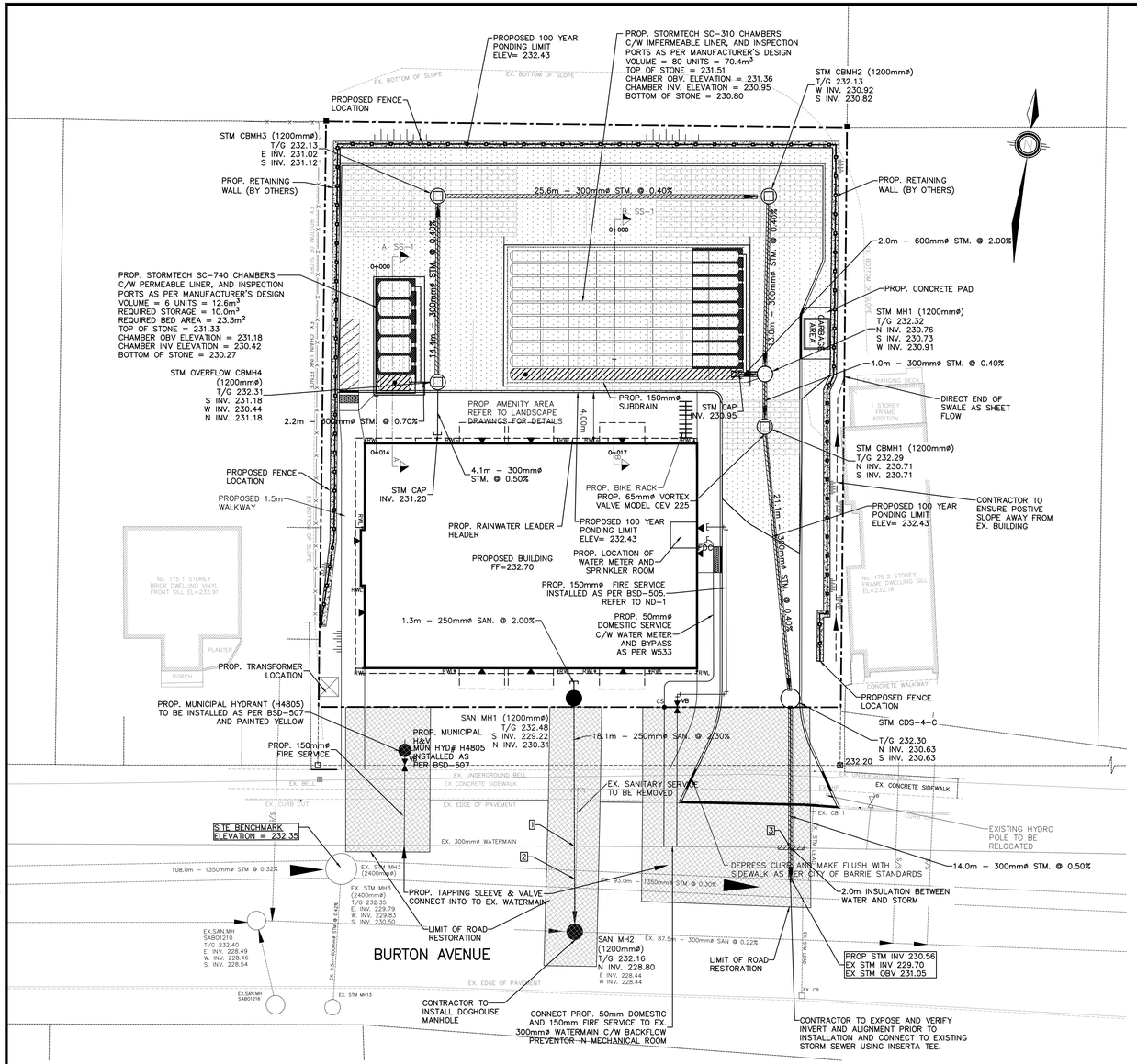
LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
Dec. 18 2023
PROVINCE OF ONTARIO

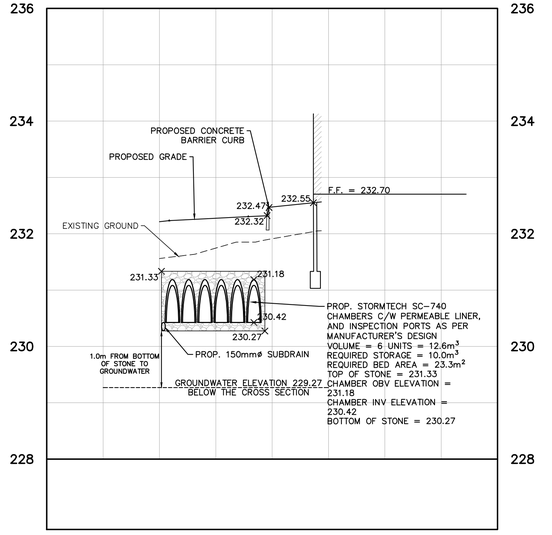
APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

SITE GRADING PLAN

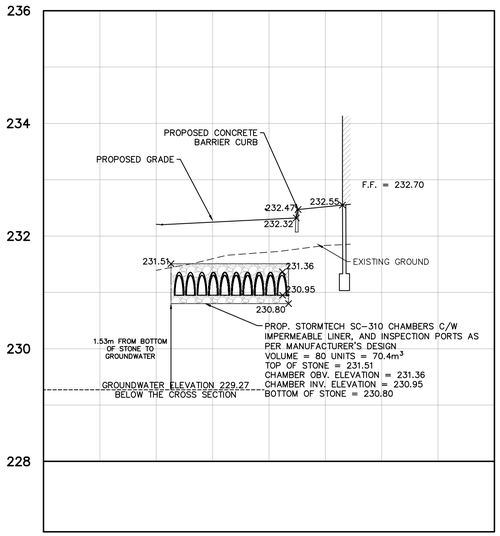
PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	JP/MWD	HORIZ SCALE	1:200	PROJECT #	19100
DRAWN BY	JP	VERT SCALE		DRAWING #	SG-1
CHECKED BY	MWD	DATE	OCTOBER 2021	REVISION #	3

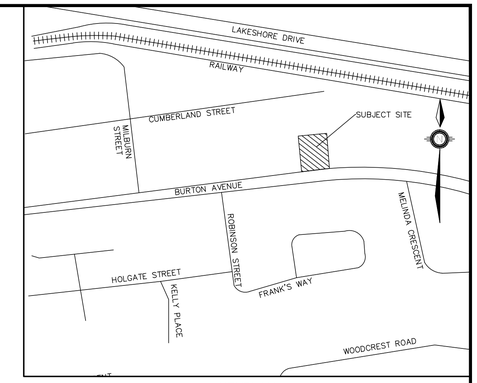




SECTION A–A
SCALE H 1:250
V 1:50



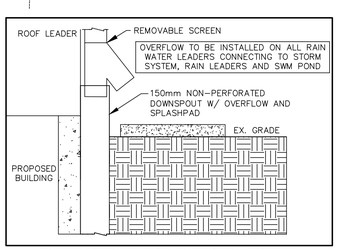
SECTION B–B
SCALE H 1:250
V 1:50



KEYPLAN
N.T.S.

LEGEND

- CB — CATCH BASIN
- DCB — DOUBLE CATCH BASIN
- CBMH — CATCH BASIN
- MH — STORM MANHOLE
- MH — SANITARY MANHOLE
- SERVICE CAP
- HYD. — FIRE HYDRANT
- VB — WATER VALVE
- 254.63 / 254.09 — PROPOSED ELEVATION / EXISTING ELEVATION
- 1.5% — PROPOSED DIRECTION AND GRADE
- BACK OF CURB
- EDGE OF PAVEMENT
- CURB CUT LOCATION
-) (— HIGH POINT
- PROP. RAINWATER LEADER
- MANDOOR
- PROP. RETAINING WALL (BY OTHERS)
- PROP. PERMEABLE PAVERS
- LIMIT OF ROAD & BOULEVARD RESTORATION
- 100 YEARS PONDING LIMITS
- PIPE INSULATION AS PER DETAIL ON SS-1
- FDC — FIRE DEPARTMENT CONNECTION

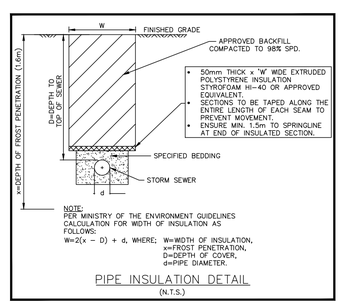


RAINWATER LEADER OVERFLOW DETAIL
N.T.S

CONTRACTOR TO LOCATE AND DECOMMISSION EX. WATER SERVICE AS PER CITY STANDARDS.

CONTRACTOR TO CONFIRM ADEQUATE SEPARATION BETWEEN ANY APPLICABLE HYDRO, GAS, AND BELL UTILITIES PRIOR TO ORDERING STORM, SANITARY AND WATERMAIN MATERIALS

PIPE CROSSING			
LOCATION	INV.	OBV.	SEPARATION
1	W/M 230.22	SAN 229.13	1.09m
2	STM 229.74	SAN 229.08	0.66m
3	STM 230.57	W/M 230.27	0.30m



NOTE:
PER MINISTRY OF THE ENVIRONMENT GUIDELINES CALCULATION FOR WIDTH OF INSULATION AS FOLLOWS:
W=2(x – D) + d, WHERE; W=WIDTH OF INSULATION, x=FROST PENETRATION, D=DEPTH OF COVER, d=PIPE DIAMETER.

PIPE INSULATION DETAIL
(N.T.S.)

NO.	REVISION NOTE	DATE	BY
3	AS PER CITY OF BARRIE COMMENTS	12/18/23	JP
2	AS PER CITY OF BARRIE COMMENTS	08/29/23	JP
1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

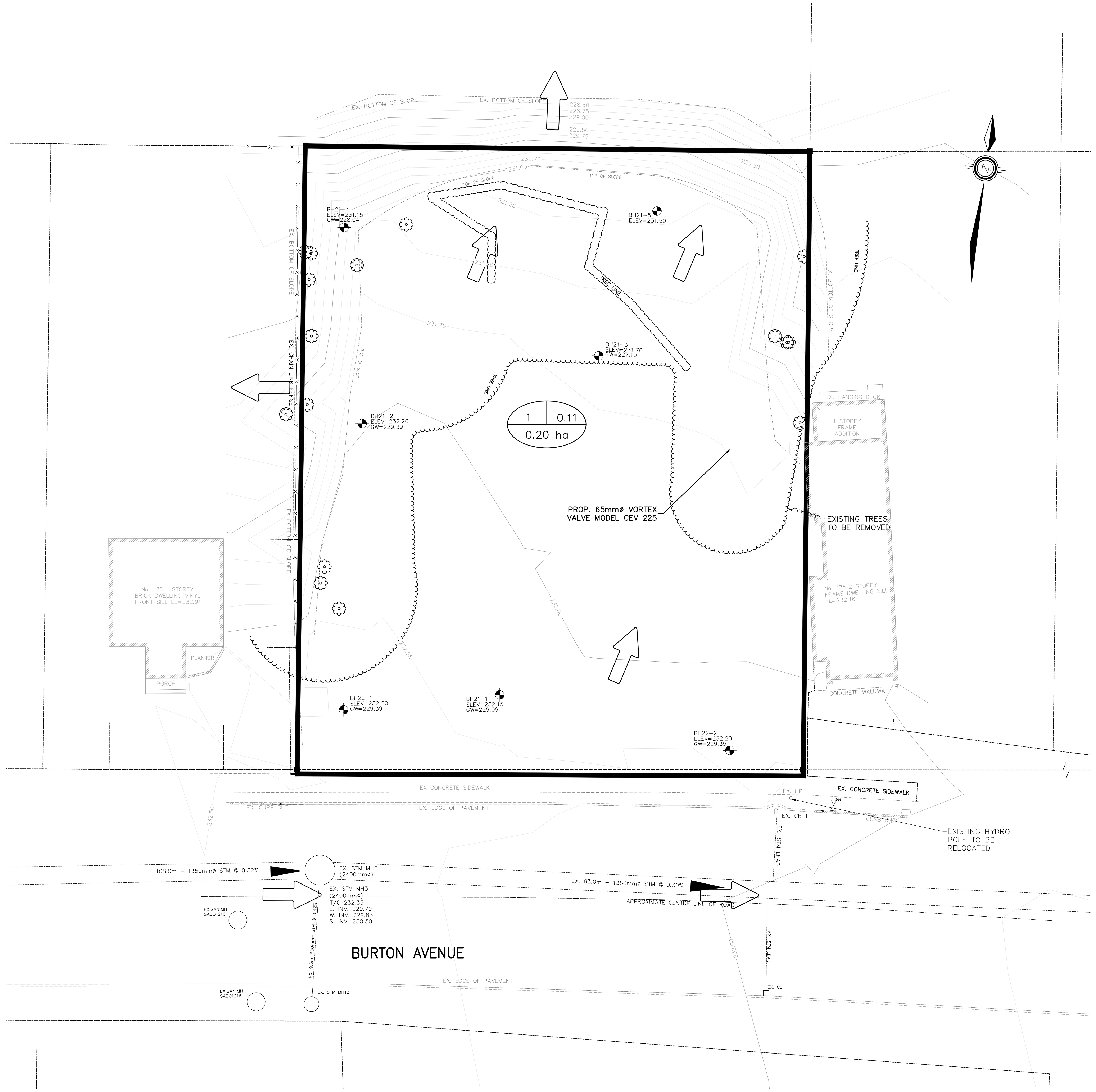
LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
Dec. 18 2023
PROVINCE OF ONTARIO

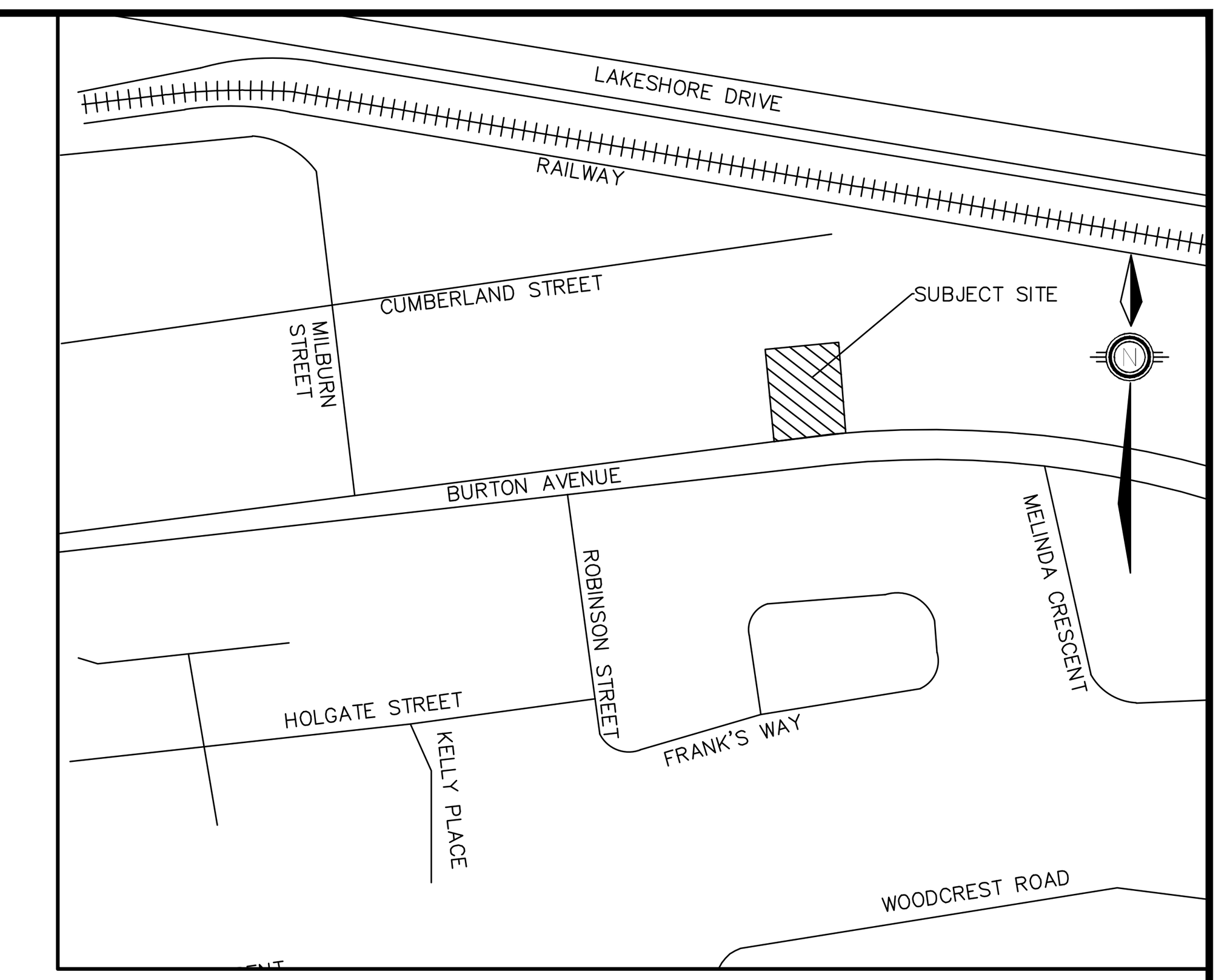
APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

SITE SERVICING PLAN

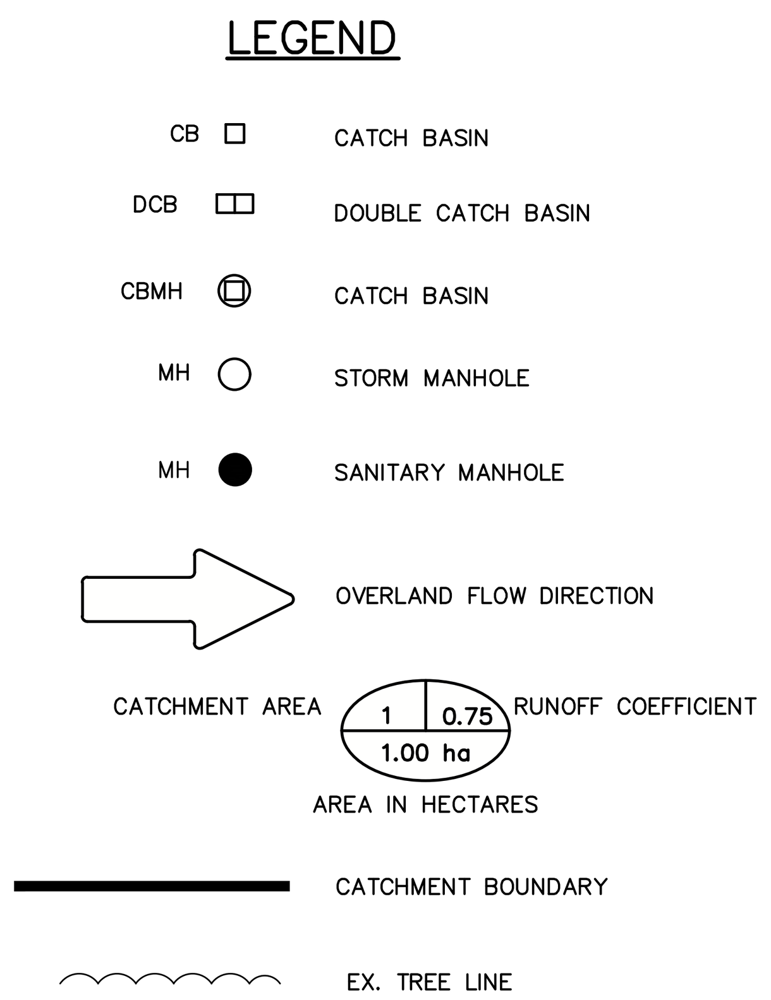
PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	JP/MWD	HORIZ SCALE	1:200
DRAWN BY	JP	VERT SCALE	
CHECKED BY	MWD	DATE	OCTOBER 2021
PROJECT #	19100		
DRAWING #	SS-1		
REVISION #	3		





KEYPLAN
N.T.S.



NO.	REVISION NOTE	DATE	BY
3	AS PER CITY OF BARRIE COMMENTS	12/18/23	JP
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1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

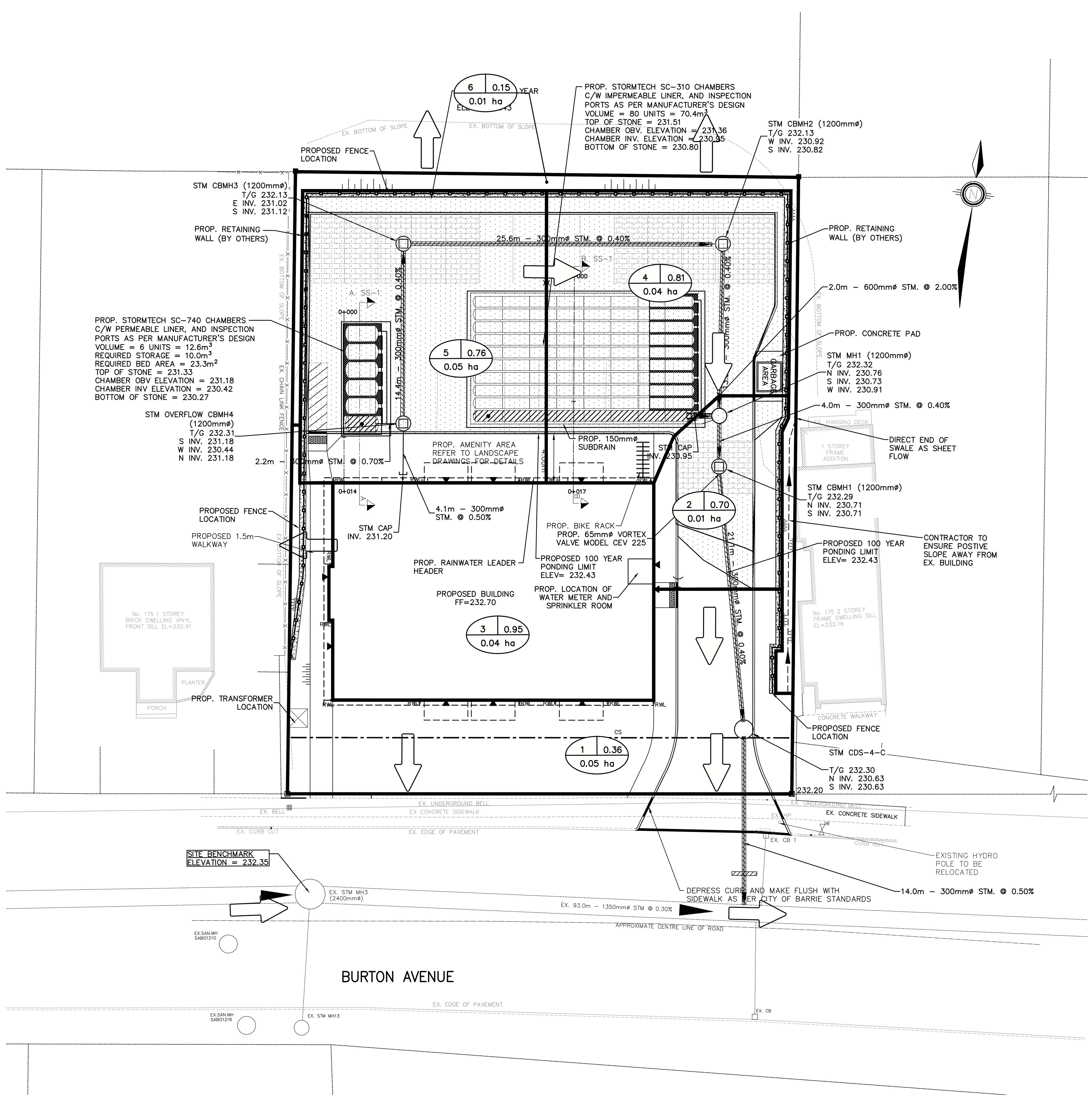
LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
Dec. 18 2023
PROVINCE OF ONTARIO

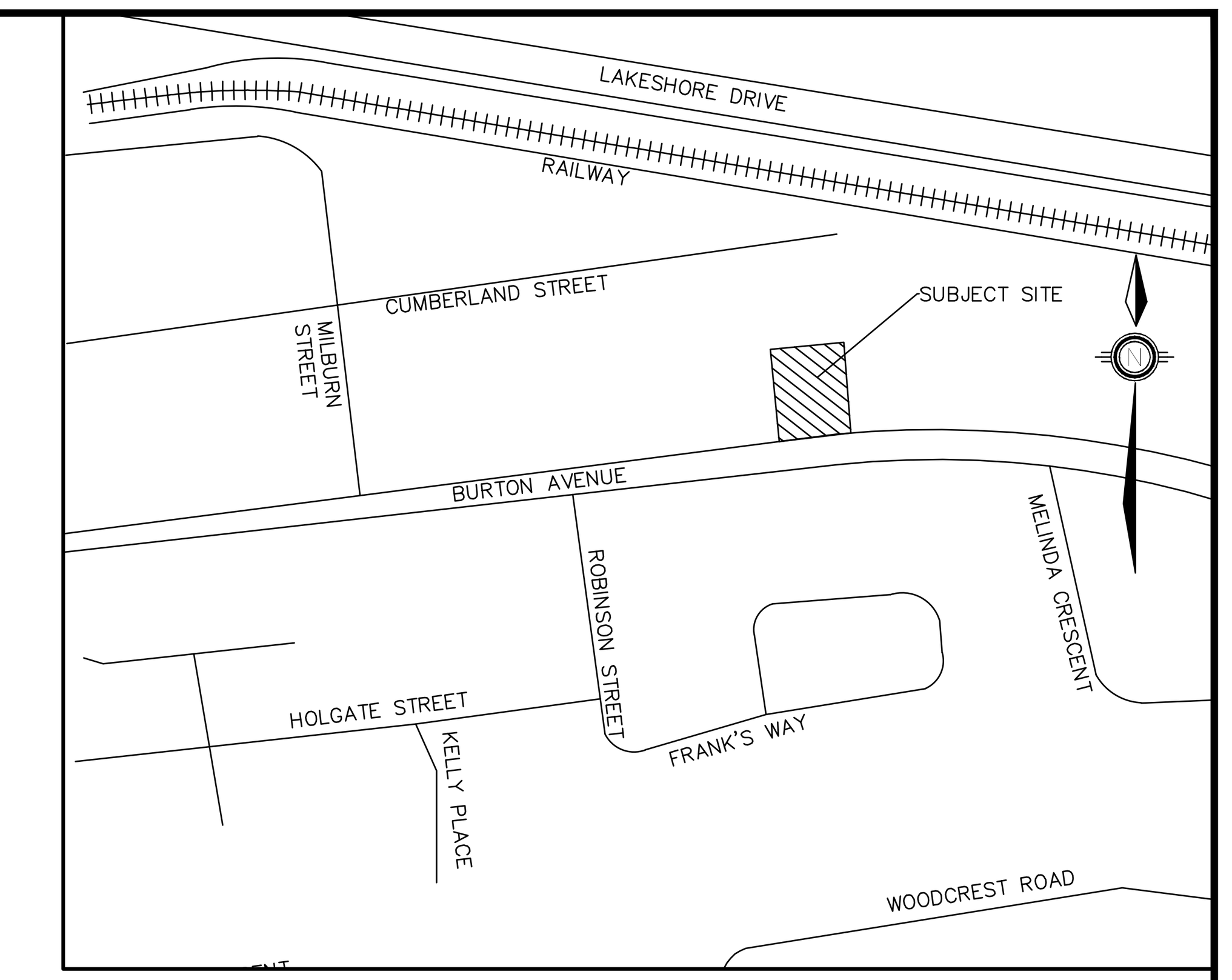
APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

PRE-DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	JP/MWD	HORIZ SCALE	1:200	PROJECT #	19100
DRAWN BY	JP	VERT SCALE		DRAWING #	STM-1
CHECKED BY	MWD	DATE	OCTOBER 2021	REVISION #	3





KEYPLAN
N.T.S.

LEGEND

CB	□	CATCH BASIN
DCB	□□	DOUBLE CATCH BASIN
CBMH		CATCH BASIN
MH	○	STORM MANHOLE
MH	●	SANITARY MANHOLE
	⇨	OVERLAND FLOW DIRECTION
CATCHMENT AREA	1 / 0.75 / 1.00 ha	RUNOFF COEFFICIENT; AREA IN HECTARES
	━━	CATCHMENT BOUNDARY
		PROP. PERMEABLE PAVERS

NO.	REVISION NOTE	DATE	BY
3	AS PER CITY OF BARRIE COMMENTS	12/18/23	JP
2	AS PER CITY OF BARRIE COMMENTS	08/29/23	JP
1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

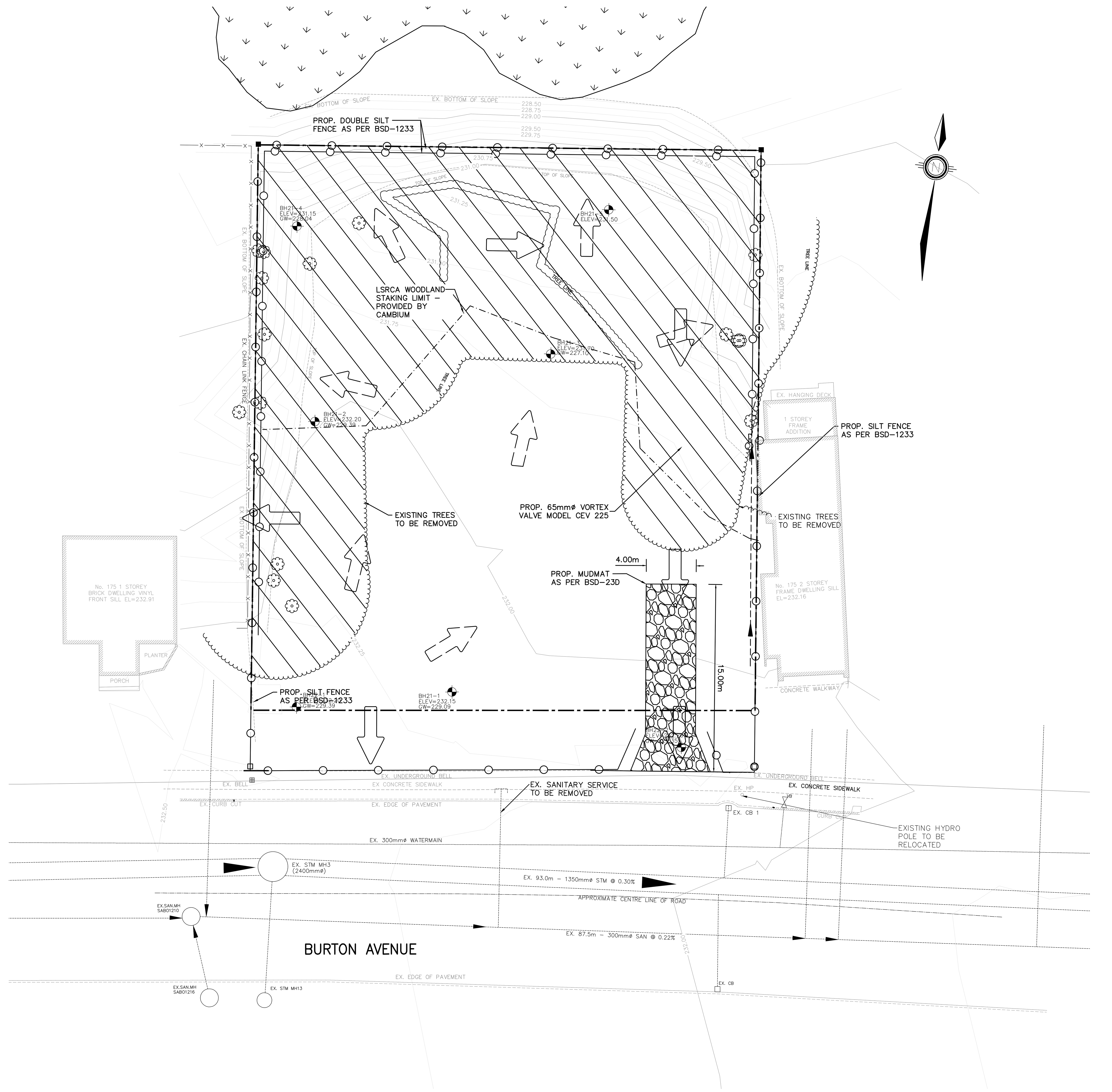
LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
Dec. 18 2023
PROVINCE OF ONTARIO

APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

POST DEVELOPMENT STORM CATCHMENT PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	JP/MWD	HORIZ SCALE	1:200	PROJECT #	19100
DRAWN BY	JP	VERT SCALE		DRAWING #	STM-2
CHECKED BY	MWD	DATE	OCTOBER 2021	REVISION #	3


PROP. DOUBLE SILT FENCE AS PER BSD-1233
LSRCA WOODLAND STAKING LIMIT - PROVIDED BY CAMBIUM
EXISTING TREES TO BE REMOVED
PROP. 65mmø VORTEX VALVE MODEL CEV 225
PROP. SILT FENCE AS PER BSD-1233
EXISTING TREES TO BE REMOVED
4.00m
PROP. MUDMAT AS PER BSD-23D
15.00m
PROP. SILT FENCE AS PER BSD-1233
EX. SANITARY SERVICE TO BE REMOVED
EX. CONCRETE SIDEWALK
EXISTING HYDRO POLE TO BE RELOCATED
EX. 300mmø WATERMAIN
EX. STM MH3 (2400mmø)
EX. 93.0m - 1350mmø STM @ 0.30%
APPROXIMATE CENTRE LINE OF ROAD
EX. 87.5m - 300mmø SAN @ 0.22%
BURTON AVENUE
EX. EDGE OF PAVEMENT

NOTES FOR SEDIMENT & EROSION CONTROL

1. DISTURBED AREAS THAT HAVE FAILED TO HAVE STABLE GROUND COVER ESTABLISHED BY OCTOBER 30TH SHALL BE PROTECTED WITH A SILTATION CONTROL FENCE OR STRAW MULCH ETC. AND MAINTAINED BY THE CONTRACTOR UNTIL VEGETATION BECOMES ESTABLISHED IN THE SUBSEQUENT GROWING SEASON.
2. ANY DEWATERING WASTE SHALL BE DISCHARGED TO A VEGETATED AREA AT LEAST 30m FROM ANY WATERCOURSE AND FILTERED. FILTERING METHODS MUST BE APPROVED BY THE SITE ADMINISTRATOR. DISCHARGE TO MUNICIPAL SERVICES MUST BE APPROVED BY THE CITY OF BARRIE PRIOR TO STARTING WORK AND ADHERE TO CITY OF BARRIE STANDARDS
3. SILT FENCE SHALL BE PUT IN PLACE PRIOR TO AND MAINTAINED DURING ALL GRADING. SILT FENCE TO BE INSPECTED PRIOR TO COMMENCEMENT OF EARTH GRADING ACTIVITIES. SILT FENCE TO BE INSPECTED AND REPAIRED OR REPLACED IF DAMAGED AS DIRECTED BY THE SITE ADMINISTRATOR. SILT CONTROLS TO BE INSPECTED ON A REGULAR BASIS AND AFTER EVERY RAIN EVENT. INSTALLATION SHALL BE TO THE MANUFACTURER'S SUGGESTED SPECIFICATIONS.
4. THE CONTRACTOR SHALL BE PREPARED FOR UNEXPECTED CONDITIONS AND ACCORDINGLY HAVE STOCKPILED MATERIALS ON SITE FOR NECESSARY REPAIRS AS A RESULT OF FAILED OR INADEQUATE CONTROL MEASURES. ALL SEDIMENT AND EROSION CONTROL MEASURES SHALL BE INSPECTED AT LEAST ONCE A WEEK, AND AFTER EVERY RAINFALL EVENT.
5. CONTRACTOR SHALL OBTAIN A CURRENT COPY AND BECOME FAMILIAR WITH OPSS 577, CONSTRUCTION SPECIFICATION FOR TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS ALL APPLICABLE MUNICIPAL STANDARDS.
6. THE CONTRACTOR MAY CONSIDER ALTERNATIVE SEDIMENT AND EROSION CONTROL MEASURES. SUCH MEASURES SHOULD BE PRESENTED IN WRITING FOR APPROVAL OF THE SITE ADMINISTRATOR AND MUST BE APPROVED IN WRITING BY THE MUNICIPALITY AND CONSERVATION AUTHORITY.
7. THE TOPS OF ALL FILTER FABRIC MUST BE A MINIMUM OF 1.0 METRES ABOVE THE GROUND LEVEL AND ATTACHED TO THE FENCE WITH A CONTINUOUS STEEL WIRE. ALTERNATIVELY, THE FILTER FABRIC MUST BE FOLDED OVER THE TOP OF THE FENCE AND ATTACHED TO THE FENCE WITH WIRE LOOPED THROUGH THE FABRIC ON BOTH SIDES OF THE FENCE. FILTER FABRIC IS TO BE TERRAFIX 270R OR EQUIVALENT.
8. ALL DISTURBED GROUND LEFT INACTIVE SHALL BE STABILIZED BY SEEDING, SODDING, MULCHING, OR COVERING OR OTHER EQUIVALENT CONTROL MEASURES. THIS PERIOD OF INACTIVITY SHALL BE AT THE DISCRETION OF THE CITY OF BARRIE MANAGER OF ENGINEERING BUT SHALL NOT EXCEED THIRTY DAYS.
9. CONTRACTOR SHALL INSTALL AND MAINTAIN CATCHBASIN SEDIMENT BARRIERS THROUGHOUT THE SITE DURING ALL CONSTRUCTION ACTIVITIES IN ORDER TO TRAP SEDIMENT. REFER TO DETAIL

SITE DATA

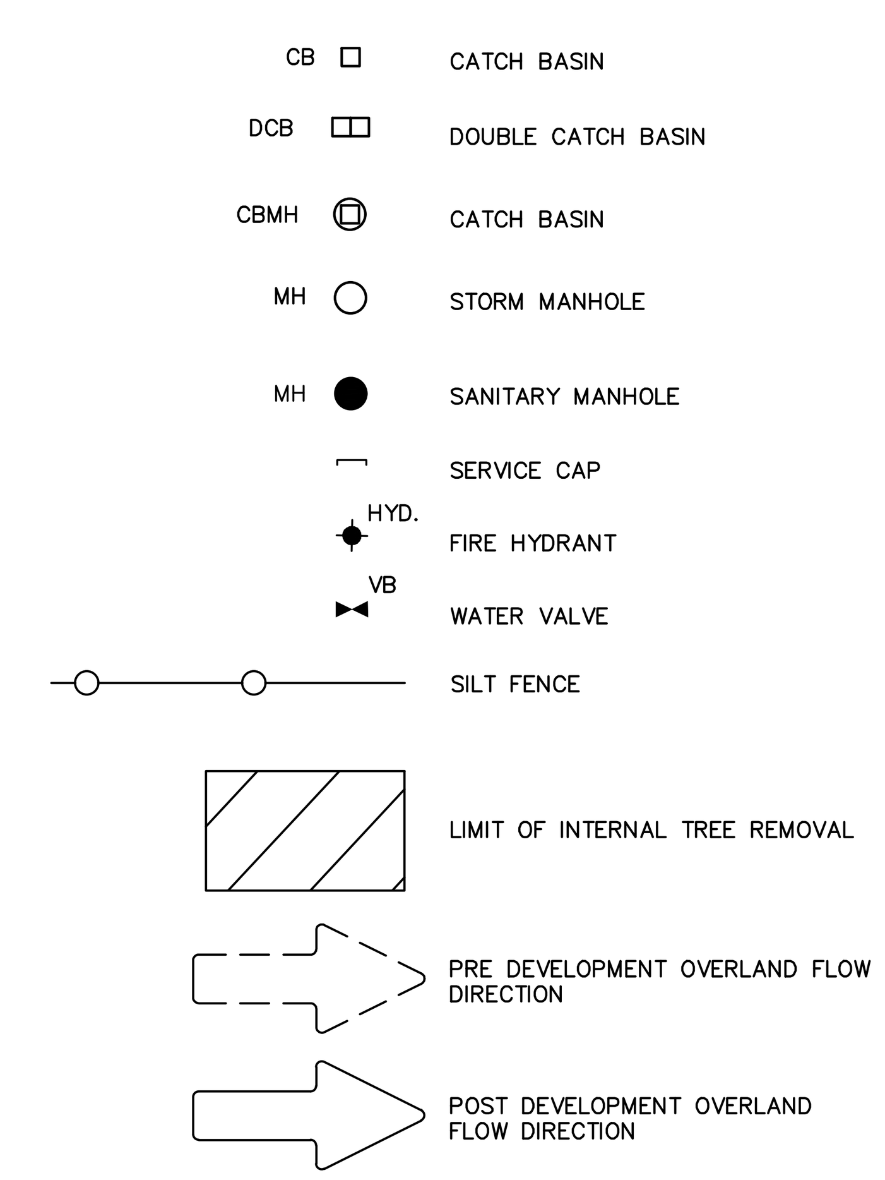
1. OVERALL SITE AREA – 0.18ha
2. EXISTING LAND USE – VACANT
3. PREDOMINATE SOIL – SITE GENERALLY INCLUDED FILL AND PEAT OVERLAYING AN ORIGINAL DEPOSIT OF SAND & SILT TILL

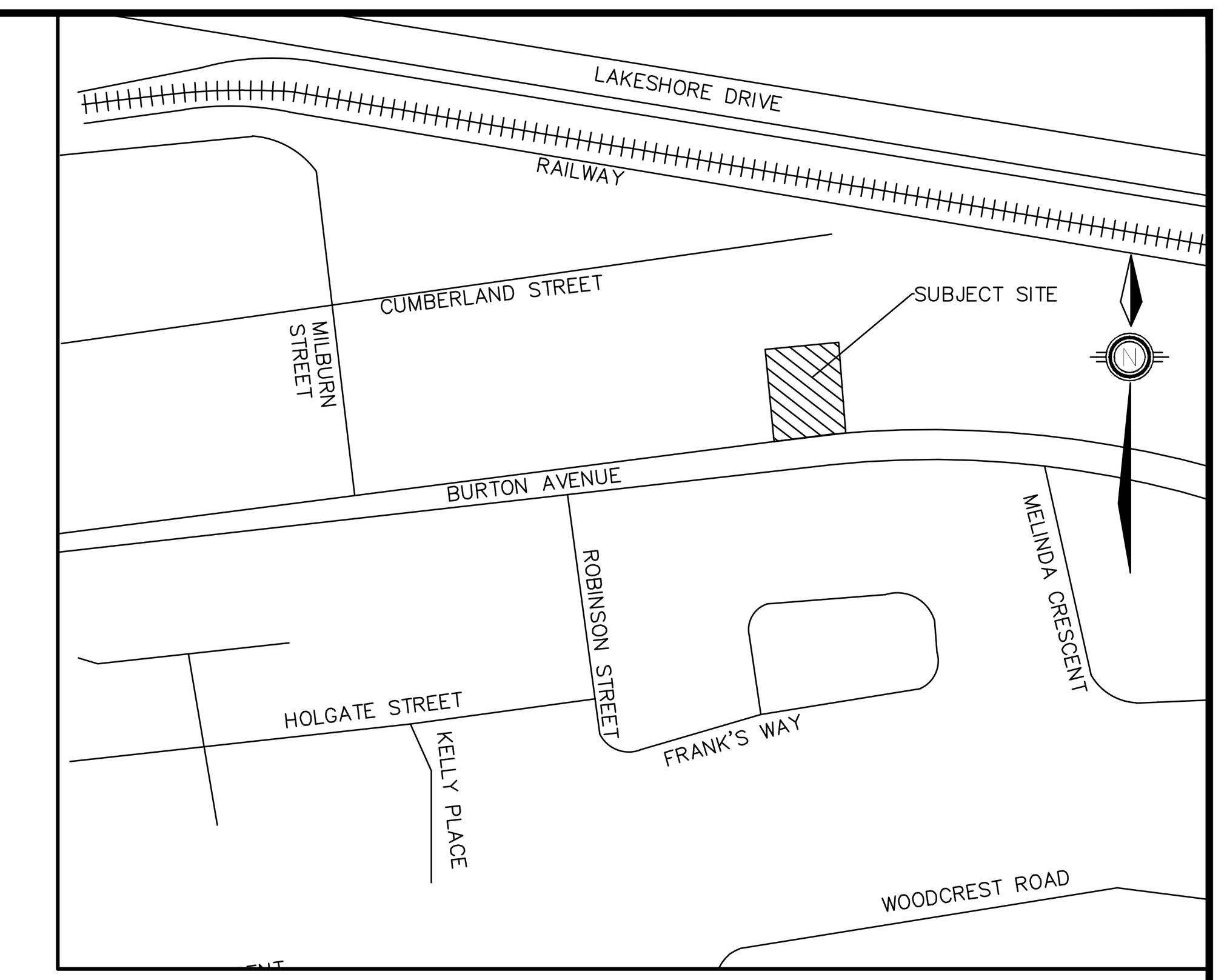
SEQUENCE OF CONSTRUCTION

1. ENGINEER TO BE NOTIFIED PRIOR TO INITIATION OF ANY ON SITE WORKS.
2. SILT FENCE AND CONSTRUCTION ACCESS MATS TO BE INSTALLED PRIOR TO THE COMMENCEMENT OF ANY WORKS ONSITE.
3. VEGETATION REMOVAL MAY COMMENCE AFTER ALL SILT FENCE IS INSTALLED AND APPROVED BY THE ENGINEER.
4. COMMENCE WITH EARTH EXCAVATION AND SITE SERVICING (TO BE REMOVED FROM SITE – NO STOCKPILE).
5. EROSION CONTROL MEASURES TO BE MAINTAINED AS DIRECTED BY THE ENGINEER DURING THE CONSTRUCTION PERIOD. ADDITIONAL CONTROL MEASURES MAY BE REQUIRED AT THE DISCRETION OF THE ENGINEER.
6. ALL DISTURBED GROUND LEFT INACTIVE FOR MORE THAN 30 DAYS SHALL BE STABILIZED WITH SEED, SOD, MULCH OR OTHER ADEQUATE COVERING, AS INSTRUCTED BY THE ENGINEER.

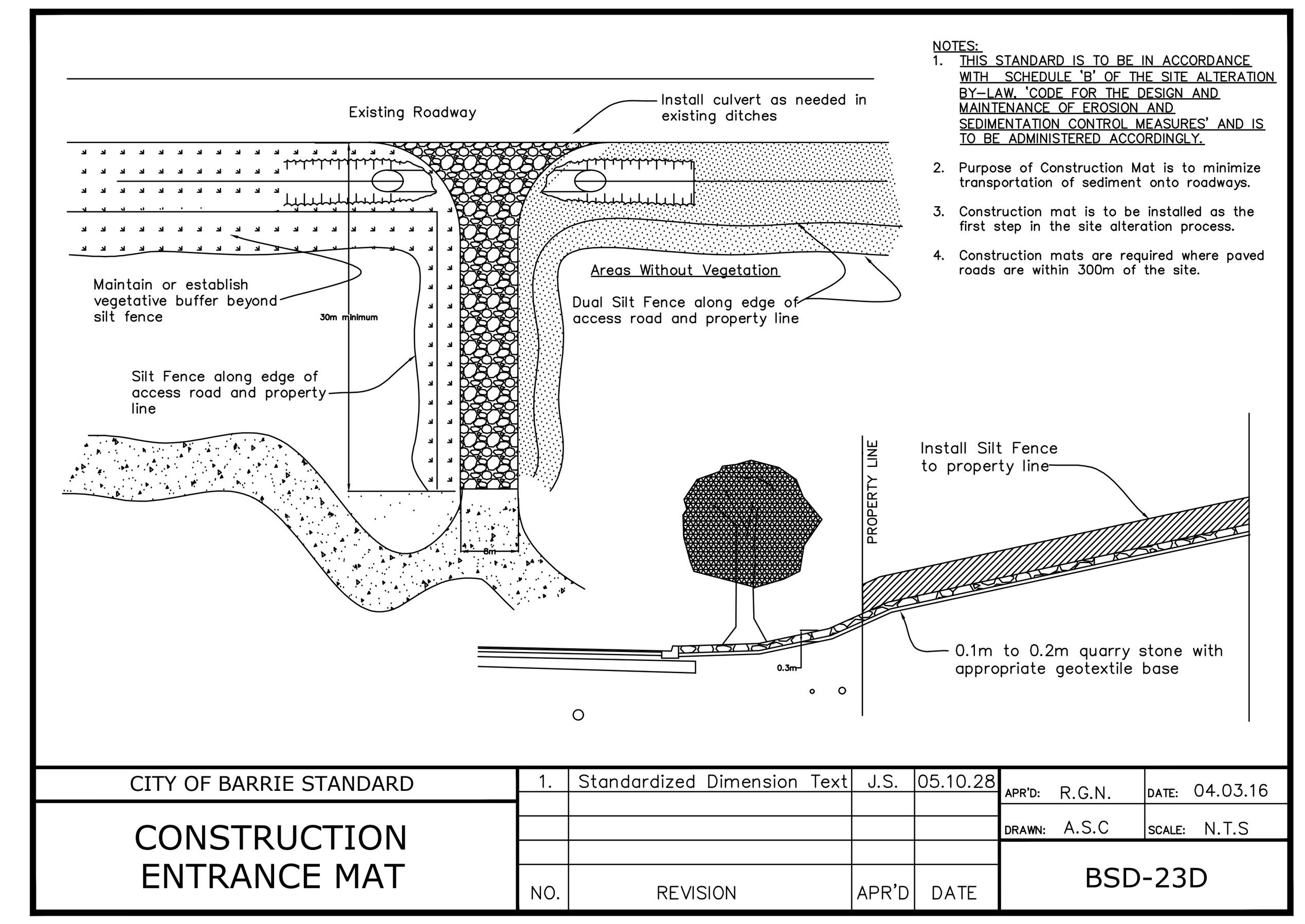
CONTRACTOR TO LOCATE AND DECOMMISSION EX. WATER SERVICE AS PER CITY STANDARDS.

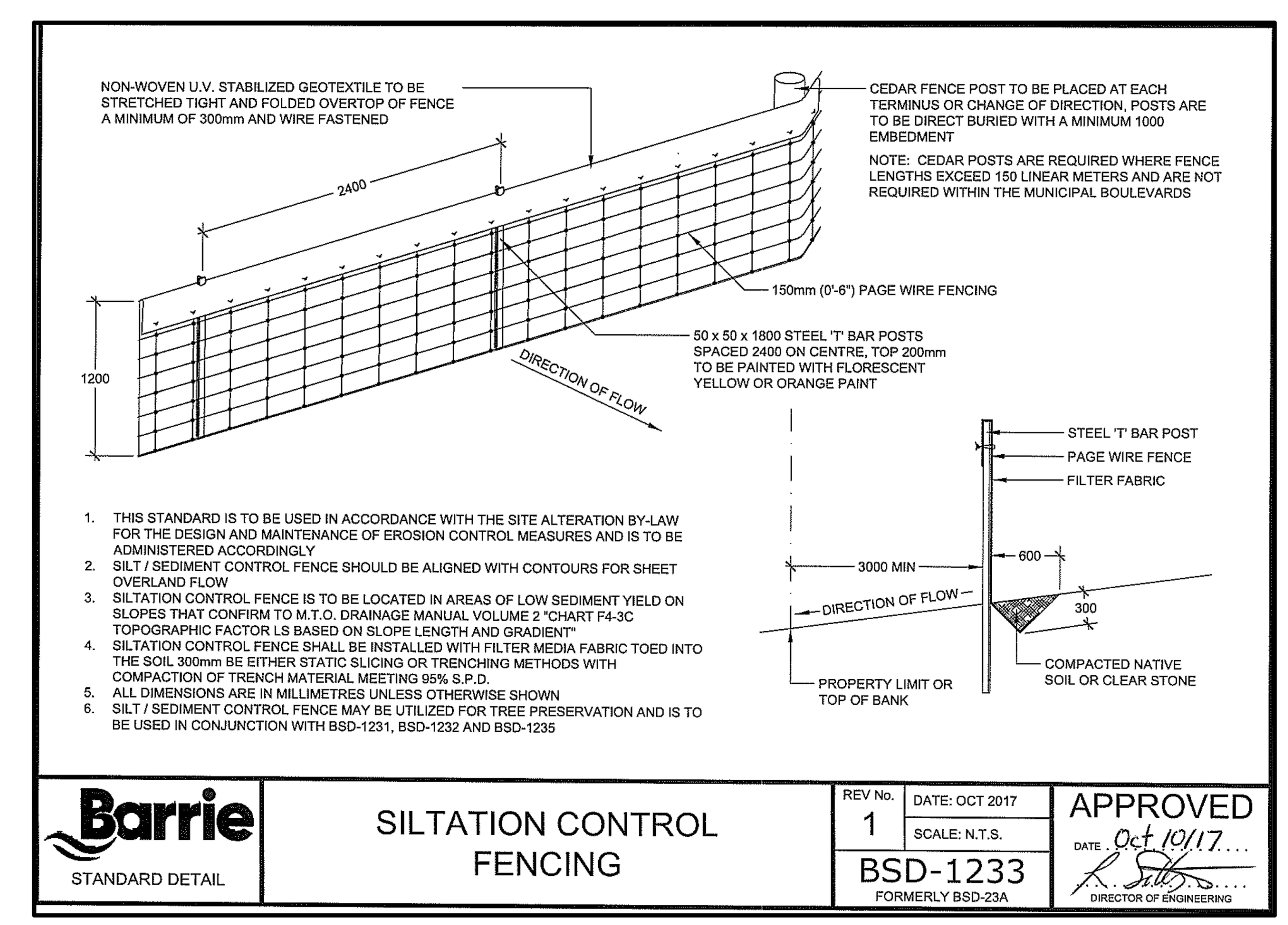
LEGEND


CB CATCH BASIN
DCB DOUBLE CATCH BASIN
CBMH CATCH BASIN
MH STORM MANHOLE
MH SANITARY MANHOLE
SERVICE CAP
HYD. FIRE HYDRANT
VB WATER VALVE
SILT FENCE
LIMIT OF INTERNAL TREE REMOVAL
PRE DEVELOPMENT OVERLAND FLOW DIRECTION
POST DEVELOPMENT OVERLAND FLOW DIRECTION



KEYPLAN
N.T.S.


Existing Roadway
Install culvert as needed in existing ditches
Areas Without Vegetation
Maintain or establish vegetative buffer beyond silt fence
Dual Silt Fence along edge of access road and property line
Silt Fence along edge of access road and property line
Install Silt Fence to property line
PROPERTY LINE
0.1m to 0.2m quarry stone with appropriate geotextile base
CITY OF BARRIE STANDARD
CONSTRUCTION ENTRANCE MAT
BSD-23D


CEDAR FENCE POST TO BE PLACED AT EACH STRETCHED TIGHT AND FOLDED OVERTOP OF FENCE
150mm (6"-6") PAGE WIRE FENCING
DIRECTION OF FLOW
STEEL 'T' BAR POST
PAGE WIRE FENCE
FILTER FABRIC
COMPACTED NATIVE SOIL OR CLEAR STONE
Barrie
STANDARD DETAIL
SILTATION CONTROL FENCING
BSD-1233
APPROVED

3	AS PER CITY OF BARRIE COMMENTS	12/18/23	JP
2	AS PER CITY OF BARRIE COMMENTS	08/29/23	JP
1	AS PER CITY OF BARRIE COMMENTS	05/12/23	JP
NO.	REVISION NOTE	DATE	BY

BENCHMARK:

EXISTING STORM MANHOLE 3 ON BURTON AVENUE LOCATED SOUTH OF THE SOUTH WESTERN PROPERTY CORNER.
ELEVATION = 232.35

LICENCED PROFESSIONAL ENGINEER
M.W. DEJEAN
Dec. 18 2023
PROVINCE OF ONTARIO

APARTMENT DEVELOPMENT
181 BURTON AVENUE
BARRIE, ON

EROSION PROTECTION & REMOVALS PLAN

PEARSON ENGINEERING
PEARSONENG.COM PH. 705.719.4785

DESIGNED BY	JP/MWD	HORIZ SCALE	1:200	PROJECT #	19100
DRAWN BY	JP	VERT SCALE		DRAWING #	EPR-1
CHECKED BY	MWD	DATE	OCTOBER 2021	REVISION #	3