S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS

Functional Servicing Report

1396 GUELPH LINE

CITY OF BURLINGTON

INFINITY DEVELOPMENT GROUP

March 2022

SLA File: 22024

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1.0 INTRODUCTION AND BACKGROUND

1.1 OVERVIEW

S. Llewellyn & Associates Limited has been retained by Infinity Development Group to provide Consulting Engineering services for the proposed development at 1396 Guelph Line in the City of Burlington, Region of Halton (see Figure 1.0 for location plan). This report will outline the functional servicing strategy for the proposed development.

The proposed development consists of constructing an 11-storey residential building including three levels of underground parking, an asphalt driveway, concrete sidewalk, and landscaped areas.

This Functional Servicing Report will provide detailed information of the proposed servicing scheme for this development. Please refer to the Preliminary Engineering Plans prepared by S. Llewellyn and Associates Limited (see Appendix F) and the Site Plan prepared by Zedd Architecture for additional information.

1.2 BACKGROUND INFORMATION

The following documents were referenced in the preparation of this report:

Ref. 1: MOE Stormwater Management Practices Planning and Design Manual (Ministry of Environment, March 2003)

Ref. 2: City of Burlington Standard Drawings (City of Burlington, March 2014)

Ref. 3: Halton Region Water and Wastewater Linear Design Manual (Halton Region, May 2014)

Ref. 4: Low Impact Development Stormwater Management Planning and Design Guide (Credit Valley Conservation Authority / Toronto and Region Conservation Authority, 2010)

Ref. 5: Geotechnical Investigation (Fisher Engineering, March 11, 2022)

Ref. 6: Hydrogeological Investigation (Fisher Engineering, March 11, 2022)

Ref. 7: Stormwater Management Design Guidelines (City of Burlington, May 21, 2020)

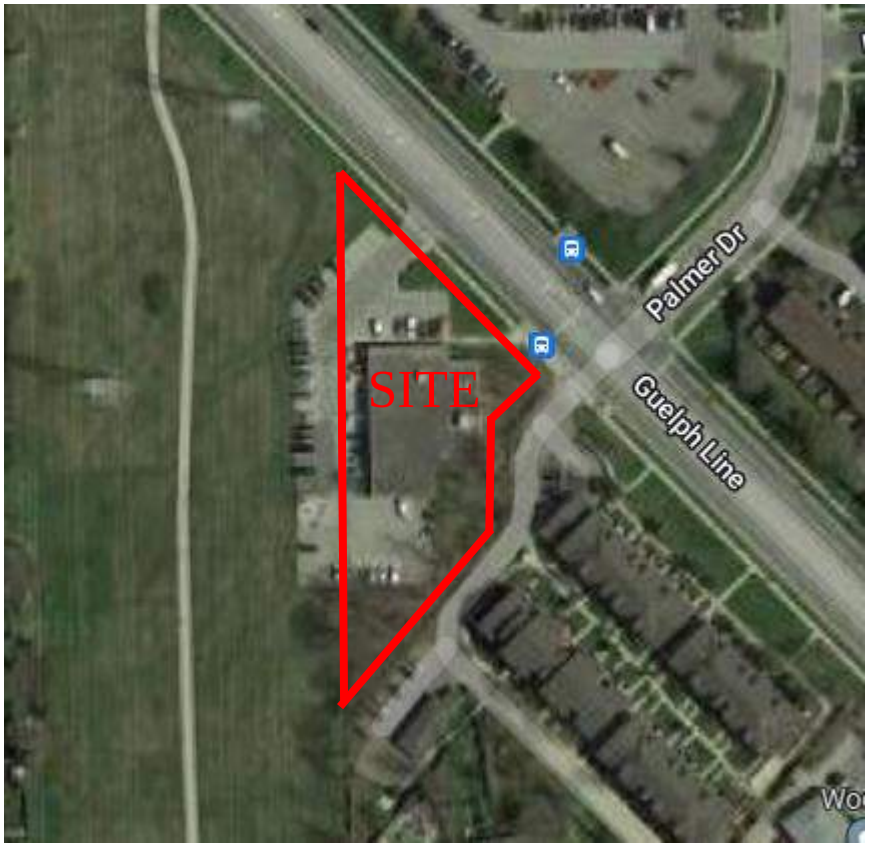


Figure 1.0 – Location Plan

1.3 GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

A Geotechnical and Hydrogeological Investigation was prepared by Fisher Engineering dated March 11, 2022. Six boreholes were drilled on March 2 & 3, 2022 to depths ranging between 9.25m and 15.37m below grade. Asphalt was encountered at the surface of all boreholes and was underlain by granular material to depths ranging from 0.61m to 1.68m. A sandy silt layer was encountered below the granular material extending to depths of 1.98m to 3.35m. A clayey silt later was encountered below the sandy silt layer extending to depths of 5.18m to 6.10m. Shale was encountered beneath the overburden soils in all boreholes extending to depths of 9.25m to 15.37m.

The groundwater quality determined by laboratory analyses revealed compliance to Region of Halton parameters of the sanitary and storm sewer limits. Temporary construction dewatering will be required and the dewatering flowrates, taking into consideration precipitation volumes, are 50,230 L/day (0.58 l/s) (unfactored) and 60,340 L/day (0.70 l/s) (factored), which is less than the allowable discharge rates noted in Table 2.3 of this report. Permanent drainage rate of 17,810 L/day (0.21 l/s) was obtained for three underground levels. A factored permanent drainage rate of 26,720 L/day (0.31 l/s) (FS of 1.5) should be used for planning purposes. Registration on the MOECC Environmental Activity and Sector Registry for Water Taking will be required for construction since the temporary construction dewatering flow rate is more than 50,000 L/day. An application for permission to take water will not be required for neither

construction nor permanent drainage as the daily flowrates are less than 400,000 and 50,000 L/day, respectively. An application for permission to discharge to the storm sewer system will be required unless the subsurface structure of the building is designed as watertight or onsite disposal facilities are implemented.

Groundwater levels are currently being monitored and the report will be updated upon completion of the groundwater monitoring programme. For additional information, refer to the Geotechnical and Hydrogeological Investigations in Appendix D and E, respectively.

2.0 STORMWATER MANAGEMENT

The following stormwater management (SWM) criteria will be applied to the site, in accordance with the City of Burlington and Region of Halton:

Quantity Control
The post development flow rates shall be controlled to pre-development flow rates for the 2-year to 100-year storm events. Additionally, the maximum pre-development imperviousness of 36% is to be used for the pre-development calculations.

Quality Control
The stormwater runoff from the proposed condition site must meet Level 1 (Enhanced) stormwater quality control (80% TSS removal, 90% average annual runoff treatment).

2.1 EXISTING CONDITIONS

In the existing condition, there is an existing commercial building with associated asphalt parking lot and landscaped areas. The site is bounded by Guelph Line to the north, existing residential lands to the south and east and a hydro corridor to the west. The runoff from the majority of site is captured by existing catchbasins within the asphalt parking lot and landscaped areas. The remainder of the site sheet drains to Guelph Line where runoff is captured by the existing 750mmø storm sewer along Guelph Line.

One (1) catchment area, Catchment 101 has been identified in the existing conditions. Catchment 101 represents the discharge to the existing 750mmø storm sewer along Guelph Line. See Table 2.1 below and the Existing Conditions Storm Drainage Area Plan in Appendix A for details.

Table 2.1 – Existing Conditions Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious	Runoff Coefficient
101	To Guelph Line	0.383	65%	0.69

The existing conditions discharge from the site was calculated using the SWMHYMO Hydrologic Modelling Program for the 2-year to 100-year City of Burlington design storms. A summary of the results can be found in Table 2.2.

Table 2.2 – Existing Condition Stormwater Discharge	
Storm Event	Catchment 101 Discharge (m^3/s)
2-year	0.055
5-year	0.073
10-year	0.086
25-year	0.103
50-year	0.117
100-year	0.130

Allowable Discharge Rates

The post development flow rates shall be controlled to pre-development flow rates for the 2-year to 100-year storm events. However, the maximum pre-development imperviousness of 36% will be used for the pre-development calculations since the existing conditions site is greater than 36% impervious. The allowable discharge rates for the 2-year to 100-year storm events have been calculated using the SWMHYMO Hydrologic Modelling Program. A summary of the results can be found in Table 2.3

Table 2.3 – Allowable Discharge Rates	
Storm Event	Post-Development Allowable Discharge (m^3/s)
2-year	0.030
5-year	0.041
10-year	0.049
25-year	0.061
50-year	0.070
100-year	0.081

2.2 PROPOSED CONDITIONS

It is proposed to develop the site by constructing an 11-storey residential building including three levels of underground parking, an asphalt driveway, concrete sidewalk, and landscaped areas. It is proposed to service the site with a 250mmø storm sewer, designed and constructed in accordance with the City of Burlington and Region of Halton standards.

Three (3) catchment areas, Catchment 201, 202 and 203 have been identified in the proposed condition. Catchment 201 represents controlled drainage from the site, which will be captured by the roof and proposed area drains and discharged to the existing 750mmø storm sewer along Guelph Line. Catchment 202 represents uncontrolled drainage from the site which will discharge to Guelph Line. Catchment 203 represents the uncontrolled external drainage from the hydro corridor which will be captured by the internal mechanical system and bypass the storage tank, ultimately discharging to the

existing 750mmø storm sewer along Guelph Line. See Table 2.4 below and the Post-Development Storm Drainage Area Plan in Appendix A for details.

Table 2.4 – Proposed Condition Catchment Areas

Catchment ID	Description	Area (ha)	Percent Impervious	Runoff Coefficient
201	Controlled drainage to Guelph Line	0.342	94%	0.89
202	Uncontrolled drainage to Guelph Line	0.040	75%	0.
203	Uncontrolled external drainage to Guelph Line	0.260	0%	0.25

Water Quantity Control

It is proposed to apply quantity control measures to the runoff from Catchment 201 by means of a 140mmø outlet on the proposed cast-in-place concrete storage tank. With the installation of quantity control measures for Catchment 201, it will be required to provide on-site stormwater storage. On-site storage will be provided by a cast-in-place concrete storage tank within the underground parking. See Table 2.5 and Appendix A for the stage-storage-discharge relationship of the orifice control and on-site storage.

Table 2.5 – Proposed Condition Stage-Storage-Discharge (Catchment 201)

Elevation (m)	Storage (m^3)	Discharge (m^3/s)
129.70 (Orifice Invert)	0	0
130.05 (Overflow Weir flowing to the Bottom of Tank)	22	0.0216
127.79 (Bottom of Tank)	22	0.0216
128.29 (0.5m Deep)	53	0.0216
128.79 (1.0m Deep)	85	0.0216
129.29 (1.5m Deep)	116	0.0216
129.70 (Orifice Invert)	142	0.0216
130.05 (Overflow Weir)	142	0.0216
130.35 (Top of Tank)	161	0.0312

An analysis was performed on the Proposed Condition site using the SWMHYMO hydrologic modeling program to determine the required volume of stormwater storage during the 2-year to 100-year City of Burlington design storms. A summary of the results can be found in Table 2.6 and the detailed SWMHYMO input/output information can be found in Appendix B.

Table 2.6 – Proposed Condition Stormwater Discharge (To Guelph Line)					
Storm Event	Catchment 201 Controlled Discharge (m^3/s)	Catchment 202 Uncontrolled Discharge (m^3/s)	Total Discharge (m^3/s)	Allowable Discharge (m^3/s)	Required Storage (m^3)
2-Yr	0.022	0.007	0.028	0.030	42.1
5-Yr	0.022	0.009	0.030	0.041	60.3
10-Yr	0.022	0.010	0.032	0.049	73.0
25-Yr	0.022	0.012	0.034	0.061	89.7
50-Yr	0.022	0.013	0.035	0.070	103.3
100-Yr	0.022	0.015	0.036	0.081	116.9

This analysis determined the following:

- The proposed condition discharge rates to Guelph Line will not exceed the maximum allowable discharge rates during all storm events, with the installation of a 140mmø outlet on the cast-in-place concrete storage tank.

- Catchment 201 will require $117m^3$ of stormwater storage during the 100-year event, which can be accommodated by the proposed storage tank having a volume of $161m^3$.

Water Quality Control

Water quality control will be achieved through a treatment train approach. See the Preliminary Servicing Plan prepared by S. Llewellyn & Associates Limited for details.

The proposed development is required to achieve an “Enhanced” (80% TSS removal) level of water quality protection. To achieve these criteria, discharge from the site will be subject to a treatment train that consists of ADS Flexstorm Pure Permanent Inlet Filters and a HydroStorm oil/grit separator before ultimately discharging to the existing 750mmø storm sewer along Guelph Line.

ADS Flexstorm Pure Permanent Inlet Filters have been proposed within the proposed area drains in the asphalt parking lot. The installation of the ADS Flexstorm Pure Permanent Inlet Filters will contribute to the removal of TSS and the capture of floatables within the area drains. The technical information regarding the ADS Flexstorm Pure Permanent Inlet Filters can be found in Appendix A.

The HydroStorm sizing software was used to determine the required size of the oil/grit separator unit for the site. It was determined that a HydroStorm HS6 will treat 80% of the annual runoff and provides 97% annual TSS removal for the ETV particle size distribution. See HydroStorm unit sizing procedures in Appendix A for details.

With the combination of the proposed HydroStorm Unit and the ADS Flexstorm Pure Permanent Inlet Filters, the requirements for an “Enhanced” level of quality control for the site will be satisfied.

HydroStorm units and ADS Inlet Filters require regular inspection and maintenance as per the manufacture's specifications to ensure the unit operates properly. See the Maintenance Manuals in Appendix A for details.

2.3 SEDIMENT AND EROSION CONTROL

In order to minimize erosion during the grading and site servicing period of construction, the following measures will be implemented:

- Install silt fencing along the outer boundary of the site to ensure that sediment does not migrate to the adjacent properties;
- Install sediment control (silt sacks or silt socks) in the proposed area drains as well as the nearby existing catchbasins to ensure that no untreated runoff enters the existing conveyance system;
- Stabilize all disturbed or landscaped areas with hydro seeding/sodding to minimize the opportunity for erosion.

For details on the proposed erosion and sediment control for the proposed site, see the Preliminary Grading & Erosion Control Plan included in the engineering drawings.

3.0 SANITARY SEWER SERVICING

3.1 EXISTING CONDITIONS

There is an existing 200mmø sanitary sewer located adjacent to the site along Guelph Line.

3.2 SANITARY DEMAND

Sanitary discharge from the site was estimated in accordance with the Halton Region Water and Wastewater Linear Design Manual. Table 3.1 summarizes the sanitary sewer discharge rate for the subject lands.

Table 3.1 - Post-Development Sanitary Sewer Discharge

Population [A]	Avg. Demand [B] (l/s)	Peaking Factor [C]	Infiltration [D] (l/s)	**Peak Flow [E] (l/s)**
383 persons	1.22	4.0	0.11	**4.99**

[A] Population = (236 units x 1.62 persons/unit) = 383 persons
[B] Average demand = 275 l/cap/day x population
[C] Peaking Factor = $1+((14/(4+P^{0.5})))$ with P expressed in thousands Min=2.0
[D] Infiltration flow based on 0.286 l/ha/sec infiltration rate x Site Area (0.382 hectares)
[E] Peak Flow = (Average Flow x Peaking Factor) + Infiltration

3.3 PROPOSED SANITARY SERVICING AND CAPACITY ANALYSIS

The proposed site will be serviced by a 200mmø sanitary sewer, designed and constructed in accordance with City of Burlington and Region of Halton standards. Drainage from this sewer will discharge to the existing 200mmø sanitary sewer adjacent to the site along Guelph Line.

The minimum grade of the proposed 200mmø sanitary sewer will be 2.0%. At this minimum grade, the proposed sanitary sewer will have a capacity of 0.039 m^3/s (39 l/s). Therefore, the proposed 200mmø sanitary sewer at a minimum grade of 2.0% is adequately sized to service the proposed development.

4.0 DOMESTIC AND FIRE WATER SUPPLY SERVICING

4.1 EXISTING CONDITIONS

The existing municipal water distribution system consists of a 400mmø watermain located adjacent to the site along Guelph Line. There is an existing fire hydrant fronting the site and it is connected to the 400mmø watermain.

4.2 DOMESTIC WATER DEMAND

Water demand for the site was estimated in accordance with the Halton Region Water and Wastewater Linear Design Manual. Tables 4.1 summarizes the domestic water demand requirements for the Average Daily, Maximum Daily and Peaking Hourly demand scenarios.

Table 4.1 - Post-Development Domestic Water Demand

Population [A*]	Average Daily Demand [B] (l/s)	Max. Daily Peaking Factor [C]	Max. Hourly Peaking Factor [D]	**Max. Daily Demand [E] (l/s)**	**Max. Hourly Demand [F] (l/s)**
383 persons	1.22	3.0	4.5	**3.66**	**5.49**

[A] Population = (236 units x 1.62 persons/unit) = 383 persons
[B] Average Daily Demand = 275 l/cap/day x population
[C] Max. Daily Peaking Factor = 3.0 [D]
Max. Hourly Peaking Factor = 4.5
[E] Max. Daily Demand = Average Daily Demand x Max. Daily Peaking Factor
[F] Max. Hourly Demand = Average Daily Demand x Max. Hourly Peaking Factor

4.3 FIRE FLOW DEMAND

Fire flow demands for the proposed development are governed by a number of guidelines and criteria, such as the Water Supply for Public Fire Protection (Fire Underwriters Survey, 1999), Ontario Building Code (OBC), and various codes and standards published by the National Fire Protection Association (NFPA).

The proposed building is non-combustible construction (C=0.8), with limited combustible occupancy (-15% correction) and a fully supervised sprinkler system (-50% correction). Exposure components are based on the following:

North Face: 0% correction (>45m)
South Face: 10% correction (20.1m to 30.0m)
East Face: 15% correction (10.1m to 20.0m)
West Face: 0% correction (>45m)

It is estimated that the required fire flow for the proposed development will be **250 l/s**. See the Fire Flow Demand Requirements in Appendix C for details.

The existing hydrant fronting the site on Guelph Line is located within the 90m separation from the building face adjacent to a street (as per Sentence 3.2.5.7 of the 2020 Ontario Building Code), no additional private hydrants are proposed for this development.

There are currently no hydrant flow tests available. A hydrant flow test will be completed at a later date and the results will be provided in an updated report.

4.4 PROPOSED WATER SERVICING AND ANALYSIS

Proposed water servicing for the site consists of connecting a 150mmø watermain to the existing 400mmø watermain adjacent to the site. The 150mm watermain will split at property line to provide a 150mm fire water service and a 100mm domestic water service for the proposed building. All proposed water services will be designed and constructed in accordance with City of Burlington and Region of Halton standards.

5.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the information provided herein, it is concluded that the proposed development at 1396 Guelph Line can be constructed to meet the requirements of the City of Burlington and Region of Halton. Therefore, it is recommended that:

- The development be graded and serviced in accordance with the Preliminary Servicing and Preliminary Grading & Erosion Control Plans prepared by S. Llewellyn & Associates Limited;

- A 140mmø outlet be installed on the cast-in-place storage tank as per the Preliminary Servicing Plan and this report to achieve effective stormwater quantity control;

- A cast-in-place concrete storage tank be installed as per the Preliminary Servicing Plan and this report to provide adequate stormwater storage;

- Erosion and sediment controls be installed as described in this report and shown on the Preliminary Grading & Erosion Control Plan prepared by S. Llewellyn & Associates Limited;

- The proposed sanitary and water servicing system be installed as per the Preliminary Servicing Plan and this report to adequately service the proposed development.

We trust the information enclosed herein is satisfactory. Should you have any questions please do not hesitate to contact our office.

Prepared by:

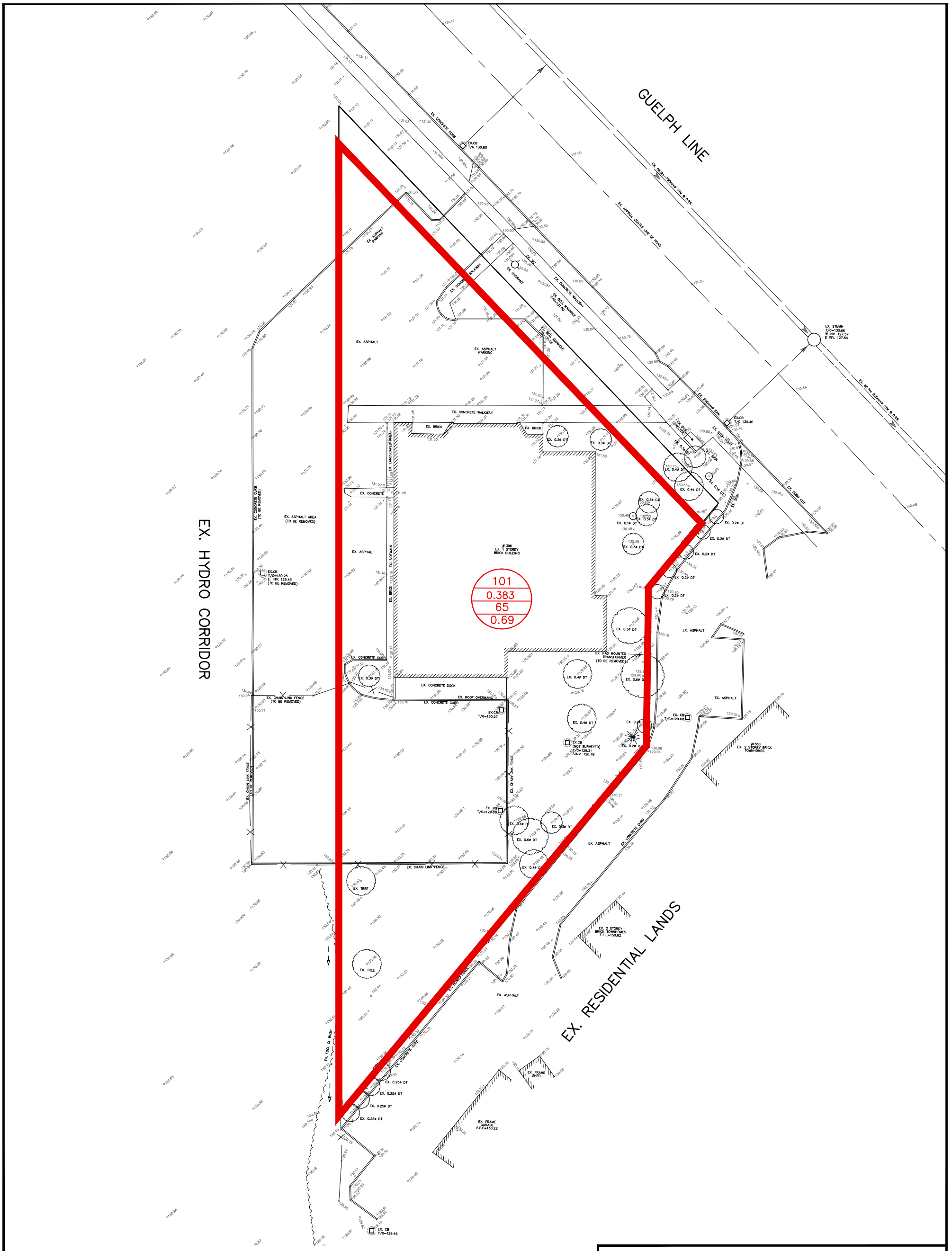
S. LLEWELLYN & ASSOCIATES LIMITED



S. Nelson, P.Eng.

APPENDIX A

STORMWATER MANAGEMENT INFORMATION



LEGEND

101 / 0.383 / 65 / 0.69	DRAINAGE AREA I.D. / DRAINAGE AREA (ha) / PERCENT IMPERVIOUS / RUNOFF COEFFICENT
	DRAINAGE BOUNDARY
	EXISTING DIRECTION OF SHEET FLOW
	OVERLAND FLOW ROUTE

EXISTING CONDITION
STORM DRAINAGE AREA PLAN

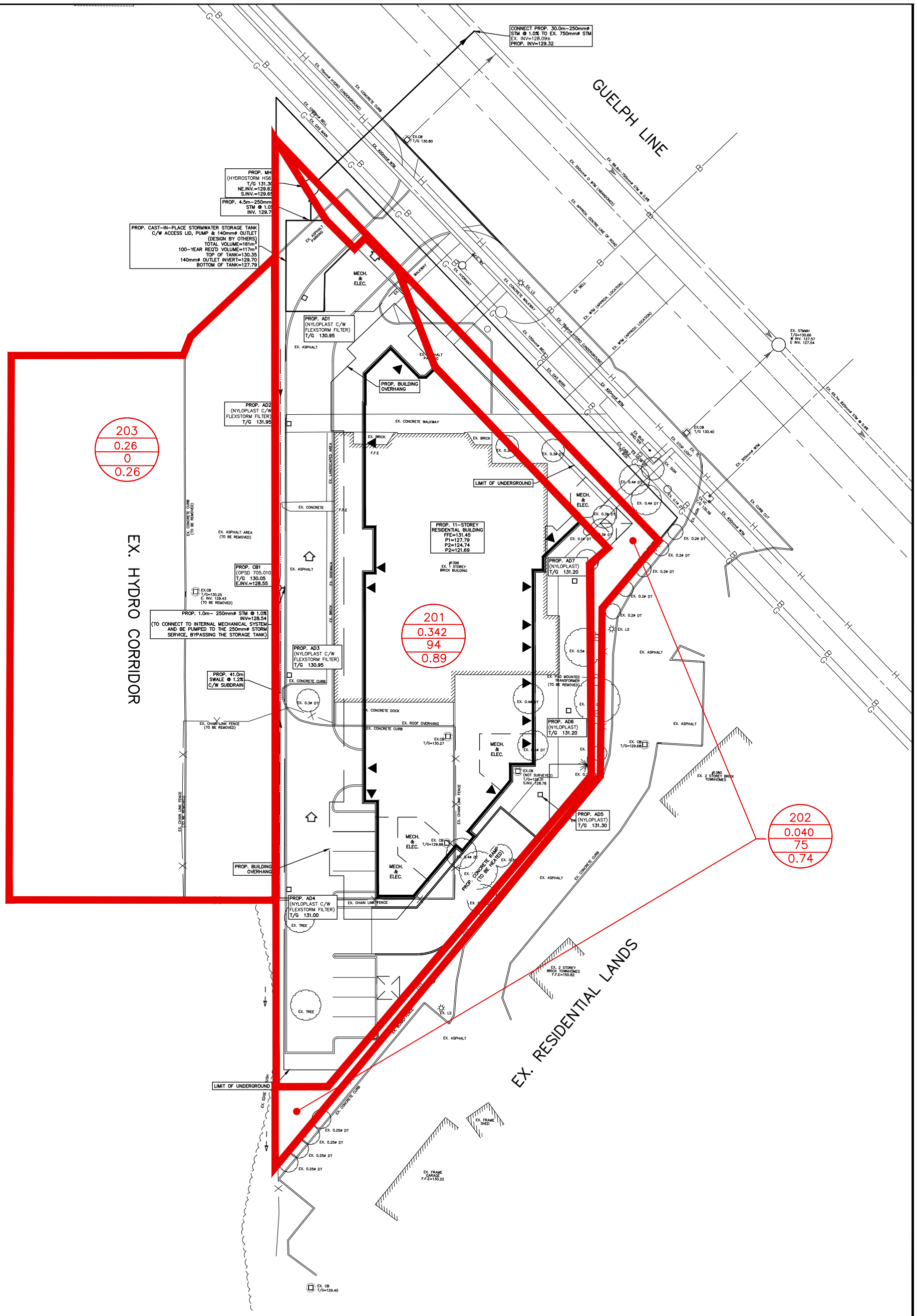
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PROJECT: 1396 GUELPH LINE, BURLINGTON
PROJECT No.: 22024

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LEGEND

101 / 0.383 / 65 / 0.69	DRAINAGE AREA I.D. DRAINAGE AREA (ha) PERCENT IMPERVIOUS RUNOFF COEFFICENT
	DRAINAGE BOUNDARY
	PROPOSED DIRECTION OF SHEET FLOW
	EXISTING DIRECTION OF SHEET FLOW
	OVERLAND FLOW ROUTE

PROPOSED CONDITION

STORM DRAINAGE AREA PLAN

SCALE: 1:500

PROJECT: 1396 GUELPH LINE, BURLINGTON
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Burlington, ON

S. LLEWELLYN & ASSOCIATES LIMITED
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RUNOFF COEFFICIENT CALCULATIONS

Pre

		C-Value
Drainage Area #:	101	
Roof/Building Area (m²):	987	0.95
Asphalt/Conc. Area (m²):	1520	0.90
Gravel Area (m²):l	0	0.80
Grass Area - Pervious (m²):	1323	0.25
Total Area (m²):	3830	0.69
Impervious	2507	**0.65**
Pervious	1323	**0.35**
Site	3830	

Post

		C-Value
Drainage Area #:	201	
Roof/Building Area (m²):	1690	0.95
Asphalt/Conc. Area (m²):	1530	0.90
Gravel Area (m²):l	0	0.80
Grass Area - Pervious (m²):	200	0.25
Total Area (m²):	3420	0.89
Impervious	3220	**0.94**
Pervious	200	**0.06**
Site	3420	

Post

		C-Value
Drainage Area #:	202	
Roof/Building Area (m²):	0	0.95
Asphalt/Conc. Area (m²):	300	0.90
Grass Area - Pervious (m²):	100	0.25
Total Area (m²):	400	0.74
Impervious	300	**0.75**
Pervious	100	**0.25**
Site	400	

Post

		C-Value
Drainage Area #:	203	
Roof/Building Area (m²):	0	0.95
Asphalt/Conc. Area (m²):	0	0.90
Grass Area - Pervious (m²):	2600	0.25
Total Area (m²):	2600	0.25
Impervious	0	**0.00**
Pervious	2600	**1.00**
Site	2600	

1396 Guelph Line
Burlington, Ontario

S. LLEWELLYN & ASSOCIATES LIMITED
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STAGE-STORAGE-DISCHARGE CALCULATIONS

Catchment 201
Outlet Device No. 1 (Quantity)

Type:	Tank Outlet
Diameter (mm)	**140**
Area (m^2)	0.01539
Invert Elev. (m)	129.70
C/L Elev. (m)	129.77
Disch. Coeff. (C_d)	0.6
Discharge (Q) =	$C_d A (2 g H)^{0.5}$
Number of Orifices:	1

		SWM Pond Volumes			Outlet No. 1	
	Elevation m	Area m^2	Tank Incremental Volume	Active Storage Volume m^3	H m	Discharge m^3/s
Orifice Invert	129.70	61.5	0.0	0	0.000	0.0000
Weir	130.05	61.5	21.5	22	0.280	0.0216
Bottom of Tank	127.79	63.0	0.0	22	0.280	0.0216
0.5m Deep	128.29	63.0	31.5	53	0.280	0.0216
1.0m Deep	128.79	63.0	31.5	85	0.280	0.0216
1.5m Deep	129.29	63.0	31.5	116	0.280	0.0216
Orifice Invert	129.70	63.0	25.8	142	0.280	0.0216
Weir	130.05	63.0	0.5	142	0.280	0.0216
Top of Tank	130.35	63.0	18.9	161	0.580	0.0312

Hydroworks Sizing Summary

1396 Guelph Line

03-09-2022

Recommended Size: HydroStorm HS 6

A HydroStorm HS 6 is recommended to provide 80 % annual TSS removal based on a drainage area of 0.342 (ha) with an imperviousness of 94 % and Hamilton RBG, Ontario rainfall for the ETV Canada particle size distribution.

The recommended HydroStorm HS 6 treats 97 % of the annual runoff and provides 80 % annual TSS removal for the Hamilton RBG rainfall records and ETV Canada particle size distribution.

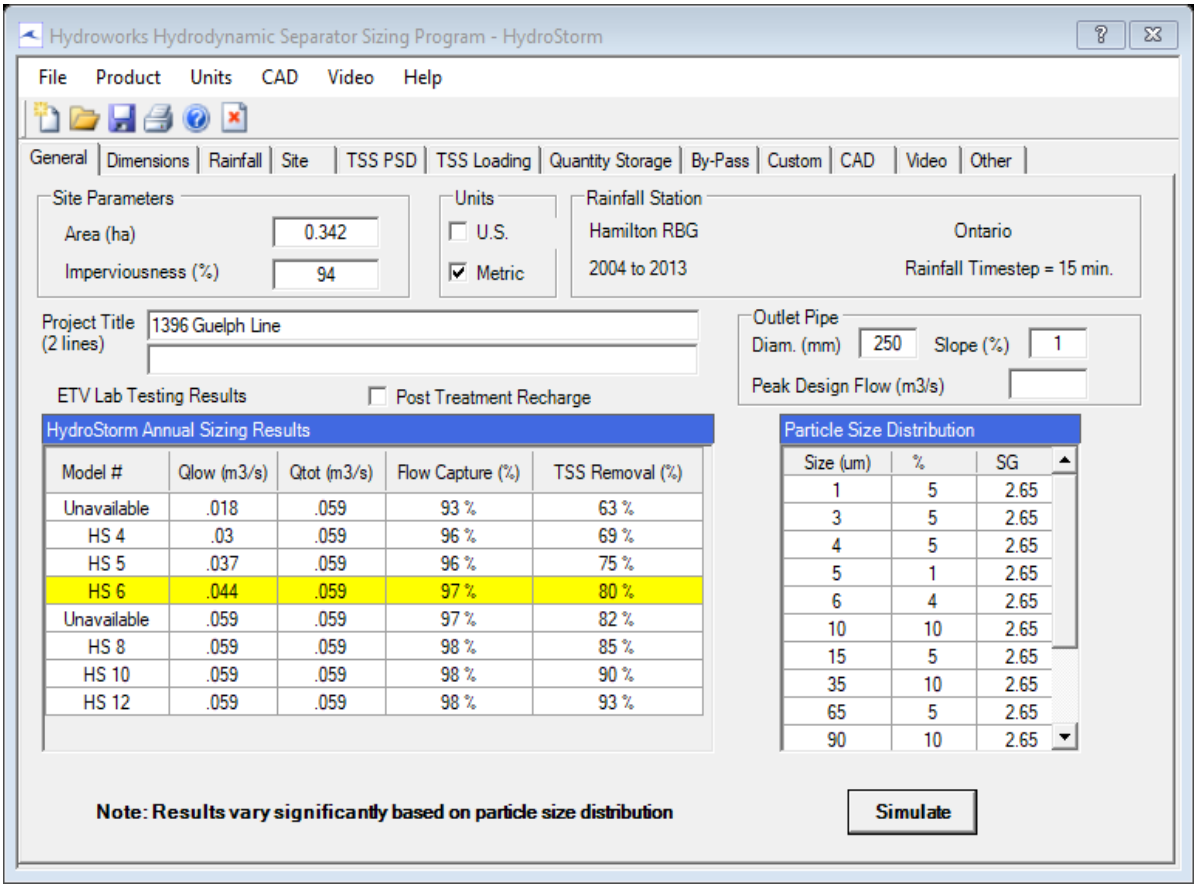
The HydroStorm has a headloss coefficient (K) of 1.04. Since a peak flow was not specified, headloss was calculated using the full pipe flow of .06 (m3/s) for the given 250 (mm) pipe diameter at 1% slope. The headloss was calculated to be 78 (mm) based on a flow depth of 250 (mm) (full pipe flow).

This summary report provides the main parameters that were used for sizing. These parameters are shown on the summary tables and graphs provided in this report.

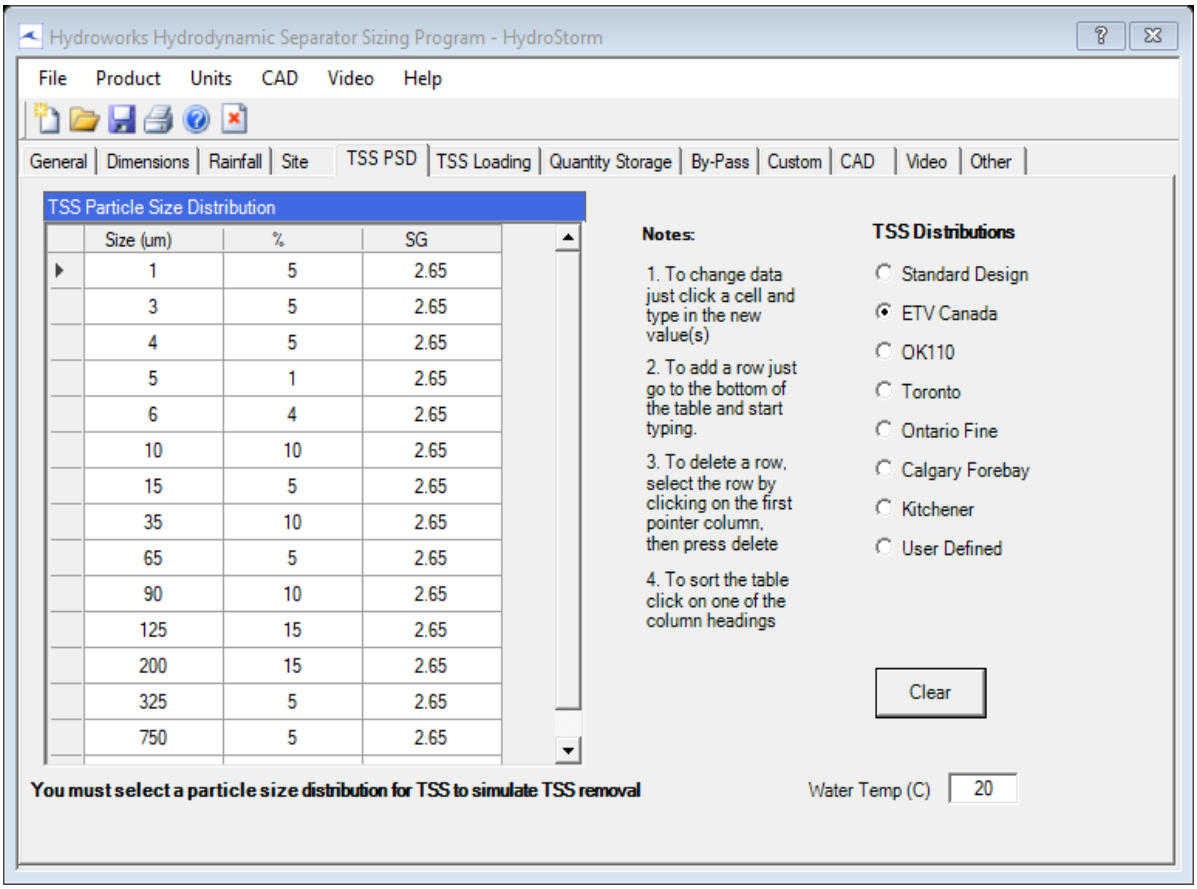
If you have any questions regarding this sizing summary please do not hesitate to contact Hydroworks at 888-290-7900 or email us at support@hydroworks.com.

The sizing program is for sizing purposes only and does not address any site specific parameters such as hydraulic gradeline, tailwater submergence, groundwater, soils bearing capacity, etc. Headloss calculations are not a hydraulic gradeline calculation since this requires a starting water level and an analysis of the entire system downstream of the HydroStorm .

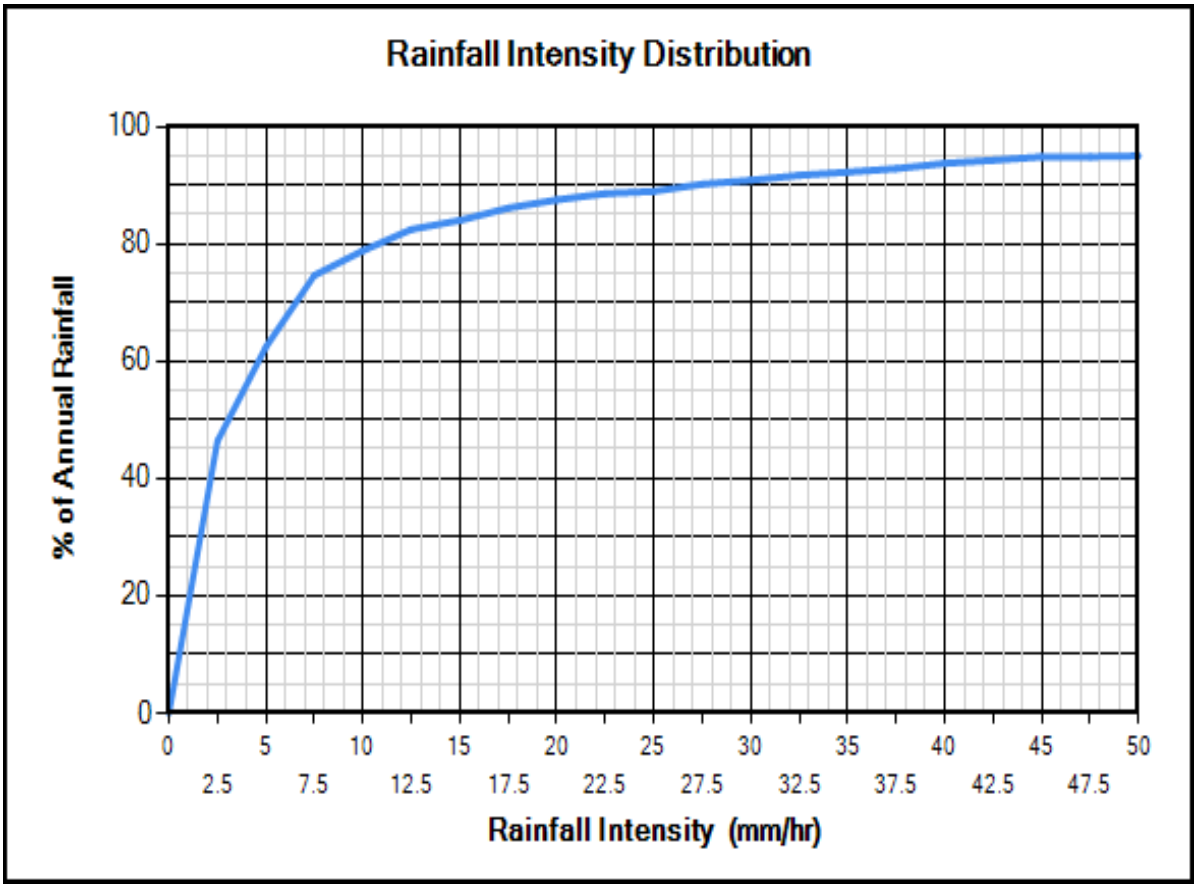
TSS Removal Sizing Summary



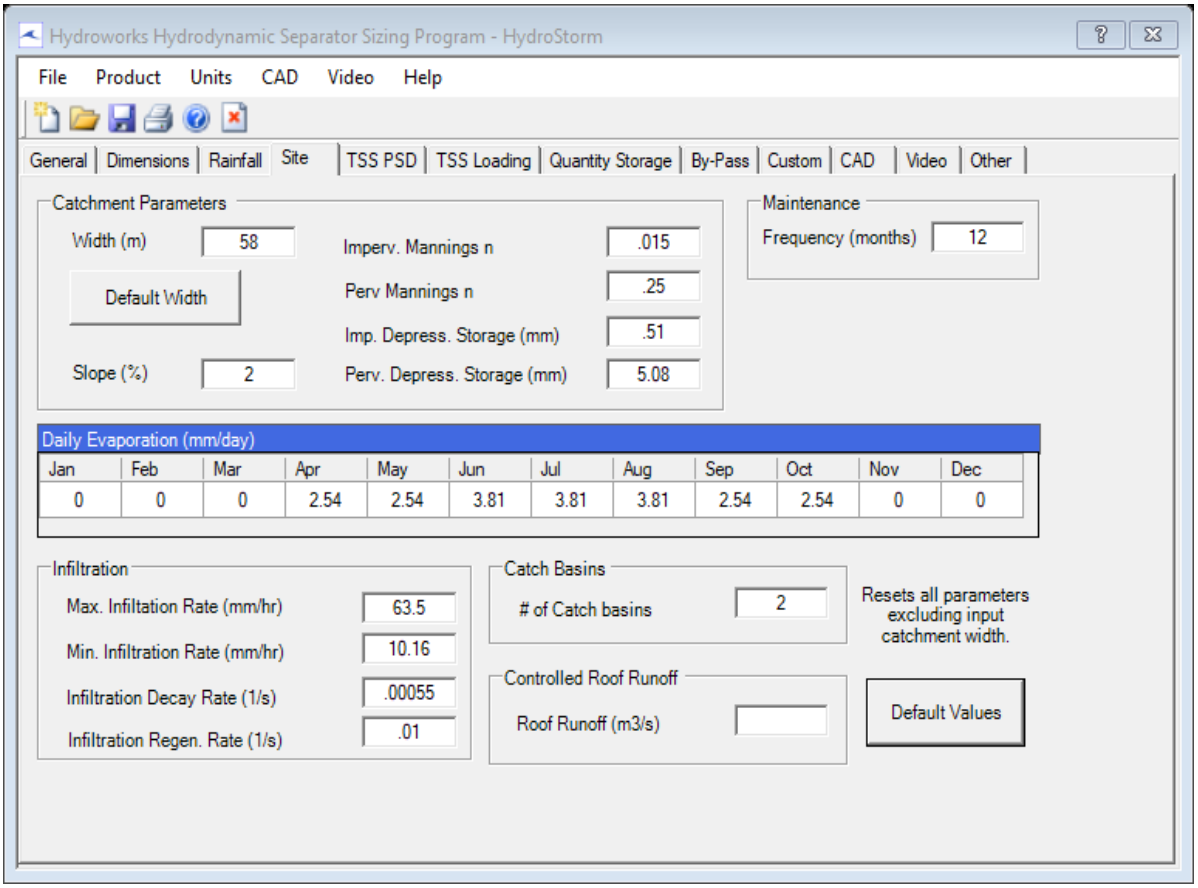
TSS Particle Size Distribution



Rainfall Station - Hamilton RBG, Ontario(2004 to 2013)



Site Physical Characteristics



Dimensions And Capacities

Hydroworks Hydrodynamic Separator Sizing Program - HydroStorm

File Product Units CAD Video Help

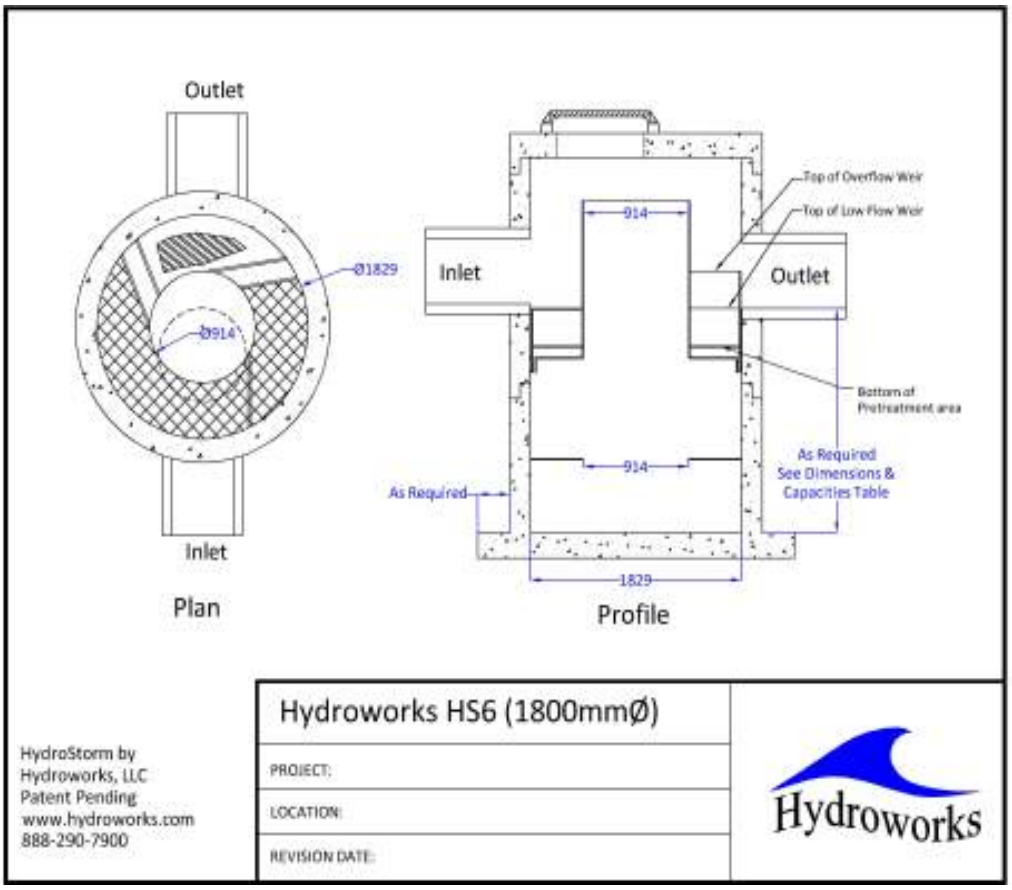
General | Dimensions | Rainfall | Site | TSS PSD | TSS Loading | Quantity Storage | By-Pass | Custom | CAD | Video | Other

Dimensions and Capacities

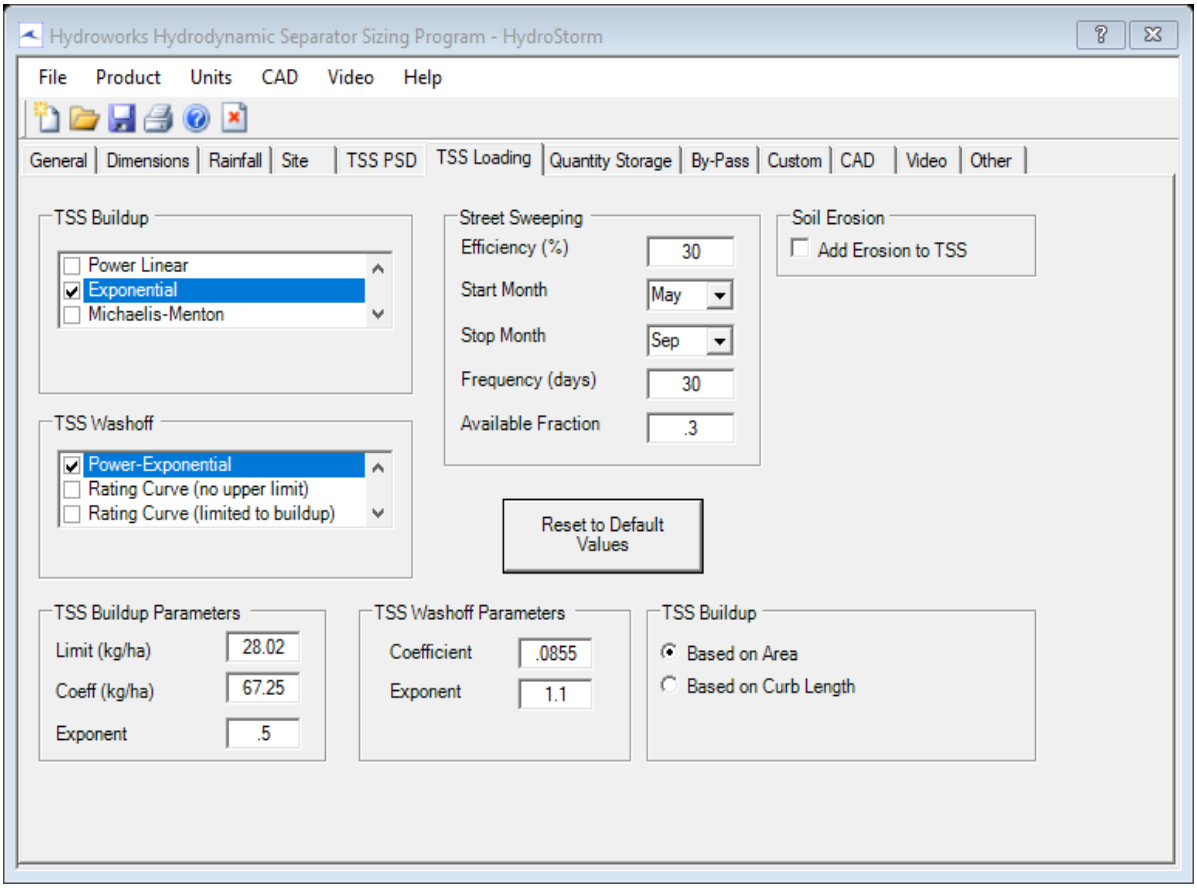
Model	Diam. (m)	Depth (m)	Float. Vol. (L)	Sediment Vol. (m3)	Total Vol. (m3)
HS 3	0.91	1.07	185	0.4	0.7
HS 4	1.22	1.22	381	0.9	1.4
HS 5	1.52	1.52	642	1.8	2.8
HS 6	1.83	1.83	1041	3.2	4.8
HS 7	2.13	1.98	1575	4.6	7.1
HS 8	2.44	2.13	2354	6.3	10
HS 10	3.05	2.74	4327	13.2	20
HS 12	3.66	3.35	7164	23.8	35.2

Depth = Depth from outlet invert to inside bottom of tank

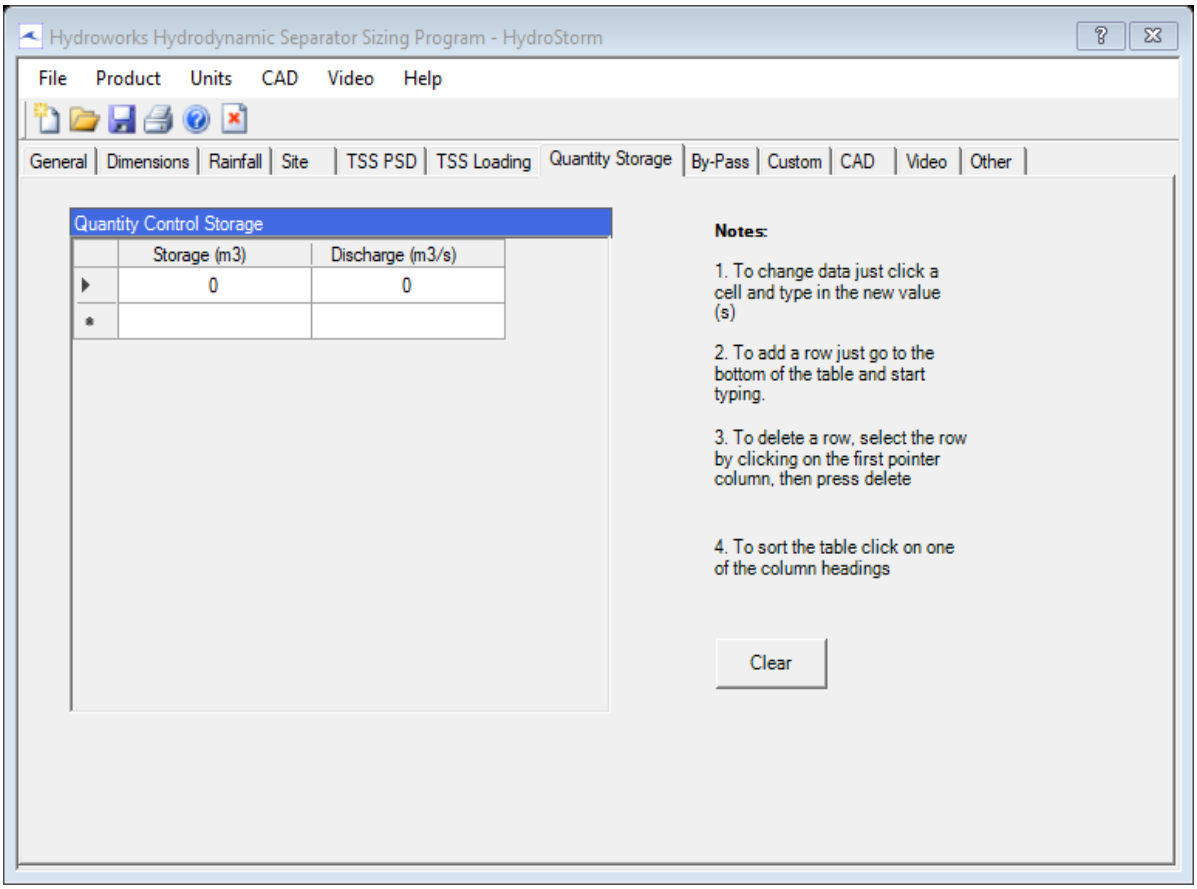
Generic HS 6 CAD Drawing



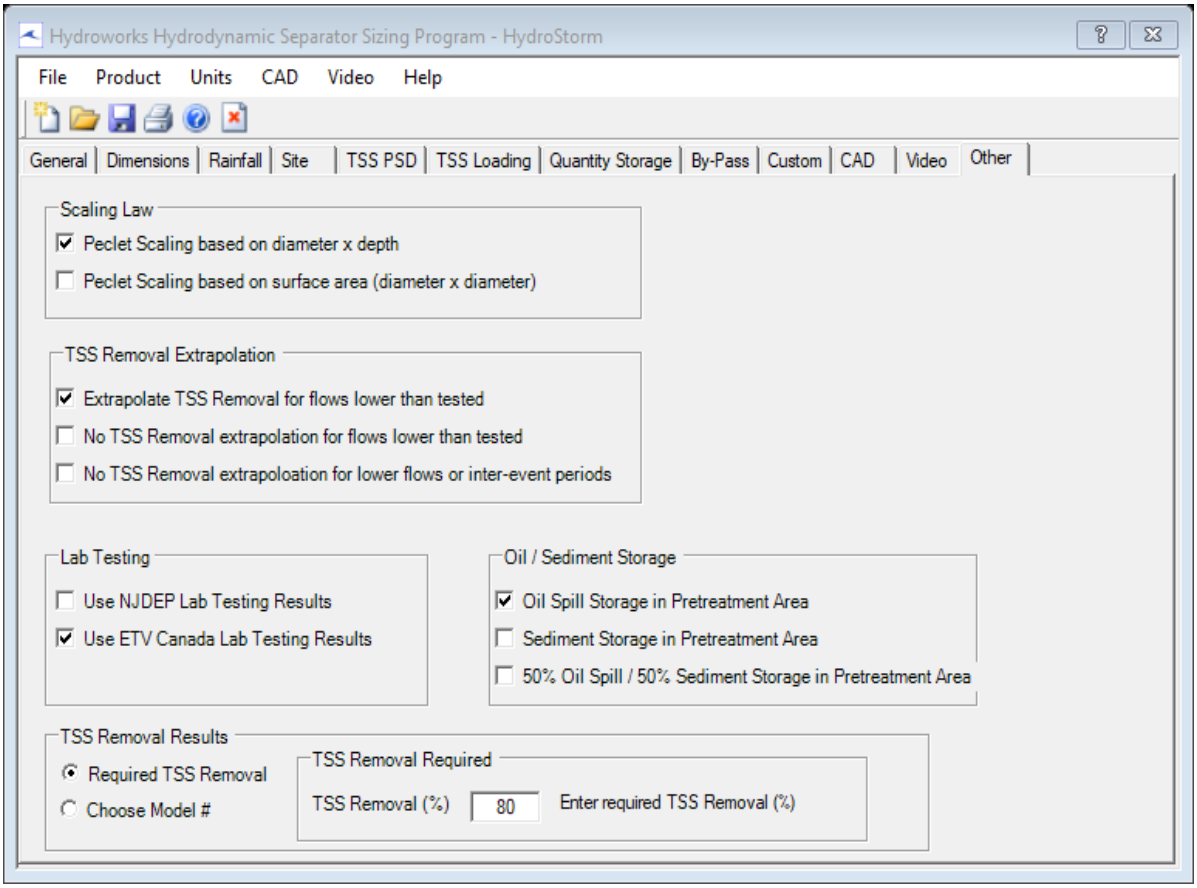
TSS Buildup And Washoff



Upstream Quantity Storage



Other Parameters



Hydroworks Sizing Program - Version 5.5
Copyright Hydroworks, LLC, 2021



Hydroworks® HydroStorm

Operations & Maintenance Manual

Version 1.0

Please call Hydroworks at 888-290-7900 or email us at support@hydroworks.com if you have any questions regarding the Inspection Checklist. Please fax a copy of the completed checklist to Hydroworks at 888-783-7271 for our records.

Introduction

The HydroStorm is a state of the art hydrodynamic separator. Hydrodynamic separators remove solids, debris and lighter than water (oil, trash, floating debris) pollutants from stormwater. Hydrodynamic separators and other water quality measures are mandated by regulatory agencies (Town/City, State, Federal Government) to protect storm water quality from pollution generated by urban development (traffic, people) as part of new development permitting requirements.

As storm water treatment structures fill up with pollutants they become less and less effective in removing new pollution. Therefore, it is important that storm water treatment structures be maintained on a regular basis to ensure that they are operating at optimum performance. The HydroStorm is no different in this regard and this manual has been assembled to provide the owner/operator with the necessary information to inspect and coordinate maintenance of their HydroStorm.

Hydroworks® HydroStorm Operation

The Hydroworks HydroStorm (HS) separator is a unique hydrodynamic by-pass separator. It incorporates a protected submerged pretreatment zone to collect larger solids, a treatment tank to remove finer solids, and a dual set of weirs to create a high flow bypass. High flows are conveyed directly to the outlet and do not enter the treatment area, however, the submerged pretreatment area still allows removal of coarse solids during high flows.

Under normal or low flows, water enters an inlet area with a horizontal grate. The area underneath the grate is submerged with openings to the main treatment area of the separator. Coarse solids fall through the grate and are either trapped in the pretreatment area or conveyed into the main treatment area depending on the flow rate. Fines are transported into the main treatment area. Openings and weirs in the pretreatment area allow entry of water and solids into the main treatment area and cause water to rotate in the main treatment area creating a vortex motion. Water in the main treatment area is forced to rise along the walls of the separator to discharge from the treatment area to the downstream pipe.

The vortex motion forces solids and floatables to the middle of the inner chamber. Floatables are trapped since the inlet to the treatment area is submerged. The design maximizes the retention of settled solids since solids are forced to the center of the inner chamber by the vortex motion of water while water must flow up the walls of the separator to discharge into the downstream pipe.

A set of high flow weirs near the outlet pipe create a high flow bypass over both the pretreatment area and main treatment chamber. The rate of flow into the treatment area is regulated by the number and size of openings into the treatment chamber and the height of by-pass weirs. High flows flow over the weirs directly to the outlet pipe preventing the scour and resuspension of any fines collected in the treatment chamber.

A central access tube is located in the structure to provide access for cleaning. The arrangement of the inlet area and bypass weirs near the outlet pipe facilitate the use of multiple inlet pipes.

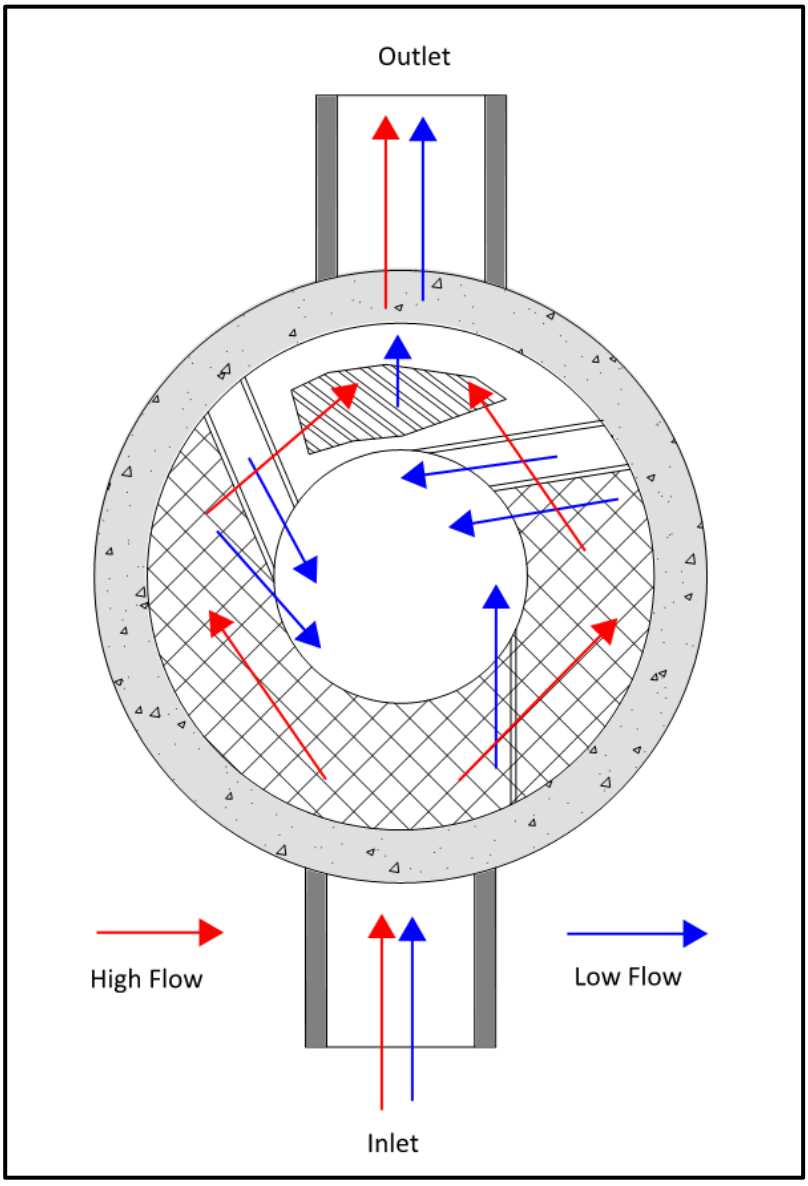


Figure 1. Hydroworks HydroStorm Operation – Plan View

Figure 2 is a profile view of the HydroStorm separator showing the flow patterns for low and high flows.

Hydroworks

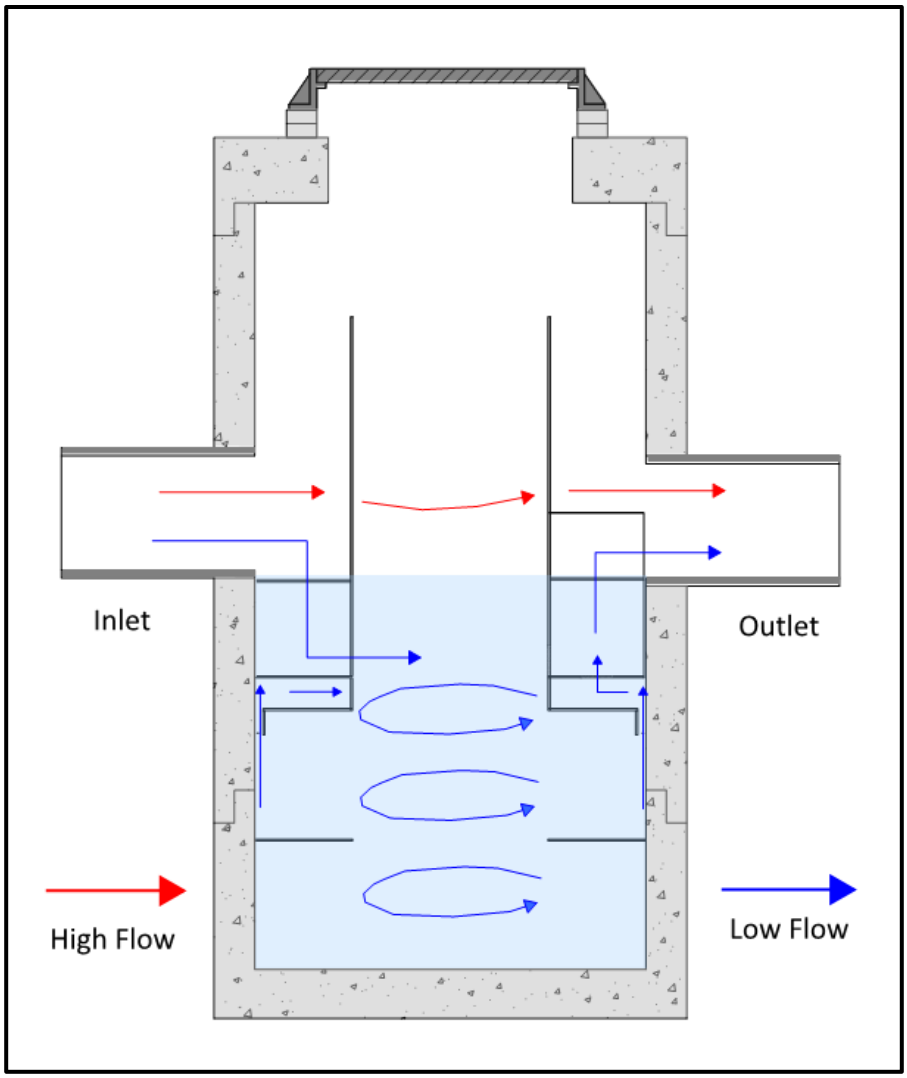


Figure 2. Hydroworks HydroStorm Operation – Profile View

The HS 4i is an inlet version of the HS 4 separator. There is a catch-basin grate on top of the HS 4i. A funnel sits sits underneath the grate on the frame and directs the water to the inlet side of the separator to ensure all lows flows are properly treated. The whole funnel is removed for inspection and cleaning.

Hydroworks

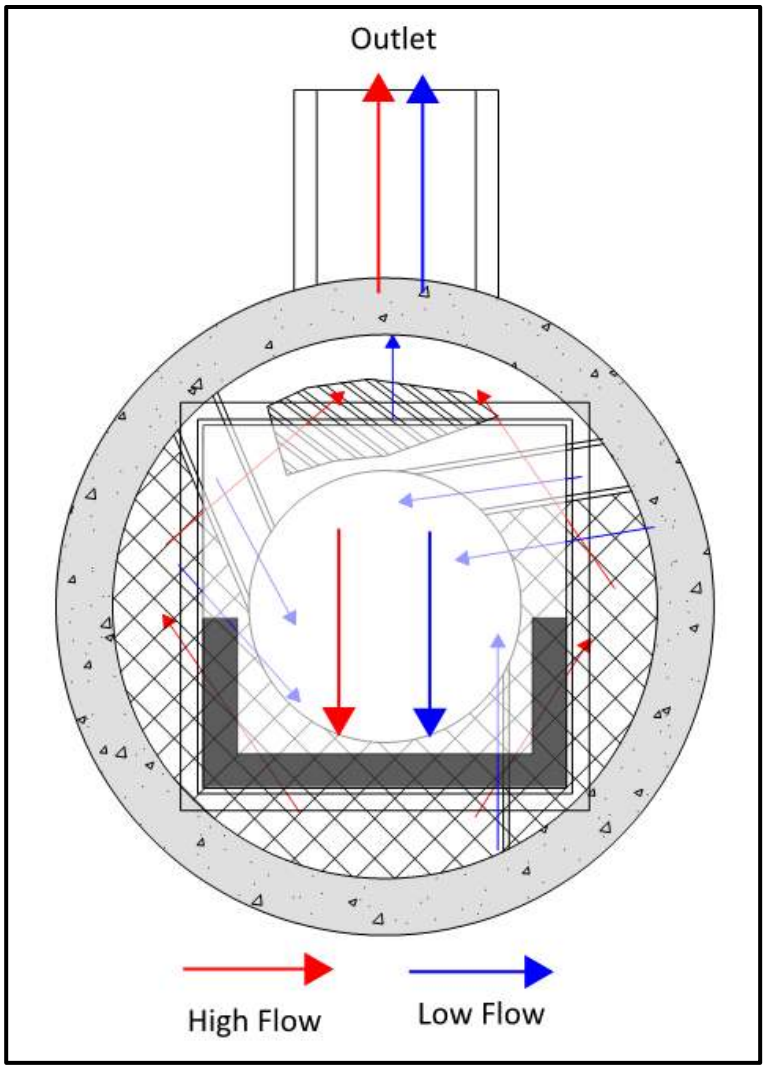


Figure 3. Hydroworks HS 4i Funnel

Inspection

Procedure

Floatables

A visual inspection can be conducted for floatables by removing the covers and looking down into the center access tube of the separator. Separators with an inlet grate (HS 4i or custom separator) will have a plastic funnel located under the grate that must be removed from the frame prior to inspection or maintenance. If you are missing a funnel please contact Hydroworks at the numbers provided at the end of this document.

Hydroworks

TSS/Sediment

Inspection for TSS build-up can be conducted using a Sludge Judge®, Core Pro®, AccuSludge® or equivalent sampling device that allows the measurement of the depth of TSS/sediment in the unit. These devices typically have a ball valve at the bottom of the tube that allows water and TSS to flow into the tube when lowering the tube into the unit. Once the unit touches the bottom of the device, it is quickly pulled upward such that the water and TSS in the tube forces the ball valve closed allowing the user to see a full core of water/TSS in the unit. The unit should be inspected for TSS through each of the access covers. Several readings (2 or 3) should be made at each access cover to ensure that an accurate TSS depth measurement is recorded.

Frequency

Construction Period

The HydroStorm separator should be inspected every four weeks and after every large storm (over 0.5" (12.5 mm) of rain) during the construction period.

Post-Construction Period

The Hydroworks HydroStorm separator should be inspected during the first year of operation for normal stabilized sites (grassed or paved areas). If the unit is subject to oil spills or runoff from unstabilized (storage piles, exposed soils) areas the HydroStorm separator should be inspected more frequently (4 times per year). The initial annual inspection will indicate the required future frequency of inspection and maintenance if the unit was maintained after the construction period.

Reporting

Reports should be prepared as part of each inspection and include the following information:

1. Date of inspection
2. GPS coordinates of Hydroworks unit
3. Time since last rainfall
4. Date of last inspection
5. Installation deficiencies (missing parts, incorrect installation of parts)
6. Structural deficiencies (concrete cracks, broken parts)
7. Operational deficiencies (leaks, blockages)
8. Presence of oil sheen or depth of oil layer
9. Estimate of depth/volume of floatables (trash, leaves) captured
10. Sediment depth measured
11. Recommendations for any repairs and/or maintenance for the unit
12. Estimation of time before maintenance is required if not required at time of inspection

A sample inspection checklist is provided at the end of this manual.

Maintenance

Procedure

The Hydroworks HydroStorm unit is typically maintained using a vacuum truck. There are numerous companies that can maintain the HydroStorm separator. Maintenance with a vacuum truck involves removing all of the water and sediment together. The water is then separated from the sediment on the truck or at the disposal facility.

A central access opening (24” or greater) is provided to the gain access to the lower treatment tank of the unit. This is the primary location to maintain by vacuum truck. The pretreatment area can also be vacuumed and/or flushed into the lower treatment tank of the separator for cleaning via the central access once the water level is lowered below the pretreatment floor.

In instances where a vacuum truck is not available other maintenance methods (i.e. clamshell bucket) can be used, but they will be less effective. If a clamshell bucket is used the water must be decanted prior to cleaning since the sediment is under water and typically fine in nature. Disposal of the water will depend on local requirements. Disposal options for the decanted water may include:

1. Discharge into a nearby sanitary sewer manhole
2. Discharge into a nearby LID practice (grassed swale, bioretention)
3. Discharge through a filter bag into a downstream storm drain connection

The local municipality should be consulted for the allowable disposal options for both water and sediments prior to any maintenance operation. Once the water is decanted the sediment can be removed with the clamshell bucket.

Disposal of the contents of the separator depend on local requirements. Maintenance of a Hydroworks HydroStorm unit will typically take 1 to 2 hours based on a vacuum truck and longer for other cleaning methods (i.e. clamshell bucket).

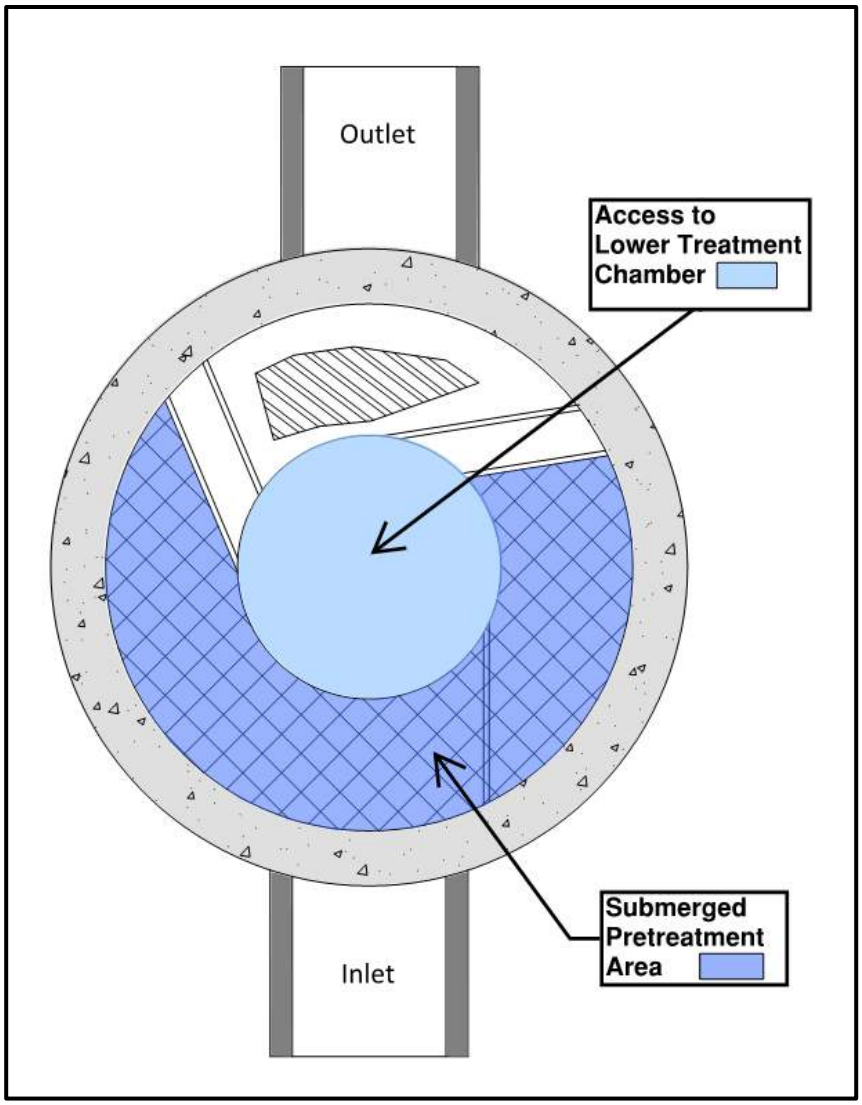


Figure 3. Maintenance Access

Frequency

Construction Period

A HydroStorm separator can fill with construction sediment quickly during the construction period. The HydroStorm must be maintained during the construction period when the depth of TSS/sediment reaches 24” (600 mm). It must also be maintained during the construction period if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the area of the separator

The HydroStorm separator should be maintained at the end of the construction period, prior to operation for the post-construction period.

Post-Construction Period

The HydroStorm was independently tested by Alden Research Laboratory in 2017. A HydroStorm HS 4 was tested for scour with a 50% sediment depth of 0.5 ft. Therefore, maintenance for sediment accumulation is required if the depth of sediment is 1 ft or greater in separators with standard water (sump) depths (Table 1).

There will be designs with increased sediment storage based on specifications or site-specific criteria. A measurement of the total water depth in the separator through the central access tube should be taken and compared to water depth given in Table 1. The standard water depth from Table 1 should be subtracted from the measured water depth and the resulting extra depth should be added to the 1 ft to determine the site-specific sediment maintenance depth for that separator.

For example, if the measured water depth in the HS-7 is 7 feet, then the sediment maintenance depth for that HS-7 is 2 ft (= 1 + 7 – 6) and the separator does not need to be cleaned for sediment accumulation until the measure sediment depth is 2 ft.

The HydroStorm separator must also be maintained if there is an appreciable depth of oil in the unit (more than a sheen) or if floatables other than oil cover over 50% of the water surface of the separator.

Table 1 Standard Dimensions for Hydroworks HydroStorm Models

Model	Diameter (ft)	Total Water Depth (ft)	Sediment Maintenance Depth for Table 1 Total Water Depth(ft)
HS-3	3	3	1
HS-4	4	4	1
HS-5	5	4	1
HS-6	6	4	1
HS-7	7	6	1
HS-8	8	7	1
HS-9	9	7.5	1
HS-10	10	8	1
HS-11	11	9	1
HS-12	12	9.5	1

HYDROSTORM INSPECTION SHEET

Date _____
Date of Last Inspection _____

Site _____
City _____
State _____
Owner _____

GPS Coordinates _____

Date of last rainfall _____

Site Characteristics	**Yes**	**No**
Soil erosion evident	☐	☐
Exposed material storage on site	☐	☐
Large exposure to leaf litter (lots of trees)	☐	☐
High traffic (vehicle) area	☐	☐

HydroStorm	**Yes**	**No**
Obstructions in the inlet or outlet	☐ *	☐
Missing internal components	☐ **	☐
Improperly installed inlet or outlet pipes	☐ ***	☐
Internal component damage (cracked, broken, loose pieces)	☐ **	☐
Floating debris in the separator (oil, leaves, trash)	☐	☐
Large debris visible in the separator	☐ *	☐
Concrete cracks/deficiencies	☐ ***	☐
Exposed rebar	☐ **	☐
Water seepage (water level not at outlet pipe invert)	☐ ***	☐

Water level depth below outlet pipe invert _____"

Routine Measurements

Floating debris depth	**< 0.5" (13mm)**	☐	**>0.5" 13mm)**	☐ *
Floating debris coverage	**< 50% of surface area**	☐	**> 50% surface area**	☐ *
Sludge depth	**< 12" (300mm)**	☐	**> 12" (300mm)**	☐ *****

* Maintenance required
** Repairs required
*** Further investigation is required

Hydroworks

Other Comments:

Hydroworks

Hydroworks® HydroStorm

One Year Limited Warranty

Hydroworks, LLC warrants, to the purchaser and subsequent owner(s) during the warranty period subject to the terms and conditions hereof, the Hydroworks HydroStorm to be free from defects in material and workmanship under normal use and service, when properly installed, used, inspected and maintained in accordance with Hydroworks written instructions, for the period of the warranty. The standard warranty period is 1 year.

The warranty period begins once the separator has been manufactured and is available for delivery. Any components determined to be defective, either by failure or by inspection, in material and workmanship will be repaired, replaced or remanufactured at Hydroworks' option provided, however, that by doing so Hydroworks, LLC will not be obligated to replace an entire insert or concrete section, or the complete unit. This warranty does not cover shipping charges, damages, labor, any costs incurred to obtain access to the unit, any costs to repair/replace any surface treatment/cover after repair/replacement, or other charges that may occur due to product failure, repair or replacement.

This warranty does not apply to any material that has been disassembled or modified without prior approval of Hydroworks, LLC, that has been subjected to misuse, misapplication, neglect, alteration, accident or act of God, or that has not been installed, inspected, operated or maintained in accordance with Hydroworks, LLC instructions and is in lieu of all other warranties expressed or implied. Hydroworks, LLC does not authorize any representative or other person to expand or otherwise modify this limited warranty.

The owner shall provide Hydroworks, LLC with written notice of any alleged defect in material or workmanship including a detailed description of the alleged defect upon discovery of the defect. Hydroworks, LLC should be contacted at 136 Central Ave., Clark, NJ 07066 or any other address as supplied by Hydroworks, LLC. (888-290-7900).

This limited warranty is exclusive. There are no other warranties, express or implied, or merchantability or fitness for a particular purpose and none shall be created whether under the uniform commercial code, custom or usage in the industry or the course of dealings between the parties. Hydroworks, LLC will replace any goods that are defective under this warranty as the sole and exclusive remedy for breach of this warranty.

Subject to the foregoing, all conditions, warranties, terms, undertakings or liabilities (including liability as to negligence), expressed or implied, and howsoever arising, as to the condition, suitability, fitness, safety, or title to the Hydroworks HydroStorm are hereby negated and excluded and Hydroworks, LLC gives and makes no such representation, warranty or undertaking except as expressly set forth herein. Under no circumstances shall Hydroworks, LLC be liable to the Purchaser or to any third party for product liability claims; claims arising from the design, shipment, or installation of the HydroStorm, or the cost of other goods or services related to the purchase and installation of the HydroStorm. For this Limited Warranty to apply, the HydroStorm must be installed in accordance with all site conditions required by state and local codes; all other applicable laws; and Hydroworks' written installation instructions.

Hydroworks, LLC expressly disclaims liability for special, consequential or incidental damages (even if it has been advised of the possibility of the same) or breach of expressed or implied warranty. Hydroworks, LLC shall not be liable for penalties or liquidated damages, including loss of production and profits; labor and materials; overhead costs; or other loss or expense incurred by the purchaser or any third party. Specifically excluded from limited warranty coverage are damages to the HydroStorm arising from ordinary wear and tear; alteration, accident, misuse, abuse or neglect; improper maintenance, failure of the product due to improper installation of the concrete sections or improper sizing; or any other event not caused by Hydroworks, LLC. This limited warranty represents Hydroworks' sole liability to the purchaser for claims related to the HydroStorm, whether the claim is based upon contract, tort, or other legal basis.

FLEXSTORM™ Inlet Filter Specifications and Work Instructions

Product: **FLEXSTORM Inlet Filters**

Manufacturer: **Inlet & Pipe Protection, Inc** www.inletfilters.com

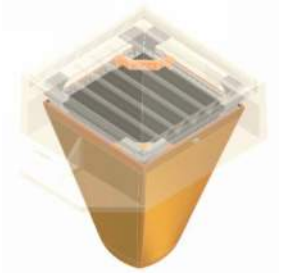
A subsidiary of **Advanced Drainage Systems (ADS)** www.ads-pipe.com

1.0 Description of Work:

1.1 The work covered shall consist of supplying, installing, and maintaining/cleaning of the FLEXSTORM Inlet Filter assembly. The purpose of the FLEXSTORM Inlet Filter system is to collect silt and sediment from surface storm water runoff at drainage locations shown on the plans or as directed by the Engineer. FLEXSTORM PURE, permanent filters, are capable of removing small particles, hydrocarbons, and other contaminants from drainage "hot spots".

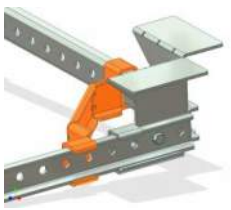
2.0 Material:

2.1 The FLEXSTORM Inlet Filter system is comprised of a corrosion resistant steel frame and a replaceable geotextile sediment bag attached to the frame with a stainless steel locking band. The sediment bag hangs suspended from the rigid frame at a distance below the grate that shall allow full water flow into the drainage structure if the bag is completely filled with sediment.






2.2 The FLEXSTORM Inlet Filter frame includes lifting handles in addition to the standard overflow feature. A FLEXSTORM Removal Tool engages the lifting bars or handles to allow manual removal of the assembly without machine assistance. The frame suspension system on most rectangular designs is adjustable in ½" increments up to 5" per side should the casting or drainage structure have imperfections.


2.3 **FLEXSTORM CATCH-IT** Inlet Filters for temporary inlet protection: The FLEXSTORM CATCH-IT framing is galvanized or zinc plated for corrosion resistance. The **"FX"** Woven Polypropylene filter bag is the design standard, although the **"IL"** Nonwoven geotextile is also available if preferred by the engineer. These products are typically used for temporary inlet protection lasting 3 months (short term road work) to 5 years (residential developments).





2.4 **FLEXSTORM PURE** Inlet Filters for permanent inlet protection: The FLEXSTORM PURE framing is comprised of 304 stainless steel with a 25 year life rating. Multiple filter bags are available: **FX, FX+, PC, PC+, LL** and others. The Post Construction **"PC+"** is the design standard consisting of the **"FX"** Woven Polypropylene sediment bag lined with Adsorb-it filter fabric, which is made from recycled polyester fibers. The **"PC+"** includes a replaceable hydrocarbon skimmer pouch strapped to the bottom of the bag for advanced TPH removal.







3.0 Filter Bag Specifications and Capabilities:

3.1 Material Properties (taken from manufacturers average roll value):

FLEXSTORM FILTER BAGS	(22" depth) STD Bag P/N	(12" depth) Short Bag P/N	Clean Water Flow Rate (GPM/SqFt)	Min A.O.S. (US Sieve)
FX: Standard Woven Bag	FX	FX-S	200	40
FX+: Woven w/ Oil Skimmer	FXP	FXP-S	200	40
FXO: Woven w/ Oil Boom	FXO	FXO-S	200	40
PC: Post Construction Bag	PC	PC-S	137	140
PC+: PC w/ Oil Skimmer	PCP	PCP-S	137	140
LL: Litter and Leaf Bag	LL	LL-S	High	3.5
IL: IDOT Non-Woven Bag	IL	IL-S	145	70

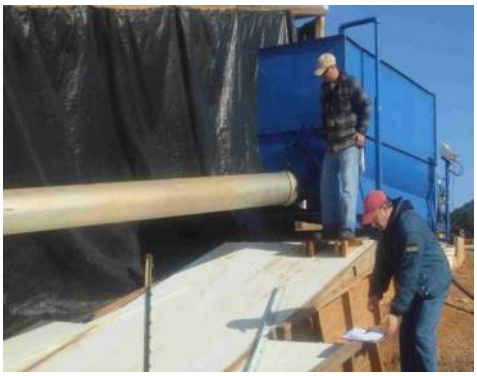
3.2 Standard Bag Sizes and Capabilities: Bag Sizes are determined by clear opening dimensions of the drainage structure. Once frame design size is confirmed, Small - XL bag ratings can be confirmed to meet design criteria. Ratings below are for standard 22" deep bags.

Standard Bag Size§	Solids Storage Capacity (CuFt)	Filtered Flow Rate at 50% Max (CFS)			Oil Retention (Oz)	
		FX	PC	IL	PC*	PCP**
Small	1.6	1.2	0.8	0.9	66	155
Medium	2.1	1.8	1.2	1.3	96	185
Large	3.8	2.2	1.5	1.6	120	209
XL	4.2	3.6	2.4	2.6	192	370

4.0 Tested Filtration Efficiency and Removal Rates: Filtration Efficiency, TSS, and TPH testing performed under large scale, real world conditions at accredited third party erosion and sediment control testing laboratory. (See Full Test Reports at www.inletfilters.com)



Inside View of Hopper Agitator



Hopper With Outlet Pipe Leading To Area Inlet



Area Inlet Simulated Showing Influent Discharge From Pipe

4.1 **FLEXSTORM "FX" Filtration Efficiency Test Results:** All testing performed in general accordance with the ASTM D 7351, *Standard Test Method For Determination of Sediment Retention Device Effectiveness in Sheet Flow Application,* with flow diverted into an area inlet. Test Soil used as sediment had the following characteristics with a nominal 7% sediment to water concentration mix. This is representative of a heavy sediment load running off of a construction site.

Soil Characteristics	Test Method	Value		Filtration Efficiency of "FX" FLEXSTORM Bag
% Gravel	ASTM D 422	2		**82%**
% Sand		60		
% Silt		24		
% Clay		14		
Liquid Limit, %	ASTM D 4318	34		
Plasticity Index, %		9		
Soil Classification	USDA	Sandy Loam		
Soil Classification	USCS	Silty Sand (SM)		

4.2 **FLEXSTORM "PC" and "PC+" Test Results:** TSS measured on effluent samples in accordance with SM 2540D and TPH in accordance with EPA 1664A.

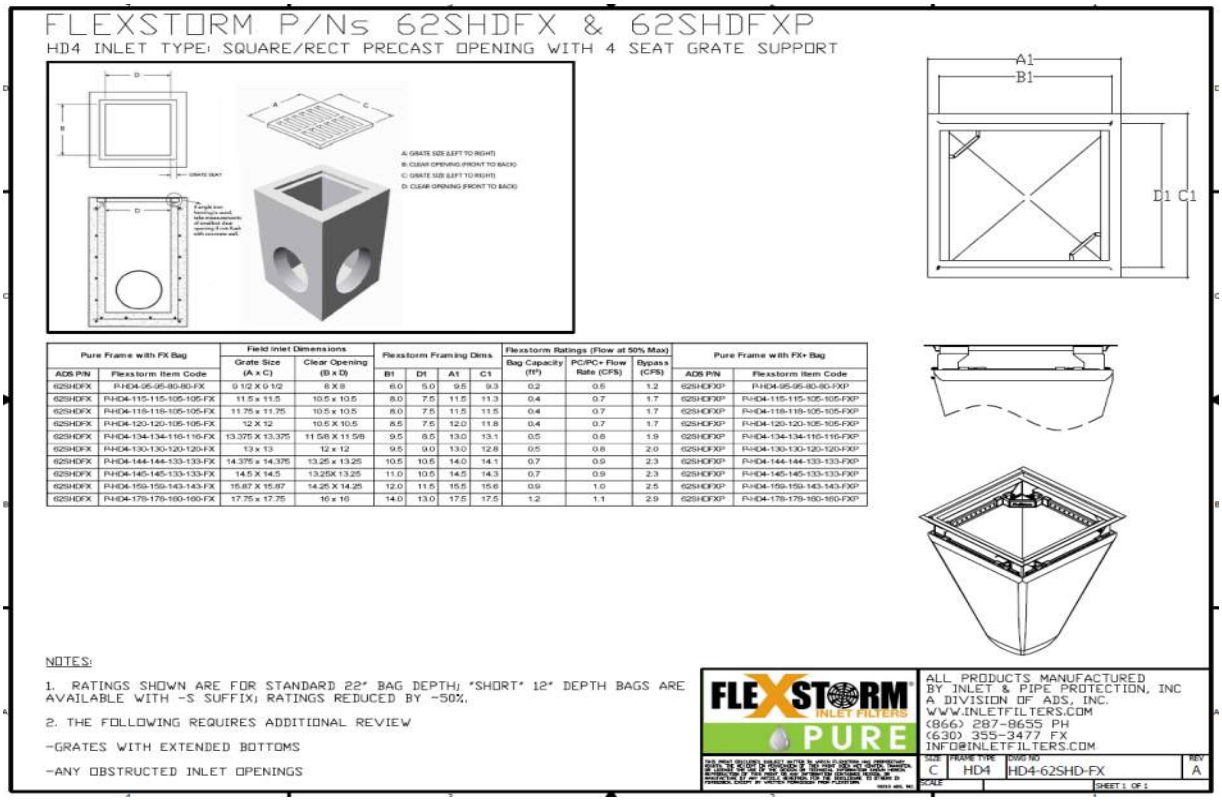
Product Tested	110 micron Sediment Load	Ave Flow Rate GPM	% TSS Removal	Soil Retention Efficiency
FLEXSTORM PC Sediment Bag	1750 mg/L using OK-110 Silica Sand and Clean Water	23	**99.28%**	98.96%
		48	**99.32%**	99.25%
		70	**98.89%**	98.80%

Product Tested	Street Sweep Sediment Load	Particle Size of Sediment Load	% TSS Removal	Soil Retention Efficiency
FLEXSTORM PC Sediment Bag	2.5% = 100 lbs Sed / 4000 lbs water	.001 mm – 10.0 mm (median 200 micron)	**99.68%**	95.61%

Product Tested	Hydrocarbon Load	Ave Flow Rate GPM	% TPH Removal	Oil Retention Efficiency
FLEXSTORM PC+	243 mg/L using 750 mL (1.45 lb) used motor oil + lube oil and clean water	19	**99.04%**	97.22%
FLEXSTORM PC		20	**97.67%**	91.61%
FLEXSTORM PC+		92	**96.88%**	99.11%

5.0 Identification of Drainage Structures to Determine FLEXSTORM Item Codes:

5.1 The Installer (Contactor) shall inspect the plans and/or worksite to determine the quantity of each drainage structure casting type. The foundry casting number or the exact grate size and clear opening size will provide the information necessary to identify the required FLEXSTORM Inlet Filter part number. Inlet Filters are supplied to the field pre-configured to fit the specified drainage structure. Item Codes can be built using the FLEXSTORM Product Configurator at www.inletfilters.com. Detailed Submittal / Specification drawings are linked to each Item Code and available for download by engineers and contractors to include on plans and/or verify field inlet requirements. An example of a typical drawing is shown below.



Pure Frame with FX Bag		Field Inlet Dimensions		Flexstorm Framing Dims				Flexstorm Ratings (Flow at 50% Max)			Pure Frame with FX+ Bag	
ADS P/N	Flexstorm Item Code	Grate Size (A x C)	Clear Opening (B x D)	B1	D1	A1	C1	Bag Capacity (ft³)	PC/PC+ Flow Rate (CFS)	Bypass (CFS)	ADS P/N	Flexstorm Item Code
62SHDFX	FHD4-95-95-80-80-FX	9 1/2 X 9 1/2	8 X 8	6.0	5.0	9.5	9.3	0.2	0.5	1.2	62SHDFXP	FHD4-95-95-80-80-FXP
62SHDFX	FHD4-115-115-105-105-FX	11.5 x 11.5	10.5 x 10.5	8.0	7.5	11.5	11.3	0.4	0.7	1.7	62SHDFXP	FHD4-115-115-105-105-FXP
62SHDFX	FHD4-118-118-105-105-FX	11.75 x 11.75	10.5 x 10.5	8.0	7.5	11.5	11.5	0.4	0.7	1.7	62SHDFXP	FHD4-118-118-105-105-FXP
62SHDFX	FHD4-120-120-105-105-FX	12 X 12	10.5 X 10.5	8.5	7.5	12.0	11.8	0.4	0.7	1.7	62SHDFXP	FHD4-120-120-105-105-FXP
62SHDFX	FHD4-134-134-116-116-FX	13.375 X 13.375	11.58 X 11.58	9.5	8.5	13.0	13.1	0.5	0.8	1.9	62SHDFXP	FHD4-134-134-116-116-FXP
62SHDFX	FHD4-130-130-120-120-FX	13 x 13	12 x 12	9.5	9.0	13.0	12.8	0.5	0.8	2.0	62SHDFXP	FHD4-130-130-120-120-FXP
62SHDFX	FHD4-144-144-133-133-FX	14.375 x 14.375	13.25 x 13.25	10.5	10.5	14.0	14.1	0.7	0.9	2.3	62SHDFXP	FHD4-144-144-133-133-FXP
62SHDFX	FHD4-145-145-133-133-FX	14.5 X 14.5	13.25X 13.25	11.0	10.5	14.5	14.3	0.7	0.9	2.3	62SHDFXP	FHD4-145-145-133-133-FXP
62SHDFX	FHD4-159-159-143-143-FX	15.87 X 15.87	14.25 X 14.25	12.0	11.5	15.5	15.6	0.9	1.0	2.5	62SHDFXP	FHD4-159-159-143-143-FXP
62SHDFX	FHD4-178-178-160-160-FX	17.75 x 17.75	16 x 16	14.0	13.0	17.5	17.5	1.2	1.1	2.9	62SHDFXP	FHD4-178-178-160-160-FXP

6.0 Installation Into Standard Grated Drainage Structures:

6.1 Remove the grate from the casting or concrete drainage structure. Clean the ledge (lip) of the casting frame or drainage structure to ensure it is free of stone and dirt. Drop in the FLEXSTORM Inlet Filter through the clear opening and be sure the suspension hangers rest firmly on the inside ledge (lip) of the casting. Replace the grate and confirm it is elevated no more than 1/8", which is the thickness of the steel hangers. For Curb Box Inlet Filters: Insert FLEXSTORM CATCH IT Inlet Filter as described above, pull the rear curb guard flap up and over the open curb box until tight, align magnets to ensure firm attachment to the top portion of the curb box casting. If the curb back opening is not magnetic, slide a typical rock sack or 2 x 4 through the 2-ply rear curb box flap to create a dam which will direct runoff into the sediment bag.






7.0 Maintenance Guidelines: The frequency of maintenance will vary depending on the application (during construction, post construction, or industrial use), the area of installation (relative to grade and runoff exposure), and the time of year relative to the geographic location (infrequent rain, year round rain, rain and snow conditions). The FLEXSTORM Operation & Maintenance Plan (as shown in 7.5) or other maintenance log should be kept on file.

7.1 Frequency of Inspections: Construction site inspection should occur following each ½" or more rain event. Post Construction inspections should occur three times per year (every four months) in areas with year round rainfall and three times per year (every three months) in areas with rainy seasons before and after snowfall season. Industrial application site inspections (loading ramps, wash racks, maintenance facilities) should occur on a regularly scheduled basis no less than three times per year.

7.2 General Maintenance for standard sediment bags: Upon inspection, the FLEXSTORM Inlet Filter should be emptied if the sediment bag is more than half filled with sediment and debris, or as directed by the Engineer. Remove the grate, engage the lifting bars or handles with the FLEXSTORM Removal Tool, and lift the FLEXSTORM Inlet Filter from the drainage structure. Machine assistance is not required. Dispose of the sediment or debris as directed by the Engineer. As an alternative, an industrial vacuum may be used to collect the accumulated sediment if available. Remove any caked on silt from the sediment bag and reverse flush the bag for optimal filtration. Replace the bag if the geotextile is torn or punctured to ½" diameter or greater on the lower half of the bag. If properly maintained, the Woven sediment bag will last a minimum of 4 years in the field.

7.3 Inspection and Handling of the FLEXSTORM PC / PC+ post construction sediment bag: The PC+ sediment bags will collect oil until saturated. Both the Adsorb-it filter liner and the skimmer pouch will retain oil. The volume of oils retained will depend on sediment bag size. Unlike other passive oil sorbent products, Adsorb-it filter fabric has the ability to remove hydrocarbons at high flow rates while retaining 10- 20 times its weight in oil (weight of fabric is 12.8 oz / sq yd). The average 2' x 2' PC Bag contains approx .8 sq yds, or 10 oz of fabric. At 50% saturation, the average Adsorb-it lined PC filter will retain approximately 75 oz (4.2 lbs) of oil. Once the bag has become saturated with oils, it can be centrifuged or passed through a wringer to recover the oils, and the fabric reused with 85% to 90% efficacy. If it is determined, per Maintenance Contracts or Engineering Instructions, that the saturated PC sediment bags will be completely replaced, it is the responsibility of the service technician to place the filter medium and associated debris in an approved container and dispose of in accordance with EPA regulations. Spent Adsorb-it can be recycled for its fuel value through waste to energy incineration with a higher BTU per pound value than coal. The oil skimmers start white in color and will gradually turn brown/black as they become saturated, indicating time for replacement. The average skimmer pouch will absorb approximately 62 oz (4 lbs) of oil before requiring replacement. To remove the pouch simply unclip it from the swivel strap sewn to the bottom of the bag. Dispose of all oil contaminated products in accordance to EPA guidelines. The ClearTec Rubberizer media used in the pouch, since a solidifier, will not leach under pressure and can be disposed of in most landfills, recycled for industrial applications, or burned as fuel.

7.4 Sediment Bag Replacement: When replacing a Sediment Bag, remove the bag by loosening or cutting off the clamping band. Take the new sediment bag, which is equipped with a stainless steel worm drive clamping band, and use a drill or screw driver to tighten the bag around the frame channel. Ensure the bag is secure and that there is no slack around the perimeter of the band. For Oil absorbent boom bags, simply replace the oil boom or pouch when saturated by sliding it through the mesh support sleeve.



7.5 Operation & Maintenance Plan. (Download at www.inletfilters.com or www.ads-pipe.com)

FLEXSTORM OPERATION AND MAINTENANCE PLAN

OPERATION & MAINTENANCE PLAN

Installation Instructions:

1. Remove grate from the drainage structure
2. Clean stone and dirt from ledge (lip) of drainage structure
3. Drop the FLEXSTORM inlet filter through the clear opening such that the hangers rest firmly on the lip of the structure.
4. Replace the grate and confirm it is not elevated more than 1/8", the thickness of the steel hangers.

Frequency of Inspections:

1. Inspection should occur following any rain event >½".
2. Post construction inspections should occur 4 times per year. In snowfall affected regions additional inspections should take place before and after snowfall season.
3. Industrial application site inspections (loading ramps, wash racks, maintenance facilities) should occur on a regularly scheduled basis no less than 3 times/year.

Maintenance Guidelines:

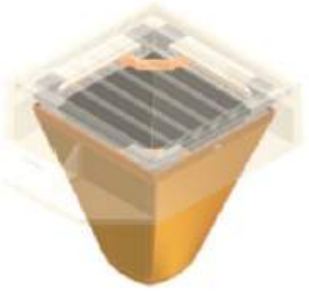
1. Empty the sediment bag if more than half filled with sediment and debris, or as directed.
2. Remove the grate, engage the lifting bars with the FLEXSTORM Removal Tool, and lift from drainage structure.
3. Dispose of sediment or debris as directed by the Engineer or Maintenance contract.
4. An industrial vacuum can be used to collect sediment.
5. Remove caked on silt from sediment bag and flush with Medium spray with optimal filtration.
6. Replace bag if torn or punctured to >½" diameter on lower half of bag.

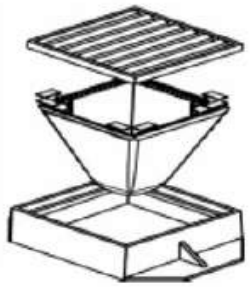
Post Construction PC Bag Maintenance:

1. At 50% saturation the average 2'x2' Adsorb-it lined PC filter will retain approximately 75 oz (4.2 lbs) of oil and should be serviced. To recover the oils the filter can be centrifuged or passed through a wringer.
2. Oil skimmer pouches start to turn black when saturated, indicating time for replacement. Each ClearTec Rubberizer pouch will absorb ~62oz (4 lbs) of oil before needing replacement.
3. Dispose of all oil contaminated products in accordance with EPA guidelines. ClearTec Rubberizer, since a solidifier, will not leach under pressure and can be disposed of in most landfills, recycled for industrial applications, or burned as fuel.

Sediment Bag Replacement:

1. Remove the bag by loosening or cutting off clamping bag.
2. Take new sediment bag and secure worm drive clamping band to the frame channel.
3. Ensure Bag is secure and there is no slack around perimeter.





STRUCTURE ID#/LOCATION:

DATE	TASK PERFORMED	INSPECTOR

APPENDIX B

SWMHYMO INPUT/OUTPUT INFORMATION

```
00001> 2     Metric units
00002> *#*************************************************************************|
00003> *#  Project Name: 1396 GUELPH LINE
00004> *#               BURLINGTON, OMTARIO
00005> *#  JOB NUMBER  : 22024
00006> *#       Date   : MARCH 2022
00007> *#    Revised   :
00008> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00009> *#       File   : 22024.DAT
00010> *#*************************************************************************|
00011> *
00012> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[002]
00013>                     BUR6_002.stm
00014> *
00015> READ STORM          STORM_FILENAME "STORM.001"
00016> *
00017> *#*************************************************************************|
00018> *#
00019> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00020> *#        ============================================
00021> *#
00022> **#************************************************************************|
00023> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
00024> CALIB STANDHYD      ID=[1], NHYD=["101"], DT=[1](min), AREA=[0.383](ha),
00025>                     XIMP=[0.65], TIMP=[0.65], DWF=[0](cms), LOSS=[2],
00026>                     SCS curve number CN=[70],
00027>                     Pervious   surfaces: IAper=[10.8](mm), SLPP=[2.0](%),
00028>                                          LGP=[10](m), MNP=[0.250], SCP=[0](min),
00029>                     Impervious surfaces: IAimp=[1.0](mm), SLPI=[2.0](%),
00030>                                          LGI=[10](m), MNI=[0.013], SCI=[0](min),
00031>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00032> *%-----------------|-------------------------------------------------------|
00033> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
00034> CALIB STANDHYD      ID=[2], NHYD=["101"], DT=[1](min), AREA=[0.382](ha),
00035>                     XIMP=[0.36], TIMP=[0.36], DWF=[0](cms), LOSS=[2],
00036>                     SCS curve number CN=[70],
00037>                     Pervious   surfaces: IAper=[10.8](mm), SLPP=[1.5](%),
00038>                                          LGP=[20](m), MNP=[0.250], SCP=[0](min),
00039>                     Impervious surfaces: IAimp=[1.0](mm), SLPI=[1.5](%),
00040>                                          LGI=[20](m), MNI=[0.013], SCI=[0](min),
00041>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00042> *%-----------------|-------------------------------------------------------|
00043>
00044> *#*************************************************************************|
00045> *#
00046> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00047> *#        =============================================
00048> *#
00049> **#************************************************************************|
00050> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
00051> CALIB STANDHYD      ID=[3], NHYD=["201"], DT=[1](min), AREA=[0.342](ha),
00052>                     XIMP=[0.94], TIMP=[0.94], DWF=[0](cms), LOSS=[2],
00053>                     SCS curve number CN=[70],
00054>                     Pervious   surfaces: IAper=[10.8](mm), SLPP=[2.0](%),
00055>                                          LGP=[10](m), MNP=[0.250], SCP=[0](min),
00056>                     Impervious surfaces: IAimp=[1.0](mm), SLPI=[2.0](%),
00057>                                          LGI=[10](m), MNI=[0.013], SCI=[0](min),
00058>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00059> *%-----------------|-------------------------------------------------------|
00060> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
00061> CALIB STANDHYD      ID=[4], NHYD=["202"], DT=[1](min), AREA=[0.040](ha),
00062>                     XIMP=[0.75], TIMP=[0.75], DWF=[0](cms), LOSS=[2],
00063>                     SCS curve number CN=[70],
00064>                     Pervious   surfaces: IAper=[10.8](mm), SLPP=[2.0](%),
00065>                                          LGP=[10](m), MNP=[0.250], SCP=[0](min),
```

```
00066>                     Impervious surfaces: IAimp=[1.0](mm), SLPI=[2.0](%),
00067>                                          LGI=[10](m), MNI=[0.013], SCI=[0](min),
00068>                     RAINFALL=[ ,  ,  ,  , ](mm/hr) ,  END=-1
00069> *%-----------------|-------------------------------------------------------------|
00070> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
00071> CALIB NASHYD        ID=[5], NHYD=["203"], DT=[1]min, AREA=[0.26](ha),
00072>                     DWF=[0](cms),  CN/C=[70], IA=[10.8](mm),
00073>                     N=[3], TP=[0.1]hrs,
00074>                     RAINFALL=[ ,  ,  ,  , ](mm/hr),  END=-1
00075> *%-----------------|-------------------------------------------------------------|
00076> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
00077> *
00078> ROUTE RESERVOIR     IDout=[6],   NHYD=["201"],  IDin=[3],
00079>                     RDT=[1](min),
00080>                           TABLE of ( OUTFLOW-STORAGE ) values
00081>                                     (cms) - (ha-m)
00082>                                      0.0000 , 0.0000
00083>                                      0.0216 , 0.0022
00084>                                      0.0216 , 0.0022
00085>                                      0.0216 , 0.0052
00086>                                      0.0216 , 0.0085
00087>                                      0.0216 , 0.0116
00088>                                      0.0216 , 0.0142
00089>                                      0.0216 , 0.0142
00090>                                      0.0312 , 0.0161
00091>                                      -1  ,  -1    (max twenty pts)
00092>                           IDovf=[7], NHYDovf=["OVF"]
00093> *%-----------------|-------------------------------------------------------------|
00094> ADD HYD             IDsum=[8], NHYD=["Total"], IDs to add=[4+6+7]
00095> *%-----------------|-------------------------------------------------------------|
00096> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
00097> *
00098> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[005]
00099>                     BUR6_005.stm
00100> *
00101> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[010]
00102>                     BUR6_010.stm
00103> *
00104> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[025]
00105>                     BUR6_025.stm
00106> *
00107> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[050]
00108>                     BUR6_050.stm
00109> *
00110> START               TZERO=[0.0],  METOUT=[2],  NSTORM=[1],  NRUN=[100]
00111>                     BUR6_100.stm
00112> *
00113> *%-----------------|-------------------------------------------------------------|
00114> FINISH
00115>
00116>
00117>
00118>
00119>
00120>
00121>
00122>
00123>
00124>
00125>
00126>
00127>
00128>
00129>
00130>
```

```
00001> ================================================================================
00002>
00003>    SSSSS  W   W  M   M  H   H  Y   Y  M   M   OOO        999    999    =========
00004>    S      W W W  MM MM  H   H   Y Y   MM MM  O   O      9   9  9   9
00005>    SSSSS  W W W  M M M  HHHHH    Y    M M M  O   O  ##  9   9  9   9   Ver  4.05
00006>        S  W W   M   M  H   H    Y    M   M  O   O       9999   9999   Sept 2011
00007>    SSSSS   W W   M   M  H   H    Y    M   M   OOO            9      9   =========
00008>                                                          9   9  9   9   # 3902680
00009>          StormWater Management HYdrologic Model          999    999    =========
00010>
00011> ********************************************************************************
00012> ***************************** SWMHYMO Ver/4.05  ********************************
00013> *********  A single event and continuous hydrologic simulation model  *********
00014> *********     based on the principles of HYMO and its successors      *********
00015> *********                    OTTHYMO-83 and OTTHYMO-89.                *********
00016> ********************************************************************************
00017> ********* Distributed by:  J.F. Sabourin and Associates Inc.          *********
00018> *********                  Ottawa,  Ontario: (613) 836-3884           *********
00019> *********                  Gatineau, Quebec: (819) 243-6858           *********
00020> *********                  E-Mail: swmhymo@jfsa.Com                   *********
00021> ********************************************************************************
00022>
00023> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00024> +++++++++ Licensed user: S. Llewellyn & Associates Ltd                +++++++++
00025> +++++++++                in any City          SERIAL#:3902680        +++++++++
00026> ++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
00027>
00028> ********************************************************************************
00029> *********           ++++++ PROGRAM ARRAY DIMENSIONS ++++++             *********
00030> *********           Maximum value for ID numbers  :     10            *********
00031> *********           Max. number of rainfall points: 105408            *********
00032> *********           Max. number of flow points    : 105408            *********
00033> ********************************************************************************
00034>
00035>
00036> *********************   D E T A I L E D   O U T P U T   **********************
00037> ********************************************************************************
00038> *         DATE: 2022-03-09     TIME: 13:48:51     RUN COUNTER: 000054          *
00039> ********************************************************************************
00040> * Input   filename: T:\projects\22024\SWMHYMO\22024.dat                        *
00041> * Output  filename: T:\projects\22024\SWMHYMO\22024.out                       *
00042> * Summary filename: T:\projects\22024\SWMHYMO\22024.sum                       *
00043> * User comments:                                                             *
00044> * 1:_____________________________________________________________________     *
00045> * 2:_____________________________________________________________________     *
00046> * 3:_____________________________________________________________________     *
00047> ********************************************************************************
00048>
00049> --------------------------------------------------------------------------------
00050> 001:0001--------------------------------------------------------------------------
00051> *#*****************************************************************************|
00052> *#  Project Name: 1396 GUELPH LINE
00053> *#               BURLINGTON, OMTARIO
00054> *#  JOB NUMBER  : 22024
00055> *#       Date   : MARCH 2022
00056> *#    Revised   :
00057> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00058> *#       File   : 22024.DAT
00059> *#*****************************************************************************|
00060> *
00061>   ** END OF RUN :   1
00062>
00063> ********************************************************************************
00064>
00065>
00066>
00067>
00068>
00069> --------------------
00070> | START            |  Project  dir.: T:\projects\22024\SWMHYMO\
00071> --------------------  Rainfall dir.: T:\projects\22024\SWMHYMO\
00072>     TZERO =   .00 hrs on        0
00073>     METOUT=   2 (output = METRIC)
00074>     NRUN  = 002
00075>     NSTORM=   1
00076>            #  1=BUR6_002.stm
00077> --------------------------------------------------------------------------------
00078> 002:0002--------------------------------------------------------------------------
00079> *#*****************************************************************************|
00080> *#  Project Name: 1396 GUELPH LINE
00081> *#               BURLINGTON, OMTARIO
00082> *#  JOB NUMBER  : 22024
00083> *#       Date   : MARCH 2022
00084> *#    Revised   :
00085> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00086> *#       File   : 22024.DAT
00087> *#*****************************************************************************|
00088> *
00089> --------------------------------------------------------------------------------
00090> 002:0002--------------------------------------------------------------------------
00091> *
00092> --------------------
00093> | READ STORM       |    Filename: Burlington 2-yr 6hr CHICAGO  (A=681.52,
00094> | Ptotal=  40.93 mm|    Comments: Burlington 2-yr 6hr CHICAGO  (A=681.52,
00095> --------------------
00096>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00097>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00098>                 .17   1.715 |   1.67   8.325 |   3.17   4.467 |   4.67   2.213
00099>                 .33   1.858 |   1.83  19.646 |   3.33   3.978 |   4.83   2.105
00100>                 .50   2.032 |   2.00  78.391 |   3.50   3.595 |   5.00   2.008
00101>                 .67   2.247 |   2.17  25.776 |   3.67   3.286 |   5.17   1.920
00102>                 .83   2.522 |   2.33  13.777 |   3.83   3.030 |   5.33   1.841
00103>                1.00   2.888 |   2.50   9.511 |   4.00   2.815 |   5.50   1.769
00104>                1.17   3.399 |   2.67   7.331 |   4.17   2.632 |   5.67   1.703
00105>                1.33   4.172 |   2.83   6.005 |   4.33   2.474 |   5.83   1.642
00106>                1.50   5.492 |   3.00   5.111 |   4.50   2.335 |   6.00   1.586
00107>
00108> --------------------------------------------------------------------------------
00109> 002:0003--------------------------------------------------------------------------
00110> *
00111> *#*****************************************************************************|
00112> *#
00113> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00114> *#        ==============================================
00115> *#
00116> **#****************************************************************************|
00117> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
00118> ----------------------
00119> | CALIB STANDHYD     |   Area    (ha)=     .38
00120> | 01:101    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
00121> ----------------------
00122>                                IMPERVIOUS    PERVIOUS (i)
00123>      Surface Area     (ha)=        .25          .13
00124>      Dep. Storage     (mm)=       1.00        10.80
00125>      Average Slope     (%)=       2.00         2.00
00126>      Length            (m)=      10.00        10.00
00127>      Mannings n            =       .013         .250
00128>
00129>      Max.eff.Inten.(mm/hr)=      78.39         8.00
00130>                 over (min)        1.00         9.00
00131>      Storage Coeff.  (min)=         .57 (ii)    9.01 (ii)
00132>      Unit Hyd. Tpeak (min)=        1.00         9.00
00133>      Unit Hyd. peak  (cms)=        1.40          .13
00134>                                                          *TOTALS*
00135>      PEAK FLOW       (cms)=         .05          .00          .055 (iii)
00136>      TIME TO PEAK    (hrs)=        1.97         2.18         2.000
00137>      RUNOFF VOLUME    (mm)=       39.93         6.53        28.243
00138>      TOTAL RAINFALL   (mm)=       40.93        40.93        40.933
00139>      RUNOFF COEFFICIENT   =         .98          .16          .690
00140>
00141>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00142>            CN* =  70.0    Ia = Dep. Storage  (Above)
00143>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00144>            THAN THE STORAGE COEFFICIENT.
00145>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00146>
00147> --------------------------------------------------------------------------------
00148> 002:0004--------------------------------------------------------------------------
00149> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
00150> ----------------------
00151> | CALIB STANDHYD     |   Area    (ha)=     .38
00152> | 02:101    DT= 1.00 |   Total Imp(%)=   36.00   Dir. Conn.(%)=   36.00
00153> ----------------------
00154>                                IMPERVIOUS    PERVIOUS (i)
00155>      Surface Area     (ha)=        .14          .24
00156>      Dep. Storage     (mm)=       1.00        10.80
00157>      Average Slope     (%)=       1.50         1.50
00158>      Length            (m)=      20.00        20.00
00159>      Mannings n            =       .013         .250
00160>
00161>      Max.eff.Inten.(mm/hr)=      78.39         6.94
00162>                 over (min)        1.00        16.00
00163>      Storage Coeff.  (min)=         .95 (ii)   15.71 (ii)
00164>      Unit Hyd. Tpeak (min)=        1.00        16.00
00165>      Unit Hyd. peak  (cms)=        1.11          .07
00166>                                                          *TOTALS*
00167>      PEAK FLOW       (cms)=         .03          .00          .030 (iii)
00168>      TIME TO PEAK    (hrs)=        2.00         2.35         2.000
00169>      RUNOFF VOLUME    (mm)=       39.93         6.53        18.557
00170>      TOTAL RAINFALL   (mm)=       40.93        40.93        40.933
00171>      RUNOFF COEFFICIENT   =         .98          .16          .453
00172>
00173>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00174>            CN* =  70.0    Ia = Dep. Storage  (Above)
00175>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00176>            THAN THE STORAGE COEFFICIENT.
00177>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00178>
00179> --------------------------------------------------------------------------------
00180> 002:0005--------------------------------------------------------------------------
00181> *#*****************************************************************************|
00182> *#
00183> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00184> *#        ==============================================
00185> *#
00186> **#****************************************************************************|
00187> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
00188> ----------------------
00189> | CALIB STANDHYD     |   Area    (ha)=     .34
00190> | 03:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
00191> ----------------------
00192>                                IMPERVIOUS    PERVIOUS (i)
00193>      Surface Area     (ha)=        .32          .02
00194>      Dep. Storage     (mm)=       1.00        10.80
00195>      Average Slope     (%)=       2.00         2.00
00196>      Length            (m)=      10.00        10.00
00197>      Mannings n            =       .013         .250
00198>
00199>      Max.eff.Inten.(mm/hr)=      78.39         8.00
00200>                 over (min)        1.00         9.00
00201>      Storage Coeff.  (min)=         .57 (ii)    9.01 (ii)
00202>      Unit Hyd. Tpeak (min)=        1.00         9.00
00203>      Unit Hyd. peak  (cms)=        1.40          .13
00204>                                                          *TOTALS*
00205>      PEAK FLOW       (cms)=         .07          .00          .070 (iii)
00206>      TIME TO PEAK    (hrs)=        1.97         2.18         2.000
00207>      RUNOFF VOLUME    (mm)=       39.93         6.53        37.929
00208>      TOTAL RAINFALL   (mm)=       40.93        40.93        40.933
00209>      RUNOFF COEFFICIENT   =         .98          .16          .927
00210>
00211>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00212>            CN* =  70.0    Ia = Dep. Storage  (Above)
00213>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00214>            THAN THE STORAGE COEFFICIENT.
00215>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00216>
00217> --------------------------------------------------------------------------------
00218> 002:0006--------------------------------------------------------------------------
00219> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
00220> ----------------------
00221> | CALIB STANDHYD     |   Area    (ha)=     .04
00222> | 04:202    DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   75.00
00223> ----------------------
00224>                                IMPERVIOUS    PERVIOUS (i)
00225>      Surface Area     (ha)=        .03          .01
00226>      Dep. Storage     (mm)=       1.00        10.80
00227>      Average Slope     (%)=       2.00         2.00
00228>      Length            (m)=      10.00        10.00
00229>      Mannings n            =       .013         .250
00230>
00231>      Max.eff.Inten.(mm/hr)=      78.39         8.00
00232>                 over (min)        1.00         9.00
00233>      Storage Coeff.  (min)=         .57 (ii)    9.01 (ii)
00234>      Unit Hyd. Tpeak (min)=        1.00         9.00
00235>      Unit Hyd. peak  (cms)=        1.40          .13
00236>                                                          *TOTALS*
00237>      PEAK FLOW       (cms)=         .01          .00          .007 (iii)
00238>      TIME TO PEAK    (hrs)=        1.95         2.18         2.000
00239>      RUNOFF VOLUME    (mm)=       39.93         6.53        31.583
00240>      TOTAL RAINFALL   (mm)=       40.93        40.93        40.933
00241>      RUNOFF COEFFICIENT   =         .98          .16          .772
00242>
00243>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00244>            CN* =  70.0    Ia = Dep. Storage  (Above)
00245>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00246>            THAN THE STORAGE COEFFICIENT.
00247>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00248>
00249> --------------------------------------------------------------------------------
00250> 002:0007--------------------------------------------------------------------------
00251> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
00252> ----------------------
00253> | CALIB NASHYD       |   Area    (ha)=     .26   Curve Number   (CN)=70.00
00254> | 05:203    DT= 1.00 |   Ia      (mm)=  10.800   # of Linear Res.(N)= 3.00
00255> ----------------------   U.H. Tp(hrs)=    .100
00256>
00257>      Unit Hyd Qpeak  (cms)=     .099
00258>
00259>      PEAK FLOW       (cms)=     .005 (i)
00260>      TIME TO PEAK    (hrs)=    2.100
00261>      RUNOFF VOLUME    (mm)=    6.532
00262>      TOTAL RAINFALL   (mm)=   40.933
00263>      RUNOFF COEFFICIENT   =     .160
00264>
00265>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00266>
00267> --------------------------------------------------------------------------------
00268> 002:0008--------------------------------------------------------------------------
00269> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
00270> *
```

```
00271> ---------------------
00272> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00273> |  IN>03:(201   )   |
00274> | OUT<06:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
00275> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00276>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00277>                             .000  .0000E+00   |     .022  .1160E-01
00278>                             .022  .2200E-02   |     .022  .1420E-01
00279>                             .022  .2200E-02   |     .022  .1420E-01
00280>                             .022  .5200E-02   |     .031  .1610E-01
00281>                             .022  .8500E-02   |     .000  .0000E+00
00282>
00283>     ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00284>     --------------------       (ha)     (cms)     (hrs)        (mm)
00285>     INFLOW >03: (201   )        .34      .070     2.000     37.929
00286>     OUTFLOW<06: (201   )        .34      .022     1.917     37.929
00287>    OVERFLOW<07: (OVF   )        .00      .000      .000       .000
00288>
00289>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00290>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00291>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00292>
00293>
00294>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   30.810
00295>                    TIME SHIFT OF PEAK FLOW         (min)=    -5.00
00296>                    MAXIMUM  STORAGE   USED       (ha.m.)=.4211E-02
00297>
00298> ------------------------------------------------------------------------------
00299> 002:0009----------------------------------------------------------------------
00300> ------------------------
00301> | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00302> ------------------------ ------------------(ha)     (cms)   (hrs)   (mm)   (cms)
00303>                         ID1 04:202           .04      .007    2.00  31.58    .000
00304>                        +ID2 06:201           .34      .022    1.92  37.93    .000
00305>                        +ID3 07:OVF           .00      .000     .00    .00    .000
00306>                         ==========================================================
00307>                         SUM 08:Total          .38      .028    2.00  37.26    .000
00308>
00309>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00310>
00311> ------------------------------------------------------------------------------
00312> 002:0010----------------------------------------------------------------------
00313> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
00314> *
00315>   ** END OF RUN :   4
00316>
00317> ******************************************************************************
00318>
00319>
00320>
00321>
00322>
00323> --------------------
00324> | START            |  Project  dir.: T:\projects\22024\SWMHYMO\
00325> --------------------  Rainfall dir.: T:\projects\22024\SWMHYMO\
00326>     TZERO =   .00 hrs on       0
00327>     METOUT=  2 (output = METRIC)
00328>     NRUN  = 005
00329>     NSTORM=  1
00330>              #  1=BUR6_005.stm
00331> ------------------------------------------------------------------------------
00332> 005:0002----------------------------------------------------------------------
00333> *#*************************************************************************|
00334> *#  Project Name: 1396 GUELPH LINE
00335> *#               BURLINGTON, OMTARIO
00336> *#  JOB NUMBER  : 22024
00337> *#       Date   : MARCH 2022
00338> *#    Revised   :
00339> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00340> *#       File   : 22024.DAT
00341> *#*************************************************************************|
00342> *
00343> ------------------------------------------------------------------------------
00344> 005:0002----------------------------------------------------------------------
00345> *
00346> --------------------
00347> | READ STORM      |    Filename: Burlington 5-yr 6hr CHICAGO    (A=802.04
00348> | Ptotal=  53.05 mm|    Comments: Burlington 5-yr 6hr CHICAGO    (A=802.04
00349> --------------------
00350>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00351>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00352>                .17   2.348 |   1.67  10.690 |   3.17   5.897 |   4.67   3.004
00353>                .33   2.537 |   1.83  24.479 |   3.33   5.279 |   4.83   2.862
00354>                .50   2.766 |   2.00 101.312 |   3.50   4.790 |   5.00   2.734
00355>                .67   3.048 |   2.17  31.941 |   3.67   4.394 |   5.17   2.619
00356>                .83   3.407 |   2.33  17.333 |   3.83   4.065 |   5.33   2.514
00357>               1.00   3.881 |   2.50  12.145 |   4.00   3.788 |   5.50   2.419
00358>               1.17   4.539 |   2.67   9.469 |   4.17   3.550 |   5.67   2.331
00359>               1.33   5.523 |   2.83   7.826 |   4.33   3.344 |   5.83   2.251
00360>               1.50   7.185 |   3.00   6.709 |   4.50   3.164 |   6.00   2.176
00361>
00362> ------------------------------------------------------------------------------
00363> 005:0003----------------------------------------------------------------------
00364> *
00365> *#*************************************************************************|
00366> *#
00367> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00368> *#        ==============================================
00369> *#
00370> **#************************************************************************|
00371> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
00372> ---------------------
00373> | CALIB STANDHYD     |   Area    (ha)=     .38
00374> | 01:101    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
00375> ---------------------
00376>                              IMPERVIOUS    PERVIOUS (i)
00377>      Surface Area     (ha)=        .25          .13
00378>      Dep. Storage     (mm)=       1.00         10.80
00379>      Average Slope     (%)=       2.00          2.00
00380>      Length            (m)=      10.00         10.00
00381>      Mannings n            =       .013          .250
00382>
00383>      Max.eff.Inten.(mm/hr)=     101.31        19.99
00384>                 over (min)        1.00          6.00
00385>      Storage Coeff.  (min)=        .52 (ii)    6.37 (ii)
00386>      Unit Hyd. Tpeak (min)=       1.00          6.00
00387>      Unit Hyd. peak  (cms)=       1.45           .18
00388>                                                          *TOTALS*
00389>      PEAK FLOW       (cms)=        .07           .00          .073 (iii)
00390>      TIME TO PEAK    (hrs)=       1.97          2.07         2.000
00391>      RUNOFF VOLUME    (mm)=      52.05         11.81        37.970
00392>      TOTAL RAINFALL   (mm)=      53.05         53.05        53.053
00393>      RUNOFF COEFFICIENT   =        .98           .22          .716
00394>
00395>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00396>            CN* =  70.0    Ia = Dep. Storage  (Above)
00397>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00398>            THAN THE STORAGE COEFFICIENT.
00399>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00400>
00401> ------------------------------------------------------------------------------
00402> 005:0004----------------------------------------------------------------------
00403> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
00404> ---------------------
00405> | CALIB STANDHYD     |   Area    (ha)=     .38
00406> | 02:101    DT= 1.00 |   Total Imp(%)=   36.00   Dir. Conn.(%)=   36.00
00407> ---------------------
00408>                              IMPERVIOUS    PERVIOUS (i)
00409>      Surface Area     (ha)=        .14           .24
00410>      Dep. Storage     (mm)=       1.00         10.80
00411>      Average Slope     (%)=       1.50          1.50
00412>      Length            (m)=      20.00         20.00
00413>      Mannings n            =       .013          .250
00414>
00415>      Max.eff.Inten.(mm/hr)=     101.31        14.65
00416>                 over (min)        1.00         12.00
00417>      Storage Coeff.  (min)=        .86 (ii)   11.80 (ii)
00418>      Unit Hyd. Tpeak (min)=       1.00         12.00
00419>      Unit Hyd. peak  (cms)=       1.17           .10
00420>                                                          *TOTALS*
00421>      PEAK FLOW       (cms)=        .04           .01          .041 (iii)
00422>      TIME TO PEAK    (hrs)=       2.00          2.18         2.000
00423>      RUNOFF VOLUME    (mm)=      52.05         11.81        26.300
00424>      TOTAL RAINFALL   (mm)=      53.05         53.05        53.053
00425>      RUNOFF COEFFICIENT   =        .98           .22          .496
00426>
00427>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00428>            CN* =  70.0    Ia = Dep. Storage  (Above)
00429>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00430>            THAN THE STORAGE COEFFICIENT.
00431>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00432>
00433> ------------------------------------------------------------------------------
00434> 005:0005----------------------------------------------------------------------
00435> *#*************************************************************************|
00436> *#
00437> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00438> *#        ===============================================
00439> *#
00440> **#************************************************************************|
00441> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
00442> ---------------------
00443> | CALIB STANDHYD     |   Area    (ha)=     .34
00444> | 03:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
00445> ---------------------
00446>                              IMPERVIOUS    PERVIOUS (i)
00447>      Surface Area     (ha)=        .32           .02
00448>      Dep. Storage     (mm)=       1.00         10.80
00449>      Average Slope     (%)=       2.00          2.00
00450>      Length            (m)=      10.00         10.00
00451>      Mannings n            =       .013          .250
00452>
00453>      Max.eff.Inten.(mm/hr)=     101.31        19.99
00454>                 over (min)        1.00          6.00
00455>      Storage Coeff.  (min)=        .52 (ii)    6.37 (ii)
00456>      Unit Hyd. Tpeak (min)=       1.00          6.00
00457>      Unit Hyd. peak  (cms)=       1.45           .18
00458>                                                          *TOTALS*
00459>      PEAK FLOW       (cms)=        .09           .00          .091 (iii)
00460>      TIME TO PEAK    (hrs)=       1.97          2.07         2.000
00461>      RUNOFF VOLUME    (mm)=      52.05         11.81        49.639
00462>      TOTAL RAINFALL   (mm)=      53.05         53.05        53.053
00463>      RUNOFF COEFFICIENT   =        .98           .22          .936
00464>
00465>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00466>            CN* =  70.0    Ia = Dep. Storage  (Above)
00467>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00468>            THAN THE STORAGE COEFFICIENT.
00469>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00470>
00471> ------------------------------------------------------------------------------
00472> 005:0006----------------------------------------------------------------------
00473> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
00474> ---------------------
00475> | CALIB STANDHYD     |   Area    (ha)=     .04
00476> | 04:202    DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   75.00
00477> ---------------------
00478>                              IMPERVIOUS    PERVIOUS (i)
00479>      Surface Area     (ha)=        .03           .01
00480>      Dep. Storage     (mm)=       1.00         10.80
00481>      Average Slope     (%)=       2.00          2.00
00482>      Length            (m)=      10.00         10.00
00483>      Mannings n            =       .013          .250
00484>
00485>      Max.eff.Inten.(mm/hr)=     101.31        19.99
00486>                 over (min)        1.00          6.00
00487>      Storage Coeff.  (min)=        .52 (ii)    6.37 (ii)
00488>      Unit Hyd. Tpeak (min)=       1.00          6.00
00489>      Unit Hyd. peak  (cms)=       1.45           .18
00490>                                                          *TOTALS*
00491>      PEAK FLOW       (cms)=        .01           .00          .009 (iii)
00492>      TIME TO PEAK    (hrs)=       1.95          2.07         2.000
00493>      RUNOFF VOLUME    (mm)=      52.05         11.81        41.993
00494>      TOTAL RAINFALL   (mm)=      53.05         53.05        53.053
00495>      RUNOFF COEFFICIENT   =        .98           .22          .792
00496>
00497>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00498>            CN* =  70.0    Ia = Dep. Storage  (Above)
00499>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00500>            THAN THE STORAGE COEFFICIENT.
00501>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00502>
00503> ------------------------------------------------------------------------------
00504> 005:0007----------------------------------------------------------------------
00505> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
00506> ---------------------
00507> | CALIB NASHYD       |   Area    (ha)=     .26   Curve Number   (CN)=70.00
00508> | 05:203    DT= 1.00 |   Ia      (mm)=  10.800   # of Linear Res.(N)= 3.00
00509> ---------------------   U.H. Tp(hrs)=    .100
00510>
00511>      Unit Hyd Qpeak  (cms)=     .099
00512>
00513>      PEAK FLOW       (cms)=     .009 (i)
00514>      TIME TO PEAK    (hrs)=    2.083
00515>      RUNOFF VOLUME    (mm)=   11.814
00516>      TOTAL RAINFALL   (mm)=   53.053
00517>      RUNOFF COEFFICIENT   =     .223
00518>
00519>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00520>
00521> ------------------------------------------------------------------------------
00522> 005:0008----------------------------------------------------------------------
00523> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
00524> *
00525> ---------------------
00526> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
00527> |  IN>03:(201   )   |
00528> | OUT<06:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
00529> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00530>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00531>                             .000  .0000E+00   |     .022  .1160E-01
00532>                             .022  .2200E-02   |     .022  .1420E-01
00533>                             .022  .2200E-02   |     .022  .1420E-01
00534>                             .022  .5200E-02   |     .031  .1610E-01
00535>                             .022  .8500E-02   |     .000  .0000E+00
00536>
00537>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00538>      --------------------       (ha)     (cms)     (hrs)        (mm)
00539>      INFLOW >03: (201   )        .34      .091     2.000     49.639
00540>      OUTFLOW<06: (201   )        .34      .022     1.883     49.639
```

```
00541>     OVERFLOW<07: (OVF   )        .00      .000      .000       .000
00542>
00543>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00544>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00545>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00546>
00547>
00548>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   23.738
00549>                    TIME SHIFT OF PEAK FLOW         (min)=    -7.00
00550>                    MAXIMUM  STORAGE   USED       (ha.m.)=.6025E-02
00551>
00552> ------------------------------------------------------------------------------
00553> 005:0009--------------------------------------------------------------------
00554> ----------------------
00555> | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00556> ----------------------                    (ha)     (cms)   (hrs)   (mm)   (cms)
00557>                        ID1 04:202           .04      .009    2.00  41.99    .000
00558>                       +ID2 06:201           .34      .022    1.88  49.64    .000
00559>                       +ID3 07:OVF           .00      .000     .00    .00    .000
00560>                        ========================================================
00561>                        SUM 08:Total          .38      .030    2.00  48.84    .000
00562>
00563>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00564>
00565> ------------------------------------------------------------------------------
00566> 005:0010--------------------------------------------------------------------
00567> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
00568> *
00569> ------------------------------------------------------------------------------
00570> 005:0002--------------------------------------------------------------------
00571> *
00572>   ** END OF RUN :   9
00573>
00574> ********************************************************************************
00575>
00576>
00577>
00578>
00579>
00580> --------------------
00581> | START            |  Project  dir.: T:\projects\22024\SWMHYMO\
00582> --------------------  Rainfall dir.: T:\projects\22024\SWMHYMO\
00583>     TZERO =   .00 hrs on       0
00584>     METOUT=   2 (output = METRIC)
00585>     NRUN  = 010
00586>     NSTORM=   1
00587>                #  1=BUR6_010.stm
00588> ------------------------------------------------------------------------------
00589> 010:0002--------------------------------------------------------------------
00590> *#*************************************************************************|
00591> *#  Project Name: 1396 GUELPH LINE
00592> *#               BURLINGTON, OMTARIO
00593> *#  JOB NUMBER  : 22024
00594> *#       Date   : MARCH 2022
00595> *#    Revised   :
00596> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00597> *#       File   : 22024.DAT
00598> *#*************************************************************************|
00599> *
00600> ------------------------------------------------------------------------------
00601> 010:0002--------------------------------------------------------------------
00602> *
00603> --------------------
00604> | READ STORM       |    Filename: Burlington 10-yr 6hr CHICAGO     (A=918.
00605> | Ptotal=  61.10 mm|    Comments: Burlington 10-yr 6hr CHICAGO     (A=918.
00606> --------------------
00607>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00608>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00609>                .17   2.714 |   1.67  12.326 |   3.17   6.808 |   4.67   3.472
00610>                .33   2.933 |   1.83  28.176 |   3.33   6.095 |   4.83   3.308
00611>                .50   3.197 |   2.00 116.310 |   3.50   5.532 |   5.00   3.161
00612>                .67   3.523 |   2.17  36.748 |   3.67   5.075 |   5.17   3.027
00613>                .83   3.937 |   2.33  19.967 |   3.83   4.696 |   5.33   2.907
00614>               1.00   4.483 |   2.50  14.001 |   4.00   4.376 |   5.50   2.796
00615>               1.17   5.242 |   2.67  10.921 |   4.17   4.102 |   5.67   2.695
00616>               1.33   6.377 |   2.83   9.030 |   4.33   3.864 |   5.83   2.602
00617>               1.50   8.291 |   3.00   7.743 |   4.50   3.656 |   6.00   2.516
00618>
00619> ------------------------------------------------------------------------------
00620> 010:0003--------------------------------------------------------------------
00621> *
00622> *#*************************************************************************|
00623> *#
00624> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00625> *#        ==============================================
00626> *#
00627> **#************************************************************************|
00628> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
00629> ---------------------
00630> | CALIB STANDHYD     |   Area    (ha)=     .38
00631> | 01:101    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
00632> ---------------------
00633>                              IMPERVIOUS    PERVIOUS (i)
00634>      Surface Area     (ha)=        .25          .13
00635>      Dep. Storage     (mm)=       1.00         10.80
00636>      Average Slope     (%)=       2.00          2.00
00637>      Length            (m)=      10.00         10.00
00638>      Mannings n            =       .013          .250
00639>
00640>      Max.eff.Inten.(mm/hr)=     116.31        28.14
00641>                    over (min)        1.00         6.00
00642>      Storage Coeff.  (min)=        .49 (ii)    5.59 (ii)
00643>      Unit Hyd. Tpeak (min)=       1.00         6.00
00644>      Unit Hyd. peak  (cms)=       1.48          .20
00645>                                                          *TOTALS*
00646>      PEAK FLOW       (cms)=        .08          .01          .086 (iii)
00647>      TIME TO PEAK    (hrs)=       1.98         2.07         2.000
00648>      RUNOFF VOLUME    (mm)=      60.10        15.90        44.630
00649>      TOTAL RAINFALL   (mm)=      61.10        61.10        61.101
00650>      RUNOFF COEFFICIENT   =        .98          .26          .730
00651>
00652>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00653>            CN* =  70.0    Ia = Dep. Storage  (Above)
00654>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00655>            THAN THE STORAGE COEFFICIENT.
00656>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00657>
00658> ------------------------------------------------------------------------------
00659> 010:0004--------------------------------------------------------------------
00660> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
00661> ---------------------
00662> | CALIB STANDHYD     |   Area    (ha)=     .38
00663> | 02:101    DT= 1.00 |   Total Imp(%)=   36.00   Dir. Conn.(%)=   36.00
00664> ---------------------
00665>                              IMPERVIOUS    PERVIOUS (i)
00666>      Surface Area     (ha)=        .14          .24
00667>      Dep. Storage     (mm)=       1.00         10.80
00668>      Average Slope     (%)=       1.50          1.50
00669>      Length            (m)=      20.00         20.00
00670>      Mannings n            =       .013          .250
00671>
00672>      Max.eff.Inten.(mm/hr)=     116.31        22.46
00673>                    over (min)        1.00         10.00
00674>      Storage Coeff.  (min)=        .81 (ii)    10.04 (ii)
00675>      Unit Hyd. Tpeak (min)=       1.00         10.00
00676>      Unit Hyd. peak  (cms)=       1.20          .11
00677>                                                          *TOTALS*
00678>      PEAK FLOW       (cms)=        .04          .01          .049 (iii)
00679>      TIME TO PEAK    (hrs)=       2.00         2.15         2.000
00680>      RUNOFF VOLUME    (mm)=      60.10        15.90        31.811
00681>      TOTAL RAINFALL   (mm)=      61.10        61.10        61.101
00682>      RUNOFF COEFFICIENT   =        .98          .26          .521
00683>
00684>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00685>            CN* =  70.0    Ia = Dep. Storage  (Above)
00686>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00687>            THAN THE STORAGE COEFFICIENT.
00688>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00689>
00690> ------------------------------------------------------------------------------
00691> 010:0005--------------------------------------------------------------------
00692> *#*************************************************************************|
00693> *#
00694> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00695> *#        ==============================================
00696> *#
00697> **#************************************************************************|
00698> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
00699> ---------------------
00700> | CALIB STANDHYD     |   Area    (ha)=     .34
00701> | 03:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
00702> ---------------------
00703>                              IMPERVIOUS    PERVIOUS (i)
00704>      Surface Area     (ha)=        .32          .02
00705>      Dep. Storage     (mm)=       1.00         10.80
00706>      Average Slope     (%)=       2.00          2.00
00707>      Length            (m)=      10.00         10.00
00708>      Mannings n            =       .013          .250
00709>
00710>      Max.eff.Inten.(mm/hr)=     116.31        28.14
00711>                    over (min)        1.00         6.00
00712>      Storage Coeff.  (min)=        .49 (ii)    5.59 (ii)
00713>      Unit Hyd. Tpeak (min)=       1.00         6.00
00714>      Unit Hyd. peak  (cms)=       1.48          .20
00715>                                                          *TOTALS*
00716>      PEAK FLOW       (cms)=        .10          .00          .105 (iii)
00717>      TIME TO PEAK    (hrs)=       1.98         2.07         2.000
00718>      RUNOFF VOLUME    (mm)=      60.10        15.90        57.449
00719>      TOTAL RAINFALL   (mm)=      61.10        61.10        61.101
00720>      RUNOFF COEFFICIENT   =        .98          .26          .940
00721>
00722>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00723>            CN* =  70.0    Ia = Dep. Storage  (Above)
00724>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00725>            THAN THE STORAGE COEFFICIENT.
00726>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00727>
00728> ------------------------------------------------------------------------------
00729> 010:0006--------------------------------------------------------------------
00730> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
00731> ---------------------
00732> | CALIB STANDHYD     |   Area    (ha)=     .04
00733> | 04:202    DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   75.00
00734> ---------------------
00735>                              IMPERVIOUS    PERVIOUS (i)
00736>      Surface Area     (ha)=        .03          .01
00737>      Dep. Storage     (mm)=       1.00         10.80
00738>      Average Slope     (%)=       2.00          2.00
00739>      Length            (m)=      10.00         10.00
00740>      Mannings n            =       .013          .250
00741>
00742>      Max.eff.Inten.(mm/hr)=     116.31        28.14
00743>                    over (min)        1.00         6.00
00744>      Storage Coeff.  (min)=        .49 (ii)    5.59 (ii)
00745>      Unit Hyd. Tpeak (min)=       1.00         6.00
00746>      Unit Hyd. peak  (cms)=       1.48          .20
00747>                                                          *TOTALS*
00748>      PEAK FLOW       (cms)=        .01          .00          .010 (iii)
00749>      TIME TO PEAK    (hrs)=       1.93         2.07         2.000
00750>      RUNOFF VOLUME    (mm)=      60.10        15.90        49.050
00751>      TOTAL RAINFALL   (mm)=      61.10        61.10        61.101
00752>      RUNOFF COEFFICIENT   =        .98          .26          .803
00753>
00754>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00755>            CN* =  70.0    Ia = Dep. Storage  (Above)
00756>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00757>            THAN THE STORAGE COEFFICIENT.
00758>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00759>
00760> ------------------------------------------------------------------------------
00761> 010:0007--------------------------------------------------------------------
00762> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
00763> ---------------------
00764> | CALIB NASHYD       |   Area    (ha)=     .26   Curve Number   (CN)=70.00
00765> | 05:203    DT= 1.00 |   Ia      (mm)=  10.800   # of Linear Res.(N)= 3.00
00766> ---------------------  U.H. Tp(hrs)=    .100
00767>
00768>      Unit Hyd Qpeak  (cms)=     .099
00769>
00770>      PEAK FLOW       (cms)=     .014 (i)
00771>      TIME TO PEAK    (hrs)=    2.067
00772>      RUNOFF VOLUME    (mm)=   15.897
00773>      TOTAL RAINFALL   (mm)=   61.101
00774>      RUNOFF COEFFICIENT   =     .260
00775>
00776>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00777>
00778> ------------------------------------------------------------------------------
00779> 010:0008--------------------------------------------------------------------
00780> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
00781> *
00782> ---------------------
00783> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
00784> |  IN>03:(201   )    |
00785> | OUT<06:(201   )    |    =========  OUTLFOW STORAGE TABLE  =========
00786> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
00787>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
00788>                             .000  .0000E+00    |     .022  .1160E-01
00789>                             .022  .2200E-02    |     .022  .1420E-01
00790>                             .022  .2200E-02    |     .022  .1420E-01
00791>                             .022  .5200E-02    |     .031  .1610E-01
00792>                             .022  .8500E-02    |     .000  .0000E+00
00793>
00794>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
00795>      --------------------       (ha)     (cms)     (hrs)       (mm)
00796>      INFLOW >03: (201   )        .34      .105     2.000     57.449
00797>      OUTFLOW<06: (201   )        .34      .022     1.867     57.449
00798>     OVERFLOW<07: (OVF   )        .00      .000      .000       .000
00799>
00800>                    TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
00801>                    CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
00802>                    PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
00803>
00804>
00805>                    PEAK   FLOW   REDUCTION [Qout/Qin](%)=   20.629
00806>                    TIME SHIFT OF PEAK FLOW         (min)=    -8.00
00807>                    MAXIMUM  STORAGE   USED       (ha.m.)=.7299E-02
00808>
00809> ------------------------------------------------------------------------------
00810> 010:0009--------------------------------------------------------------------
```

```
00811> ----------------------
00812> | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
00813> ----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
00814>                       ID1 04:202            .04      .010    2.00  49.05    .000
00815>                      +ID2 06:201            .34      .022    1.87  57.45    .000
00816>                      +ID3 07:OVF            .00      .000     .00    .00    .000
00817>                       ========================================================
00818>                       SUM 08:Total           .38      .032    2.00  56.57    .000
00819>
00820>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
00821>
00822> ------------------------------------------------------------------------------
00823> 010:0010-------------------------------------------------------------------------
00824> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
00825> *
00826> ------------------------------------------------------------------------------
00827> 010:0002-------------------------------------------------------------------------
00828> *
00829> ------------------------------------------------------------------------------
00830> 010:0002-------------------------------------------------------------------------
00831> *
00832>  ** END OF RUN :  24
00833>
00834> ********************************************************************************
00835>
00836>
00837>
00838>
00839>
00840> --------------------
00841> | START            |  Project  dir.: T:\projects\22024\SWMHYMO\
00842> --------------------  Rainfall dir.: T:\projects\22024\SWMHYMO\
00843>    TZERO =   .00 hrs on      0
00844>    METOUT=  2 (output = METRIC)
00845>    NRUN  = 025
00846>    NSTORM=  1
00847>           #  1=BUR6_025.stm
00848> ------------------------------------------------------------------------------
00849> 025:0002-------------------------------------------------------------------------
00850> *#*****************************************************************************|
00851> *#  Project Name: 1396 GUELPH LINE
00852> *#               BURLINGTON, OMTARIO
00853> *#  JOB NUMBER  : 22024
00854> *#      Date    : MARCH 2022
00855> *#    Revised   :
00856> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
00857> *#      File    : 22024.DAT
00858> *#*****************************************************************************|
00859> *
00860> ------------------------------------------------------------------------------
00861> 025:0002-------------------------------------------------------------------------
00862> *
00863> --------------------
00864> | READ STORM       |    Filename: Burlington 25-yr 6hr CHICAGO      (A=106
00865> | Ptotal=  71.35 mm|    Comments: Burlington 25-yr 6hr CHICAGO      (A=106
00866> --------------------
00867>              TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
00868>              hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
00869>               .17   3.182 |   1.67  14.410 |   3.17   7.968 |   4.67   4.068
00870>               .33   3.437 |   1.83  32.881 |   3.33   7.135 |   4.83   3.876
00871>               .50   3.746 |   2.00 135.380 |   3.50   6.477 |   5.00   3.704
00872>               .67   4.128 |   2.17  42.866 |   3.67   5.943 |   5.17   3.548
00873>               .83   4.612 |   2.33  23.321 |   3.83   5.499 |   5.33   3.407
00874>              1.00   5.251 |   2.50  16.365 |   4.00   5.125 |   5.50   3.278
00875>              1.17   6.138 |   2.67  12.771 |   4.17   4.805 |   5.67   3.160
00876>              1.33   7.465 |   2.83  10.563 |   4.33   4.527 |   5.83   3.051
00877>              1.50   9.700 |   3.00   9.061 |   4.50   4.284 |   6.00   2.950
00878>
00879> ------------------------------------------------------------------------------
00880> 025:0003-------------------------------------------------------------------------
00881> *
00882> *#*****************************************************************************|
00883> *#
00884> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00885> *#        ============================================
00886> *#
00887> **#****************************************************************************|
00888> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
00889> ----------------------
00890> | CALIB STANDHYD     |   Area    (ha)=     .38
00891> | 01:101    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
00892> ----------------------
00893>                              IMPERVIOUS    PERVIOUS (i)
00894>      Surface Area     (ha)=        .25          .13
00895>      Dep. Storage     (mm)=       1.00        10.80
00896>      Average Slope     (%)=       2.00         2.00
00897>      Length            (m)=      10.00        10.00
00898>      Mannings n             =       .013         .250
00899>
00900>      Max.eff.Inten.(mm/hr)=     135.38        41.44
00901>                  over (min)        1.00         5.00
00902>      Storage Coeff.  (min)=        .46 (ii)    4.83 (ii)
00903>      Unit Hyd. Tpeak (min)=       1.00         5.00
00904>      Unit Hyd. peak  (cms)=       1.50          .23
00905>                                                          *TOTALS*
00906>      PEAK FLOW       (cms)=        .09          .01          .103 (iii)
00907>      TIME TO PEAK    (hrs)=       1.95         2.05         2.000
00908>      RUNOFF VOLUME    (mm)=      70.35        21.64        53.299
00909>      TOTAL RAINFALL   (mm)=      71.35        71.35        71.347
00910>      RUNOFF COEFFICIENT   =        .99          .30          .747
00911>
00912>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00913>            CN* =  70.0    Ia = Dep. Storage  (Above)
00914>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00915>            THAN THE STORAGE COEFFICIENT.
00916>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00917>
00918> ------------------------------------------------------------------------------
00919> 025:0004-------------------------------------------------------------------------
00920> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
00921> ----------------------
00922> | CALIB STANDHYD     |   Area    (ha)=     .38
00923> | 02:101    DT= 1.00 |   Total Imp(%)=   36.00   Dir. Conn.(%)=   36.00
00924> ----------------------
00925>                              IMPERVIOUS    PERVIOUS (i)
00926>      Surface Area     (ha)=        .14          .24
00927>      Dep. Storage     (mm)=       1.00        10.80
00928>      Average Slope     (%)=       1.50         1.50
00929>      Length            (m)=      20.00        20.00
00930>      Mannings n             =       .013         .250
00931>
00932>      Max.eff.Inten.(mm/hr)=     135.38        36.07
00933>                  over (min)        1.00         8.00
00934>      Storage Coeff.  (min)=        .76 (ii)    8.40 (ii)
00935>      Unit Hyd. Tpeak (min)=       1.00         8.00
00936>      Unit Hyd. peak  (cms)=       1.24          .14
00937>                                                          *TOTALS*
00938>      PEAK FLOW       (cms)=        .05          .02          .061 (iii)
00939>      TIME TO PEAK    (hrs)=       2.00         2.10         2.000
00940>      RUNOFF VOLUME    (mm)=      70.35        21.64        39.174
00941>      TOTAL RAINFALL   (mm)=      71.35        71.35        71.347
00942>      RUNOFF COEFFICIENT   =        .99          .30          .549
00943>
00944>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00945>            CN* =  70.0    Ia = Dep. Storage  (Above)
00946>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00947>            THAN THE STORAGE COEFFICIENT.
00948>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00949>
00950> ------------------------------------------------------------------------------
00951> 025:0005-------------------------------------------------------------------------
00952> *#*****************************************************************************|
00953> *#
00954> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
00955> *#        ==============================================
00956> *#
00957> **#****************************************************************************|
00958> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
00959> ----------------------
00960> | CALIB STANDHYD     |   Area    (ha)=     .34
00961> | 03:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
00962> ----------------------
00963>                              IMPERVIOUS    PERVIOUS (i)
00964>      Surface Area     (ha)=        .32          .02
00965>      Dep. Storage     (mm)=       1.00        10.80
00966>      Average Slope     (%)=       2.00         2.00
00967>      Length            (m)=      10.00        10.00
00968>      Mannings n             =       .013         .250
00969>
00970>      Max.eff.Inten.(mm/hr)=     135.38        41.44
00971>                  over (min)        1.00         5.00
00972>      Storage Coeff.  (min)=        .46 (ii)    4.83 (ii)
00973>      Unit Hyd. Tpeak (min)=       1.00         5.00
00974>      Unit Hyd. peak  (cms)=       1.50          .23
00975>                                                          *TOTALS*
00976>      PEAK FLOW       (cms)=        .12          .00          .122 (iii)
00977>      TIME TO PEAK    (hrs)=       1.95         2.05         2.000
00978>      RUNOFF VOLUME    (mm)=      70.35        21.64        67.424
00979>      TOTAL RAINFALL   (mm)=      71.35        71.35        71.347
00980>      RUNOFF COEFFICIENT   =        .99          .30          .945
00981>
00982>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
00983>            CN* =  70.0    Ia = Dep. Storage  (Above)
00984>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
00985>            THAN THE STORAGE COEFFICIENT.
00986>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
00987>
00988> ------------------------------------------------------------------------------
00989> 025:0006-------------------------------------------------------------------------
00990> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
00991> ----------------------
00992> | CALIB STANDHYD     |   Area    (ha)=     .04
00993> | 04:202    DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   75.00
00994> ----------------------
00995>                              IMPERVIOUS    PERVIOUS (i)
00996>      Surface Area     (ha)=        .03          .01
00997>      Dep. Storage     (mm)=       1.00        10.80
00998>      Average Slope     (%)=       2.00         2.00
00999>      Length            (m)=      10.00        10.00
01000>      Mannings n             =       .013         .250
01001>
01002>      Max.eff.Inten.(mm/hr)=     135.38        41.44
01003>                  over (min)        1.00         5.00
01004>      Storage Coeff.  (min)=        .46 (ii)    4.83 (ii)
01005>      Unit Hyd. Tpeak (min)=       1.00         5.00
01006>      Unit Hyd. peak  (cms)=       1.50          .23
01007>                                                          *TOTALS*
01008>      PEAK FLOW       (cms)=        .01          .00          .012 (iii)
01009>      TIME TO PEAK    (hrs)=       1.93         2.05         2.000
01010>      RUNOFF VOLUME    (mm)=      70.35        21.64        58.170
01011>      TOTAL RAINFALL   (mm)=      71.35        71.35        71.347
01012>      RUNOFF COEFFICIENT   =        .99          .30          .815
01013>
01014>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01015>            CN* =  70.0    Ia = Dep. Storage  (Above)
01016>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01017>            THAN THE STORAGE COEFFICIENT.
01018>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01019>
01020> ------------------------------------------------------------------------------
01021> 025:0007-------------------------------------------------------------------------
01022> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
01023> ----------------------
01024> | CALIB NASHYD       |   Area    (ha)=     .26   Curve Number   (CN)=70.00
01025> | 05:203    DT= 1.00 |   Ia      (mm)=  10.800   # of Linear Res.(N)= 3.00
01026> ----------------------   U.H. Tp(hrs)=    .100
01027>
01028>      Unit Hyd Qpeak  (cms)=     .099
01029>
01030>      PEAK FLOW       (cms)=     .019 (i)
01031>      TIME TO PEAK    (hrs)=    2.067
01032>      RUNOFF VOLUME    (mm)=   21.639
01033>      TOTAL RAINFALL   (mm)=   71.347
01034>      RUNOFF COEFFICIENT   =     .303
01035>
01036>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01037>
01038> ------------------------------------------------------------------------------
01039> 025:0008-------------------------------------------------------------------------
01040> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
01041> *
01042> ----------------------
01043> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01044> |  IN>03:(201    )   |
01045> | OUT<06:(201    )   |    =========  OUTLFOW STORAGE TABLE  =========
01046> ----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01047>                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
01048>                              .000  .0000E+00    |     .022  .1160E-01
01049>                              .022  .2200E-02    |     .022  .1420E-01
01050>                              .022  .2200E-02    |     .022  .1420E-01
01051>                              .022  .5200E-02    |     .031  .1610E-01
01052>                              .022  .8500E-02    |     .000  .0000E+00
01053>
01054>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01055>      ---------------------      (ha)     (cms)     (hrs)       (mm)
01056>      INFLOW >03: (201   )        .34      .122     2.000     67.424
01057>      OUTFLOW<06: (201   )        .34      .022     1.867     67.424
01058>     OVERFLOW<07: (OVF   )        .00      .000      .000       .000
01059>
01060>                      TOTAL NUMBER OF SIMULATED OVERFLOWS  =       0
01061>                      CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01062>                      PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01063>
01064>
01065>                      PEAK   FLOW   REDUCTION [Qout/Qin](%)=   17.652
01066>                      TIME SHIFT OF PEAK FLOW         (min)=    -8.00
01067>                      MAXIMUM  STORAGE   USED       (ha.m.)=.8968E-02
01068>
01069> ------------------------------------------------------------------------------
01070> 025:0009-------------------------------------------------------------------------
01071> ----------------------
01072> | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01073> ----------------------                   (ha)     (cms)   (hrs)   (mm)   (cms)
01074>                       ID1 04:202            .04      .012    2.00  58.17    .000
01075>                      +ID2 06:201            .34      .022    1.87  67.42    .000
01076>                      +ID3 07:OVF            .00      .000     .00    .00    .000
01077>                       ========================================================
01078>                       SUM 08:Total           .38      .034    2.00  66.46    .000
01079>
01080>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
```

```
01081>
01082> ----------------------------------------------------------------------------
01083> 025:0010----------------------------------------------------------------------
01084> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
01085> *
01086> ----------------------------------------------------------------------------
01087> 025:0002----------------------------------------------------------------------
01088> *
01089> ----------------------------------------------------------------------------
01090> 025:0002----------------------------------------------------------------------
01091> *
01092> ----------------------------------------------------------------------------
01093> 025:0002----------------------------------------------------------------------
01094> *
01095>   ** END OF RUN :  49
01096>
01097> ****************************************************************************
01098>
01099>
01100>
01101>
01102>
01103> --------------------
01104> | START            |  Project  dir.: T:\projects\22024\SWMHYMO\
01105> --------------------  Rainfall dir.: T:\projects\22024\SWMHYMO\
01106>     TZERO =   .00 hrs on        0
01107>     METOUT=   2 (output = METRIC)
01108>     NRUN  = 050
01109>     NSTORM=   1
01110>            #  1=BUR6_050.stm
01111> ----------------------------------------------------------------------------
01112> 050:0002----------------------------------------------------------------------
01113> *#*************************************************************************|
01114> *#  Project Name: 1396 GUELPH LINE
01115> *#               BURLINGTON, OMTARIO
01116> *#  JOB NUMBER  : 22024
01117> *#       Date   : MARCH 2022
01118> *#    Revised   :
01119> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
01120> *#       File   : 22024.DAT
01121> *#*************************************************************************|
01122> *
01123> ----------------------------------------------------------------------------
01124> 050:0002----------------------------------------------------------------------
01125> *
01126> --------------------
01127> | READ STORM       |    Filename: Burlington 50-yr 6hr CHICAGO     (A=1172
01128> | Ptotal=  78.93 mm|    Comments: Burlington 50-yr 6hr CHICAGO     (A=1172
01129> --------------------
01130>               TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
01131>                hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
01132>                .17   3.533 |   1.67  15.961 |   3.17   8.836 |   4.67   4.516
01133>                .33   3.817 |   1.83  36.356 |   3.33   7.913 |   4.83   4.304
01134>                .50   4.160 |   2.00 149.296 |   3.50   7.185 |   5.00   4.113
01135>                .67   4.582 |   2.17  47.374 |   3.67   6.593 |   5.17   3.940
01136>                .83   5.119 |   2.33  25.806 |   3.83   6.102 |   5.33   3.783
01137>               1.00   5.827 |   2.50  18.121 |   4.00   5.688 |   5.50   3.640
01138>               1.17   6.809 |   2.67  14.149 |   4.17   5.333 |   5.67   3.509
01139>               1.33   8.278 |   2.83  11.707 |   4.33   5.025 |   5.83   3.388
01140>               1.50  10.753 |   3.00  10.045 |   4.50   4.755 |   6.00   3.277
01141>
01142> ----------------------------------------------------------------------------
01143> 050:0003----------------------------------------------------------------------
01144> *
01145> *#*************************************************************************|
01146> *#
01147> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
01148> *#        ==============================================
01149> *#
01150> **#************************************************************************|
01151> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
01152> ----------------------
01153> | CALIB STANDHYD     |   Area    (ha)=     .38
01154> | 01:101    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
01155> ----------------------
01156>                              IMPERVIOUS    PERVIOUS (i)
01157>      Surface Area     (ha)=        .25          .13
01158>      Dep. Storage     (mm)=       1.00        10.80
01159>      Average Slope     (%)=       2.00         2.00
01160>      Length            (m)=      10.00        10.00
01161>      Mannings n             =       .013         .250
01162>
01163>      Max.eff.Inten.(mm/hr)=     149.30        52.80
01164>                   over (min)        1.00         4.00
01165>      Storage Coeff.  (min)=        .44 (ii)    4.41 (ii)
01166>      Unit Hyd. Tpeak (min)=       1.00         4.00
01167>      Unit Hyd. peak  (cms)=       1.52          .26
01168>                                                          *TOTALS*
01169>      PEAK FLOW       (cms)=        .10          .01          .117 (iii)
01170>      TIME TO PEAK    (hrs)=       1.95         2.03         2.000
01171>      RUNOFF VOLUME    (mm)=      77.93        26.23        59.835
01172>      TOTAL RAINFALL   (mm)=      78.93        78.93        78.932
01173>      RUNOFF COEFFICIENT   =        .99          .33          .758
01174>
01175>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01176>            CN* =  70.0    Ia = Dep. Storage  (Above)
01177>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01178>            THAN THE STORAGE COEFFICIENT.
01179>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01180>
01181> ----------------------------------------------------------------------------
01182> 050:0004----------------------------------------------------------------------
01183> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
01184> ----------------------
01185> | CALIB STANDHYD     |   Area    (ha)=     .38
01186> | 02:101    DT= 1.00 |   Total Imp(%)=   36.00   Dir. Conn.(%)=   36.00
01187> ----------------------
01188>                              IMPERVIOUS    PERVIOUS (i)
01189>      Surface Area     (ha)=        .14          .24
01190>      Dep. Storage     (mm)=       1.00        10.80
01191>      Average Slope     (%)=       1.50         1.50
01192>      Length            (m)=      20.00        20.00
01193>      Mannings n             =       .013         .250
01194>
01195>      Max.eff.Inten.(mm/hr)=     149.30        44.84
01196>                   over (min)        1.00         8.00
01197>      Storage Coeff.  (min)=        .73 (ii)    7.73 (ii)
01198>      Unit Hyd. Tpeak (min)=       1.00         8.00
01199>      Unit Hyd. peak  (cms)=       1.26          .14
01200>                                                          *TOTALS*
01201>      PEAK FLOW       (cms)=        .06          .02          .070 (iii)
01202>      TIME TO PEAK    (hrs)=       2.00         2.10         2.000
01203>      RUNOFF VOLUME    (mm)=      77.93        26.23        44.841
01204>      TOTAL RAINFALL   (mm)=      78.93        78.93        78.932
01205>      RUNOFF COEFFICIENT   =        .99          .33          .568
01206>
01207>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01208>            CN* =  70.0    Ia = Dep. Storage  (Above)
01209>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01210>            THAN THE STORAGE COEFFICIENT.
01211>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01212>
01213> ----------------------------------------------------------------------------
01214> 050:0005----------------------------------------------------------------------
01215> *#*************************************************************************|
01216> *#
01217> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
01218> *#        ===============================================
01219> *#
01220> **#************************************************************************|
01221> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
01222> ----------------------
01223> | CALIB STANDHYD     |   Area    (ha)=     .34
01224> | 03:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
01225> ----------------------
01226>                              IMPERVIOUS    PERVIOUS (i)
01227>      Surface Area     (ha)=        .32          .02
01228>      Dep. Storage     (mm)=       1.00        10.80
01229>      Average Slope     (%)=       2.00         2.00
01230>      Length            (m)=      10.00        10.00
01231>      Mannings n             =       .013         .250
01232>
01233>      Max.eff.Inten.(mm/hr)=     149.30        52.80
01234>                   over (min)        1.00         4.00
01235>      Storage Coeff.  (min)=        .44 (ii)    4.41 (ii)
01236>      Unit Hyd. Tpeak (min)=       1.00         4.00
01237>      Unit Hyd. peak  (cms)=       1.52          .26
01238>                                                          *TOTALS*
01239>      PEAK FLOW       (cms)=        .13          .00          .135 (iii)
01240>      TIME TO PEAK    (hrs)=       1.95         2.03         2.000
01241>      RUNOFF VOLUME    (mm)=      77.93        26.23        74.830
01242>      TOTAL RAINFALL   (mm)=      78.93        78.93        78.932
01243>      RUNOFF COEFFICIENT   =        .99          .33          .948
01244>
01245>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01246>            CN* =  70.0    Ia = Dep. Storage  (Above)
01247>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01248>            THAN THE STORAGE COEFFICIENT.
01249>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01250>
01251> ----------------------------------------------------------------------------
01252> 050:0006----------------------------------------------------------------------
01253> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
01254> ----------------------
01255> | CALIB STANDHYD     |   Area    (ha)=     .04
01256> | 04:202    DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   75.00
01257> ----------------------
01258>                              IMPERVIOUS    PERVIOUS (i)
01259>      Surface Area     (ha)=        .03          .01
01260>      Dep. Storage     (mm)=       1.00        10.80
01261>      Average Slope     (%)=       2.00         2.00
01262>      Length            (m)=      10.00        10.00
01263>      Mannings n             =       .013         .250
01264>
01265>      Max.eff.Inten.(mm/hr)=     149.30        52.80
01266>                   over (min)        1.00         4.00
01267>      Storage Coeff.  (min)=        .44 (ii)    4.41 (ii)
01268>      Unit Hyd. Tpeak (min)=       1.00         4.00
01269>      Unit Hyd. peak  (cms)=       1.52          .26
01270>                                                          *TOTALS*
01271>      PEAK FLOW       (cms)=        .01          .00          .013 (iii)
01272>      TIME TO PEAK    (hrs)=       1.93         2.03         2.000
01273>      RUNOFF VOLUME    (mm)=      77.93        26.23        65.006
01274>      TOTAL RAINFALL   (mm)=      78.93        78.93        78.932
01275>      RUNOFF COEFFICIENT   =        .99          .33          .824
01276>
01277>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01278>            CN* =  70.0    Ia = Dep. Storage  (Above)
01279>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01280>            THAN THE STORAGE COEFFICIENT.
01281>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01282>
01283> ----------------------------------------------------------------------------
01284> 050:0007----------------------------------------------------------------------
01285> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
01286> ----------------------
01287> | CALIB NASHYD       |   Area    (ha)=     .26   Curve Number   (CN)=70.00
01288> | 05:203    DT= 1.00 |   Ia      (mm)=  10.800   # of Linear Res.(N)= 3.00
01289> ----------------------   U.H. Tp(hrs)=    .100
01290>
01291>      Unit Hyd Qpeak  (cms)=     .099
01292>
01293>      PEAK FLOW       (cms)=     .024 (i)
01294>      TIME TO PEAK    (hrs)=    2.067
01295>      RUNOFF VOLUME    (mm)=   26.227
01296>      TOTAL RAINFALL   (mm)=   78.932
01297>      RUNOFF COEFFICIENT   =     .332
01298>
01299>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01300>
01301> ----------------------------------------------------------------------------
01302> 050:0008----------------------------------------------------------------------
01303> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
01304> *
01305> ----------------------
01306> | ROUTE RESERVOIR    |    Requested routing time step =  1.0 min.
01307> |  IN>03:(201   )    |
01308> |  OUT<06:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
01309> ----------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01310>                             (cms)    (ha.m.)   |    (cms)    (ha.m.)
01311>                              .000  .0000E+00   |     .022  .1160E-01
01312>                              .022  .2200E-02   |     .022  .1420E-01
01313>                              .022  .2200E-02   |     .022  .1420E-01
01314>                              .022  .5200E-02   |     .031  .1610E-01
01315>                              .022  .8500E-02   |     .000  .0000E+00
01316>
01317>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01318>      ---------------------       (ha)     (cms)     (hrs)       (mm)
01319>      INFLOW >03: (201   )        .34      .135     2.000     74.830
01320>      OUTFLOW<06: (201   )        .34      .022     1.850     74.830
01321>     OVERFLOW<07: (OVF   )        .00      .000      .000       .000
01322>
01323>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01324>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01325>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01326>
01327>
01328>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   15.954
01329>                     TIME SHIFT OF PEAK FLOW         (min)=    -9.00
01330>                     MAXIMUM  STORAGE   USED       (ha.m.)=.1033E-01
01331>
01332> ----------------------------------------------------------------------------
01333> 050:0009----------------------------------------------------------------------
01334> ------------------------
01335> | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01336> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
01337>                         ID1 04:202          .04     .013    2.00  65.01    .000
01338>                        +ID2 06:201          .34     .022    1.85  74.83    .000
01339>                        +ID3 07:OVF          .00     .000     .00    .00    .000
01340>                         ========================================================
01341>                         SUM 08:Total         .38     .035    2.00  73.80    .000
01342>
01343>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01344>
01345> ----------------------------------------------------------------------------
01346> 050:0010----------------------------------------------------------------------
01347> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
01348> *
01349> ----------------------------------------------------------------------------
01350> 050:0002----------------------------------------------------------------------
```

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01351> *
01352> ------------------------------------------------------------------------------
01353> 050:0002------------------------------------------------------------------------
01354> *
01355> ------------------------------------------------------------------------------
01356> 050:0002------------------------------------------------------------------------
01357> *
01358> ------------------------------------------------------------------------------
01359> 050:0002------------------------------------------------------------------------
01360> *
01361>  ** END OF RUN :  99
01362>
01363> ****************************************************************************
01364>
01365>
01366>
01367>
01368>
01369> --------------------
01370> | START            |  Project  dir.: T:\projects\22024\SWMHYMO\
01371> -------------------- Rainfall dir.: T:\projects\22024\SWMHYMO\
01372>    TZERO =    .00 hrs on      0
01373>    METOUT=   2 (output = METRIC)
01374>    NRUN  = 100
01375>    NSTORM=   1
01376>           #  1=BUR6_100.stm
01377> ------------------------------------------------------------------------------
01378> 100:0002------------------------------------------------------------------------
01379> *#*************************************************************************|
01380> *#  Project Name: 1396 GUELPH LINE
01381> *#               BURLINGTON, OMTARIO
01382> *#  JOB NUMBER  : 22024
01383> *#     Date     : MARCH 2022
01384> *#    Revised   :
01385> *#    Company   : S. LLEWELLYN AND ASSOCIATES LTD.
01386> *#      File    : 22024.DAT
01387> *#*************************************************************************|
01388> *
01389> ------------------------------------------------------------------------------
01390> 100:0002------------------------------------------------------------------------
01391> *
01392> --------------------
01393> | READ STORM       |    Filename: Burlington 100-yr 6hr CHICAGO        (A=
01394> | Ptotal=  86.27 mm|    Comments: Burlington 100-yr 6hr CHICAGO        (A=
01395> --------------------
                  TIME    RAIN |   TIME    RAIN |   TIME    RAIN |   TIME    RAIN
                   hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr |    hrs   mm/hr
                   .17   3.862 |   1.67  17.445 |   3.17   9.657 |   4.67   4.936
                   .33   4.172 |   1.83  39.736 |   3.33   8.649 |   4.83   4.704
                   .50   4.546 |   2.00 163.177 |   3.50   7.853 |   5.00   4.495
                   .67   5.008 |   2.17  51.779 |   3.67   7.206 |   5.17   4.306
                   .83   5.595 |   2.33  28.205 |   3.83   6.670 |   5.33   4.135
                  1.00   6.369 |   2.50  19.806 |   4.00   6.217 |   5.50   3.979
                  1.17   7.443 |   2.67  15.465 |   4.17   5.829 |   5.67   3.835
                  1.33   9.048 |   2.83  12.795 |   4.33   5.492 |   5.83   3.703
                  1.50  11.752 |   3.00  10.979 |   4.50   5.197 |   6.00   3.581
01407>
01408> ------------------------------------------------------------------------------
01409> 100:0003------------------------------------------------------------------------
01410> *
01411> *#*************************************************************************|
01412> *#
01413> *#        PRE-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
01414> *#        ============================================
01415> *#
01416> **#************************************************************************|
01417> *# CATCHMENT 101 - EXISTING CONDITIONS (To Guelph Line)
01418> ----------------------
01419> | CALIB STANDHYD     |   Area    (ha)=     .38
01420> | 01:101    DT= 1.00 |   Total Imp(%)=   65.00   Dir. Conn.(%)=   65.00
01421> ----------------------
01422>                              IMPERVIOUS    PERVIOUS (i)
01423>      Surface Area     (ha)=        .25          .13
01424>      Dep. Storage     (mm)=       1.00         10.80
01425>      Average Slope     (%)=       2.00          2.00
01426>      Length            (m)=      10.00         10.00
01427>      Mannings n            =       .013          .250
01428>
01429>      Max.eff.Inten.(mm/hr)=     163.18        62.91
01430>                    over (min)        1.00          4.00
01431>      Storage Coeff.  (min)=        .43 (ii)    4.13 (ii)
01432>      Unit Hyd. Tpeak (min)=       1.00          4.00
01433>      Unit Hyd. peak  (cms)=       1.53           .28
01434>                                                          *TOTALS*
01435>      PEAK FLOW       (cms)=        .11           .02          .130 (iii)
01436>      TIME TO PEAK    (hrs)=       1.95          2.03         2.000
01437>      RUNOFF VOLUME    (mm)=      85.27         30.90        66.242
01438>      TOTAL RAINFALL   (mm)=      86.27         86.27        86.271
01439>      RUNOFF COEFFICIENT   =        .99           .36          .768
01440>
01441>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01442>            CN* =  70.0    Ia = Dep. Storage  (Above)
01443>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01444>            THAN THE STORAGE COEFFICIENT.
01445>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01446>
01447> ------------------------------------------------------------------------------
01448> 100:0004------------------------------------------------------------------------
01449> *# ALLOWABLE - EXISTING CONDITIONS (Allowable Discharge)
01450> ----------------------
01451> | CALIB STANDHYD     |   Area    (ha)=     .38
01452> | 02:101    DT= 1.00 |   Total Imp(%)=   36.00   Dir. Conn.(%)=   36.00
01453> ----------------------
01454>                              IMPERVIOUS    PERVIOUS (i)
01455>      Surface Area     (ha)=        .14           .24
01456>      Dep. Storage     (mm)=       1.00         10.80
01457>      Average Slope     (%)=       1.50          1.50
01458>      Length            (m)=      20.00         20.00
01459>      Mannings n            =       .013          .250
01460>
01461>      Max.eff.Inten.(mm/hr)=     163.18        56.39
01462>                    over (min)        1.00          7.00
01463>      Storage Coeff.  (min)=        .71 (ii)    7.09 (ii)
01464>      Unit Hyd. Tpeak (min)=       1.00          7.00
01465>      Unit Hyd. peak  (cms)=       1.29           .16
01466>                                                          *TOTALS*
01467>      PEAK FLOW       (cms)=        .06           .03          .081 (iii)
01468>      TIME TO PEAK    (hrs)=       2.00          2.08         2.000
01469>      RUNOFF VOLUME    (mm)=      85.27         30.90        50.474
01470>      TOTAL RAINFALL   (mm)=      86.27         86.27        86.271
01471>      RUNOFF COEFFICIENT   =        .99           .36          .585
01472>
01473>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01474>            CN* =  70.0    Ia = Dep. Storage  (Above)
01475>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01476>            THAN THE STORAGE COEFFICIENT.
01477>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01478>
01479> ------------------------------------------------------------------------------
01480> 100:0005------------------------------------------------------------------------
01481> *#*************************************************************************|
01482> *#
01483> *#        POST-DEVELOPMENT CONDITIONS HYDROLOGIC MODELING
01484> *#        =============================================
01485> *#
01486> **#************************************************************************|
01487> *# CATCHMENT 201 - PROPOSED CONDITIONS (Controlled To Guelph Line)
01488> ----------------------
01489> | CALIB STANDHYD     |   Area    (ha)=     .34
01490> | 03:201    DT= 1.00 |   Total Imp(%)=   94.00   Dir. Conn.(%)=   94.00
01491> ----------------------
01492>                              IMPERVIOUS    PERVIOUS (i)
01493>      Surface Area     (ha)=        .32           .02
01494>      Dep. Storage     (mm)=       1.00         10.80
01495>      Average Slope     (%)=       2.00          2.00
01496>      Length            (m)=      10.00         10.00
01497>      Mannings n            =       .013          .250
01498>
01499>      Max.eff.Inten.(mm/hr)=     163.18        62.91
01500>                    over (min)        1.00          4.00
01501>      Storage Coeff.  (min)=        .43 (ii)    4.13 (ii)
01502>      Unit Hyd. Tpeak (min)=       1.00          4.00
01503>      Unit Hyd. peak  (cms)=       1.53           .28
01504>                                                          *TOTALS*
01505>      PEAK FLOW       (cms)=        .15           .00          .148 (iii)
01506>      TIME TO PEAK    (hrs)=       1.95          2.03         2.000
01507>      RUNOFF VOLUME    (mm)=      85.27         30.90        82.009
01508>      TOTAL RAINFALL   (mm)=      86.27         86.27        86.271
01509>      RUNOFF COEFFICIENT   =        .99           .36          .951
01510>
01511>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01512>            CN* =  70.0    Ia = Dep. Storage  (Above)
01513>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01514>            THAN THE STORAGE COEFFICIENT.
01515>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01516>
01517> ------------------------------------------------------------------------------
01518> 100:0006------------------------------------------------------------------------
01519> *# CATCHMENT 202 - PROPOSED CONDITIONS (Uncontrolled To Guelph Line)
01520> ----------------------
01521> | CALIB STANDHYD     |   Area    (ha)=     .04
01522> | 04:202    DT= 1.00 |   Total Imp(%)=   75.00   Dir. Conn.(%)=   75.00
01523> ----------------------
01524>                              IMPERVIOUS    PERVIOUS (i)
01525>      Surface Area     (ha)=        .03           .01
01526>      Dep. Storage     (mm)=       1.00         10.80
01527>      Average Slope     (%)=       2.00          2.00
01528>      Length            (m)=      10.00         10.00
01529>      Mannings n            =       .013          .250
01530>
01531>      Max.eff.Inten.(mm/hr)=     163.18        62.91
01532>                    over (min)        1.00          4.00
01533>      Storage Coeff.  (min)=        .43 (ii)    4.13 (ii)
01534>      Unit Hyd. Tpeak (min)=       1.00          4.00
01535>      Unit Hyd. peak  (cms)=       1.53           .28
01536>                                                          *TOTALS*
01537>      PEAK FLOW       (cms)=        .01           .00          .015 (iii)
01538>      TIME TO PEAK    (hrs)=       1.93          2.03         2.000
01539>      RUNOFF VOLUME    (mm)=      85.27         30.90        71.678
01540>      TOTAL RAINFALL   (mm)=      86.27         86.27        86.271
01541>      RUNOFF COEFFICIENT   =        .99           .36          .831
01542>
01543>        (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
01544>            CN* =  70.0    Ia = Dep. Storage  (Above)
01545>       (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
01546>            THAN THE STORAGE COEFFICIENT.
01547>      (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01548>
01549> ------------------------------------------------------------------------------
01550> 100:0007------------------------------------------------------------------------
01551> *# CATCHMENT 203 - PROPOSED CONDITIONS (Extrenal Uncontrolled to Guelph Line)
01552> ----------------------
01553> | CALIB NASHYD       |   Area    (ha)=     .26   Curve Number   (CN)=70.00
01554> | 05:203    DT= 1.00 |   Ia      (mm)=  10.800   # of Linear Res.(N)= 3.00
01555> ----------------------   U.H. Tp(hrs)=    .100
01556>
01557>      Unit Hyd Qpeak  (cms)=     .099
01558>
01559>      PEAK FLOW       (cms)=     .029 (i)
01560>      TIME TO PEAK    (hrs)=    2.067
01561>      RUNOFF VOLUME    (mm)=   30.900
01562>      TOTAL RAINFALL   (mm)=   86.271
01563>      RUNOFF COEFFICIENT   =     .358
01564>
01565>      (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.
01566>
01567> ------------------------------------------------------------------------------
01568> 100:0008------------------------------------------------------------------------
01569> *# ROUTE CATCHMENT 201 THROUGH ORIFICE CONTROL
01570> *
01571> ---------------------
01572> | ROUTE RESERVOIR   |    Requested routing time step =  1.0 min.
01573> |  IN>03:(201   )   |
01574> | OUT<06:(201   )   |    =========  OUTLFOW STORAGE TABLE  =========
01575> ---------------------    OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
01576>                            (cms)    (ha.m.)   |    (cms)    (ha.m.)
01577>                             .000  .0000E+00   |     .022  .1160E-01
01578>                             .022  .2200E-02   |     .022  .1420E-01
01579>                             .022  .2200E-02   |     .022  .1420E-01
01580>                             .022  .5200E-02   |     .031  .1610E-01
01581>                             .022  .8500E-02   |     .000  .0000E+00
01582>
01583>      ROUTING RESULTS            AREA     QPEAK     TPEAK       R.V.
01584>      --------------------       (ha)     (cms)     (hrs)       (mm)
01585>      INFLOW >03: (201   )        .34      .148     2.000     82.009
01586>      OUTFLOW<06: (201   )        .34      .022     1.833     82.009
01587>     OVERFLOW<07: (OVF   )        .00      .000      .000       .000
01588>
01589>                     TOTAL NUMBER OF SIMULATED OVERFLOWS  =        0
01590>                     CUMULATIVE TIME OF OVERFLOWS  (hours)=      .00
01591>                     PERCENTAGE OF TIME OVERFLOWING    (%)=      .00
01592>
01593>
01594>                     PEAK   FLOW   REDUCTION [Qout/Qin](%)=   14.567
01595>                     TIME SHIFT OF PEAK FLOW         (min)=   -10.00
01596>                     MAXIMUM  STORAGE   USED       (ha.m.)=.1169E-01
01597>
01598> ------------------------------------------------------------------------------
01599> 100:0009------------------------------------------------------------------------
01600> ------------------------
01601> | ADD HYD (Total     ) | ID: NHYD         AREA     QPEAK   TPEAK   R.V.    DWF
01602> ------------------------                  (ha)     (cms)   (hrs)   (mm)   (cms)
01603>                          ID1 04:202         .04      .015    2.00  71.68    .000
01604>                         +ID2 06:201         .34      .022    1.83  82.01    .000
01605>                         +ID3 07:OVF         .00      .000     .00    .00    .000
01606>                          ========================================================
01607>                          SUM 08:Total       .38      .036    2.00  80.93    .000
01608>
01609>    NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.
01610>
01611> ------------------------------------------------------------------------------
01612> 100:0010------------------------------------------------------------------------
01613> * RUN REMAINING DESIGN STORMS (City of Burlington 5 TO 100-YR)
01614> *
01615> ------------------------------------------------------------------------------
01616> 100:0002------------------------------------------------------------------------
01617> *
01618> ------------------------------------------------------------------------------
01619> 100:0002------------------------------------------------------------------------
01620> *
```

```
01621> ------------------------------------------------------------------------------
01622> 100:0002----------------------------------------------------------------------
01623> *
01624> ------------------------------------------------------------------------------
01625> 100:0002----------------------------------------------------------------------
01626> *
01627> ------------------------------------------------------------------------------
01628> 100:0002----------------------------------------------------------------------
01629> *
01630>       FINISH
01631> ------------------------------------------------------------------------------
01632> ******************************************************************************
01633>      WARNINGS / ERRORS / NOTES
01634>      -------------------------
01635>    Simulation ended on 2022-03-09     at 13:48:52
01636> ==============================================================================
01637>
01638>
```

APPENDIX C

FIRE FLOW ANALYSIS

FIRE FLOW DEMAND REQUIREMENTS - FIRE UNDERWRITERS SURVEY (FUS GUIDELINES)

Project Number: 22024
Project Name: 1396 Guelph Line
Date: 9-Mar-22

Fire flow demands for the FUS method is based on information and guidance provided in "Water Supply for Public Protection" (Fire Underwriters Survey, 1999).

An estimate of the fire flow required is given by the following formula:

$$F = 220\,C\sqrt{A} \qquad \textbf{(1)}$$

where:

F = the required fire flow in litres per minute
C = coefficient related to the type of construction
= 1.5 for wood frame construction (structure essentially all combustible).
= 1.0 for ordinary construction (brick or other masonry walls, combustible floor and interior)
= 0.8 for non-combustible construction (unprotected metal structural components, masonry or metal walls)
= 0.6 for fire-resistive construction (fully protected frame, floors, roof)
A = Total floor area in square metres

	Building Area				(1)		(2)			(3)		(4)		Final Adjusted Fire Flow	
Building / Location	Footprint Area (m^2)	# of Storeys	**Total GFA* (m^2)**	Type of Construction	***Fire Flow "F"*** (l/min)	(l/s)	***Occupancy*** %	Adjustment (l/min)	**Adjusted Fire Flow (l/min)**	***Sprinkler*** %	Adjustment (l/min)	***Exposure*** %	Adjustment (l/min)	**(l/min)**	**(l/s)**
11-Storey Building	**16747.0**	**1**	**16747**	**0.8**	23000	383.3	**-15**	-3450.0	**19550.0**	**-50**	-9775.0	25	4887.5	**15000**	**250**

(2) Occupancy

Non-Combustible	-25%
Limited Combustible	-15%
Combustible	No charge
Free Burning	15%
Rapid Burning	25%

(3) Sprinkler

Minimum credit for systems designed to NFPA 13 is 30%.

If the domestic and fire services are supplied by the same municipal water system, then take an additional 10%.

If the sprinkler system is fully supervised (ie. annunciator panel that alerts the Fire Dept., such as a school), then an additional 10% can be taken. Maximum credit = 50%.

(4) Exposure

			Side	Exposure (m)	Charge (%)
0 to 3m	25%		North =	**>45**	**0**
3.1 to 10m	20%	Calculate for all	South =	**20.1 to 30m**	**10**
10.1 to 20m	15%	sides. Maximum	East =	**10.1 to 20m**	**15**
20.1 to 30m	10%	charge shall not	West =	**>45**	**0**
30.1 to 45m	5%	exceed 75%	***Total Expoure =***		***25***

APPENDIX D

GEOTECHNICAL INVESTIGATION

FISHER ENGINEERING

ENGINEERING

Professional Engineers Ontario

LABORATORY

CALA
Canadian Association for Laboratory Accreditation Inc.

GEOTECHNICAL INVESTIGATION



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Prepared for:

INFINITY DEVELOPMENT GROUP

Project No. FE-P 22-11966Geo

March 11, 2022

Issued to:	Infinity Development Group
Contact:	Arjun Anand Arjun.anand@infinitydevelopment.ca
Project Name:	Geotechnical Investigation for Proposed Development
Project Address:	1396 Guelph Line, Burlington, ON
Project Number:	FE-P 22-11966Geo
Issued on:	March 11, 2022
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1. INTRODUCTION

Fisher Engineering Limited (Fisher) was commissioned by Infinity Development Group to conduct a Geotechnical Investigation for the proposed redevelopment of the property located at 1396 Guelph Line, Burlington, ON hereinafter referred to as the 'Site'.

The purpose of this investigation was to assess subsurface soil and groundwater conditions at the Site, and to outline geotechnical parameters and make recommendations for the design of the proposed redevelopment.

Discussion of the findings and results of the geotechnical investigation is in accordance with the general terms of reference. This report was prepared specifically and solely for the purpose of assessing geotechnical conditions as they relate to the development of the site with respect to the proposed structures as detailed to Fisher at the time of the investigation.

2. SITE and PROJECT DESCRIPTIONS

Site Settings

Guelph line is taken as running in a north-south direction for the purpose of this report. The site is located on the west side of Guelph Line, in a mixed commercial-residential neighbourhood, approximately 1.5km north of the onramp with Queen Elizabeth Way and is bounded by Guelph Line to the east, residential properties to the south, a hydro corridor to the west and north, beyond which are houses.

At the time of the investigation, the site was occupied by a single-storey commercial building with loading area located at the rear. The remaining areas of the site were mainly covered with asphalt pavement and utilized for parking.

Topography

The site is mostly flat and graded for drainage towards catch basins.

Proposed Development

It was understood that the existing building will be demolished to permit the construction of a new eleven-storey residential building, with three levels of underground parking. Finished Floor Elevation (FFE) is expected at 131.45m asl with TOS for P3 at 9.75m below (121.70m asl) according to the Site Plans prepared by Zedd Architecture dated March 8, 2022.

3. SCOPE OF GEOTECHNICAL WORK

The geotechnical scope of work included the following:

- Investigation of subsurface conditions at the site by advancing boreholes, soil sampling and visual evaluation.
- Prepare a geotechnical report with general comments and recommendations regarding:
  - Appropriate foundation depths, type and bearing pressures (SLS & ULS)
  - Seismic site classification
  - Slab-on-grade construction
  - Pavement construction
  - Excavation etc.

4. FIELD AND LABORATORY WORK

Public utilities clearances were carried out by Ontario One-Call while private utilities clearances were done by Utility Marks on behalf of Fisher Engineering.

Subsurface Investigation

Field exploration for the geotechnical investigation was carried out concurrent with drilling for the hydrogeological investigation on March 2 and 3, 2022 and consisted of (6) borehole advanced to depths of 9.12m to 15.32m below prevailing grade. All boreholes were instrumented as monitoring wells with 3.05m (10') long, 51mm diameter PVC slotted screen pipes. A clean silica sand pack was placed around each well screen which was isolated with bentonite extending to slightly below existing grade as shown on the Log of Boreholes in Appendix B.

A CME-55 Truck mounted drill rig equipped with solid stem augurs, supplied by Terra Firma Services, was used for all drilling work under direct supervision of Fisher Engineering personnel. Soil samples, in the overburden soils, were taken at regular intervals using a split–spoon sampler advanced by means of the Standard Penetration Test (SPT) which was conducted in general accordance with ASTM Specification D1586. Field tests to determine engineering parameters of the soils were carried out during drilling, which included Standard Penetration Tests (SPT). Approximate locations of the boreholes are shown on the Borehole Location Plan in Appendix A.

Laboratory Analyses

The soil samples were taken to the Fisher Environmental laboratory for further visual assessment and classification. Three (3) representative soil samples from BH1, BH3 and BH6 were submitted for grain size analyses and nine (9) samples for moisture content tests. Two (2) samples were submitted for pH, Chloride and Sulphate analyses to determine impact on concrete. The laboratory samples were tested and classified in general accordance with the Unified Soil Classification System, ASTM D 2487, and Standard Practice for Classification of Soil for Engineering Purposes. The laboratory results, which are presented in Appendix C, confirm the field description for subsurface soils discussed in Section 5.0.

The soil samples recovered during the investigation will be stored in the Fisher Environmental laboratory for a period of 30 days after submitting this report and will be discarded thereafter unless instructed otherwise by the client.

Site Survey

Elevations at borehole/monitoring well locations were interpolated from a topographic survey plan, prepared by Ashenhurst Nouwens & Associates Inc, dated December 20, 2021.

5. SUBSOIL AND BEDROCK CONDITIONS

Surface and subsurface conditions encountered at borehole locations are shown in Appendix B - Log of Boreholes and are summarized in the following sections. The logs include soil stratification at borehole locations along with detailed soil descriptions. Variations in soil stratification may occur and should be expected between borehole locations and elsewhere on the site.

Asphalt/Fill - Approximately 1.5” to 3” of asphalt pavement was encountered at the surface of all boreholes and was underlain by granular material consisting generally of moist, dense gravelly sand to sand and gravel. Fill soils consisting of dark grey to black clayey silt to brown sandy silt with trace gravel, pieces of concrete and asphalt and some organic materials were encountered below the granular material in BH1, BH3, BH5 and BH6. A layer of dark brown, moist, firm clayey silt at 0.91m to 2.29m in BH4 could not be positively identified and was described as ‘possibly fill’. Fill depths and elevations are presented in Table 1.

Grey to Brown Sandy Silt Till – A layer of grey/grey to brown, generally moist, compact, sandy silt till, with trace gravel and trace clay was encountered below the fill of BH1, BH2, BH4 (possibly fill), BH5 and BH6 and below clayey silt till in BH3. The sandy silt layer extended to depths of 1.98m (BH1) to 3.35m (BH6).

Reddish Brown Silt to Clayey Silt Till - Reddish brown, moist to dry, hard to very stiff, clayey silt till with trace sand and pieces of shale/cobbles was encountered generally below the sandy silt till extending to depths of 5.18m (BH5) to 6.10m (BH2 & BH4).

Light Brown Silty Sand - A layer of light brown, wet, silty sand was encountered at depths of 2.44m to 3.05m bgs in BH3.

Red Weathered Shale – Red, moist to dry, hard, weathered shale was encountered beneath the overburden soils in all boreholes at depths of 5.18m (BH5) to 6.10m (BH2, BH3 & BH4). Power auguring was undertaken to refusal in the weathered shale to borehole termination depths of 9.25m (BH6) to 15.37m (BH3).

Table 1: Summary of Depth and Elevation of Fill

Borehole No.	Surface Elevation (m asl)	Depth of Borehole (m bgs)	Ele at Bottom of Borehole (m asl)	Depth of Fill (m bgs)	Ele at Bottom of Fill (m asl)
BH1	131.11	10.75	120.36	0.91	130.20
BH2	131.27	10.36	120.91	0.46	130.81
BH3	130.96	15.37	115.59	1.68	129.28
BH4	130.64	15.24	115.40	1.52	129.12
BH5	129.92	13.80	116.12	0.61	129.31
BH6	130.12	9.25	120.87	1.37	128.75

6. GROUNDWATER CONDITIONS

Boreholes were advanced using dry auguring and subsoils and groundwater conditions observed and recorded during the field investigation. Standing water was measured at 5.18m in BH2 and BH4 and at 4.57m bgs in BH6 on completion of drilling. The other open boreholes were observed to be dry. A layer of wet silty sand was observed in BH6 between 2.44m and 3.05m bgs while wet seams were observed at 4.57m bgs.

The monitoring wells were purged/developed and groundwater levels measured. Measured groundwater depths and elevations are summarized in Table 2.

Based on the preceding and visual examination of the soil samples, it was concluded that groundwater exists in layers/seams of silty sand in some areas of the site. Perched water may also be encountered in the wet seams/pockets/layers trapped inside the fill or trapped/interbedded inside the native soils. Groundwater levels are also expected to fluctuate with seasonal weather conditions.

Table 2 – Measured Groundwater Depths and Elevations

Well No.		MW1	MW2	MW3	MW4	MW5	BH6
Elev. at Ground (m asl)		131.11	131.27	130.96	130.64	129.92	130.12
Depth of MW	m bgs	10.67	10.36	14.63	15.24	13.41	9.15
Elev. at bottom of well	m asl	120.44	120.91	116.33	115.40	116.51	120.97
On Completion	GW level, m bgs	Dry	5.18	Dry	5.18	Dry	4.57
	GW Ele, m asl	-	126.09	-	125.46	-	125.55
2-Mar-22	GW level, m bgs	n/a	n/a	12.64	11.17	n/a	2.84
	GW Ele, m asl	-	-	118.32	119.47	-	127.28
9-Mar-22	GW level, m bgs	10.15	3.57	4.00	3.95	6.05	2.70
	GW Ele, m asl	120.96	127.70	126.96	126.69	123.87	127.42

7. FOUNDATION CONSIDERATIONS

It is understood that the proposed development will comprise the construction of an eleven-storey residential building with three underground parking levels. FFE is 131.45m with TOS for P3 at 121.70m asl. The investigation showed that the predominant native stratum below the overburden soils, is fair to good quality rock.

7.1 Spread/Strip Footing Founded on Native Shale

The proposed building, with three underground levels, may be supported on conventional spread/strip footings in the native undisturbed shale bedrock at approximate elevations of 120.5m or below.

Spread/strip footings may be proportioned using bearing resistances given below. Differential settlement is not expected to be significant as the rock conditions were consistent across the site. For foundations embedded in bedrock, or socketed at least 0.5m into sound shale, bearing resistances can be taken as follows:

Bearing Resistance at SLS = 1000 kPa
Factored Bearing Resistance at ULS = 1200 kPa

7.2 General Comments about Footing Construction

- The as-built vertical / horizontal alignment and conditions of existing underground services should be established prior to the design / construction stage.
- In the area of existing structure footings / service trenches, the proposed footings should be established below existing footings and inverts of services in native undisturbed soils or alternatively could potentially be bridged over the trench backfill (subject to review by a structural engineer).
- Adjacent footings founded at different elevations should be stepped at 10 horizontal to 7 vertical.
- Footings subjected to seasonal winter weather, such as exterior wall and column footings, should be founded at least 1.2m below the adjacent finished grades to prevent any damage due to frost penetration.
- During construction, should areas of less competent material be encountered at the design grade, over excavations may be advanced until suitable conditions are achieved. The resulting over excavation may be returned to the proposed design grade through the placement of a low strength concrete (~2 MPa). This should be conducted under direct supervision of geotechnical personnel from Fisher.

7.3 Seismic Design Considerations

The 2012 OBC Subsection 4.1.8.7 stipulates that earthquake design for building should be based on the average properties of the top 30m soil profile.

The parameters for determining Site Classification for Seismic Site Response are given in Table 4.1.8.4A of the 2012 OBC. Site Classification for Seismic Site Response (Table 4.1.8.4.A) is based on the average shear wave velocity or Standard Penetration Resistance (N60), or the undrained shear strength of the soils (Su).

Based on the results of the current geotechnical investigation, the site designation for seismic analysis applicable for the proposed buildings with three levels of underground parking and footings placed over sound bedrock is expected to be **"Class B".** Shear wave velocity tests are recommended to confirm seismic classification and to determine if Site Class 'A' may be available for footings placed over the solid shale material.

7.4 Basement Walls

Basement walls should be designed to resist a minimum pressure "p", in the overburden soils, at any depth "h" below the surface, as given by the expression:

$$\boldsymbol{p = K[\Upsilon h + q]}$$

Where: K = coefficient of earth pressure

Υ = 21.0 kN/m^3 is the unit weight of backfill and

q = an allowance for surcharge in kPa.

The preceding equation assumes that a perimeter drainage system, as shown in Appendix D, will be provided and that the backfill against subsurface walls, where applicable, would be a free-draining granular material. If perimeter/underfloor drainage systems are not feasible or permitted, and a watertight structure (bath tub) design (full or partial) is adopted, then impacted lowest parking garage floor slab must be designed to resist hydrostatic/uplift pressures and be waterproofed. Potential/anticipated highest groundwater level during the life of the structure should be used to determine the water pressures. Parking garage walls should be waterproofed to at least 1m above the highest water level.

For a waterproofed basement, the lateral earth pressures acting on basement walls may be calculated from the following expression:

$$p = K (\gamma h_1 + \gamma' h_2 + q) + \gamma_w h_2$$

where p = lateral earth pressure in kPa acting at depth h

K = earth pressure coefficient, assumed to be 0.4 for vertical walls and horizontal backfill

γ' = submerged unit weight of backfill of 12 kN/m^3 may be assumed

γ_w = Unit weight of water, a value of 10 kN/m^3 can be used

h_1 = depth to the highest groundwater table in metre

h_2 = depth below water table in metres

q = Equivalent value of surcharge on the ground surface in kPa

7.5 Excavation and Backfill

Excavation on the site is expected to encounter layers of sandy silt and clayey silt fill with some debris. The fill may be classified as Type 3 soil (previously excavated or disturbed). The fill is generally underlain sandy silt till with silt to clayey silt till at further depths. The till below the fill may be classified as Type 2 soils. The red shale is part of a sedimentary formation with moisture content and strength properties of a Type 1 soil as set out in the Occupational Health and Safety Act Classification Part III.

For the proposed construction it should be possible to excavate the weathered shale and most of the hard shale with either a backhoe equipped with a rock bucket for service trenches, or a dozer mounted with rock rippers for large excavation areas.

Excavation for footings or underground services must be carried out in accordance with the latest edition of the Occupational Health and Safety Act (OHSA).

Slopes in the sandy silt till and clayey silt fill may be constructed at a gradient of 1H:1V. For excavation into native silt and sand layers, where encountered, a vertical face can be supported up to 1.2m. For excavations deeper than 1.2m, the sides must be sloped at a gradient of 1:1 in accordance with requirements of the OHSA. If this condition cannot be met, a temporary shoring system should be introduced.

Excavation into the solid shale should be stable at near vertical side slopes during the construction period provided adequate measures are taken to ensure the face of the rock remains in good condition. Where weathered shale is encountered, this should be cut back to approximately 2V:1H. In order to prevent loose material spilling into the excavated areas, grouting of fractures may be required to stabilize the face of the excavation.

Groundwater level in the excavation area is expected to vary depending on the time of year, and precipitation in the period of construction. Vertical seepage through the shale should be negligible, however horizontal seepage can be significant where fissures, fractures and local weathering of the rock layers exist. Water in the excavation, due to seepage from the more permeable seams/lenses or surface run-off, can be controlled by pumping from sump pits at the base of the excavation.

It is anticipated that significant amount of excavated material on the site will be red shale. Weathered shale will appear to be, and closely resemble, very stiff to hard clayey soil. The more solid shale will be in the form of large slabs. The excavated shale can be reused as backfill material after inspection by a

geotechnical engineer. Prior to reuse as backfill, the shale material will need to be conditioned as engineering fill by breaking down the material into maximum 150mm sizes and moisture conditioning the dry shale with water. Compaction should then be carried out with heavy steel vibratory pad or similar equipment in controlled lift thicknesses.

The material to be used for backfill in service trenches should be suitable for compaction, i.e., free of organics and with moisture content within 2 percent of the optimum moisture value. The backfill material should be compacted, in lifts of no more than 200mm in thickness, to at least 98 percent of Standard Proctor Maximum Dry Density (SPMDD).

For backfill against the subsurface walls and footings it is recommended that backfill materials consist of Granular Class 'B' aggregates.

7.6 Stability of Excavation Wall

It is expected that the excavation walls into the red shale will be stable at near vertical slopes during the construction period. The sandy silt till and clayey silt till layers are expected to be stable at 1V:1H in the absence of seepage while the silt is expected to be stable at 2V:1H for the duration of the construction. Loose rock pieces should be removed, and the rock face of the excavation cut back to approximately 10V:1H. Onsite inspection by qualified geotechnical engineer will determine if the slope needs to be flatter, particularly where weathered shale is encountered. A geogrid may be required to cover the full face of the exposed shale to minimize rock fall.

Other factors which could adversely impact the stability of the excavated rock face is the installation of utilities. The need for shoring should be evaluated and anticipated where excavation for utilities is in close proximity to the building excavation.

7.7 Impact on Construction and Durability of Shale

Shale comprises over-consolidated clay and silt or, in some instances, mudstone. Shale is usually susceptible to slaking which can be defined as the disintegration of the clay material when exposed to water and or wetting/drying and freezing/thawing cycles. Consequently, the following measures are recommended to minimize degradation of the shale during construction:

- Minimize the amount of time that the excavated shale is exposed to the elements to a maximum of 7 days,

- Protect exposed shale base by placing ±75mm of 15MPa concrete to form a working surface; alternatively, a ±250mm thick layer of free draining granular material (OPSS 1004 19mm Type 2 clear stone) could be applied,
- Regular inspection of the exposed rock face by a geotechnical engineer.

8. SHORING REQUIREMENTS

8.1 General Considerations

A shoring system should be designed to protect adjacent structures/infrastructure and to facilitate the excavation of underground levels and utilities in the proposed development. The shoring system should be designed in accordance with the requirements set out in the Canadian Foundation Engineering Manual, 4th Edition.

Examples of temporary shoring systems include:

- A soldier pile and timber lagging system where some deflection of the wall is permitted, and groundwater is not a concern or can be handled with conventional dewatering system and
- A caisson wall, formed from secant piles, where only minor deflections of the wall are permitted, and groundwater is a concern or where dewatering is prohibited.

Factors to be considered for the subject Site:

1. The highest groundwater elevation in the overburden soil was 127.70m asl. Groundwater elevations in the bedrock varied between 118.32m and 120.96m asl.
2. The anticipated depth of excavation for footings is approximately 120.5m asl.

8.2 Design Approach and Parameters

Geotechnical parameters, which are considered applicable for the design, are shown in Table 3. Any surcharge loads must be included in the lateral earth pressure calculations.

It should be noted that groundwater, shale fragments and boulders may be encountered during soldier pile/caisson construction, and contractors must be prepared to deal with boulders and water seepage into the caisson shafts without undue delays.

The tiebacks should be designed for 35 kPa in the overburden soils and 200 kPa in the shale bedrock. The design values must be confirmed by at least two load tests, carried out to 2 x the design loads.

The shoring system and surrounding structure must be monitored for horizontal and vertical movement, prior to shoring/or dewatering and during excavation to ensure satisfactory performance of the shoring system.

A pre-construction inspection/survey of the surrounding structures and roads is recommended prior to commencement of shoring construction and / or dewatering activities.

Table 3: Geotechnical Soil Data

Parameter	Granular Fill (Very loose to dense)	Native Granular Strata (compact to dense)	Native cohesive Strata (very stiff to hard)	Shale bedrock
Depth bgs	0.5 - 1.7m	1.7m to 3.05m	3.05m to 5.5m	5.5m to 15.39m
Range of SPT 'N' values	4 - 38	15 - 40	23 – 100+	100^{+}
Bulk Unit Weight (kN/m^3)	19	20	21	25
Effective friction angle, φ^o	26	34	38	48
Effective Cohesion C' (KPa)	0	0	25	-
K_o (at rest)	0.56	0.44	0.41	-
K_a (active)	0.39	0..28	0.26	-
K_p (passive)	2.56	3.53	3.85	-

9. SLAB ON GRADE AND PERMANENT DRAINAGE

For the subject Site, the floor slab for the lowest underground parking level should rest on a compacted bed of size 19mm clear stone at least 200mm thick which will act as a vapour barrier. The vapour barrier stone should meet the requirements of OPSS 1004 for 19mm Type II clear stone. If required, the thickness of

the stone layer can be increased to 500mm to accommodate mechanical components of the parking drainage.

Perimeter drainage pipes, with a positive gravity outlet, should be solid PVC with a minimum of 0.5% slope. In addition, silt traps must be provided at convenient / accessible locations. To further minimize siltation, all drainage pipe connection should be solid PVC elbows and T's. No 'butt' end should be permitted. The perforated pipes should slope to a sump at a minimum 1% slope.

A permanent perimeter and sub-floor drainage system for shoring system/foundation walls must be provided as shown in Appendix D.

It should be noted that if a watertight subsurface structure is used on the site, then a permanent drainage system for the footings may not be required. This is however contingent on a properly designed watertight structure with adequate built-in maintenance.

10. UNDERGROUND UTILITIES

Pipe bedding and backfill materials specifications and compaction criteria for water and sewer services should be in accordance with the pipe designer's recommendations and/or local municipal requirements.

If the excavation is deeper than 1.2m, the excavation sides should be sloped in accordance with requirements of OHSA. If this condition cannot be met, a temporary shoring system or trench box should be introduced.

Trench backfill should be uniformly compacted to a density that minimizes the risk of long-term settlement. Selected on-site excavated native soils may be considered suitable for re-use in trench backfilling, provided that organics / construction debris are sorted out and material are not allowed to be wet. Moisture content should be within 2% of the optimum moisture content.

In normal sewer construction practice, the problem of road settlement largely occurs adjacent to manholes, catch basins and service crossings. In these areas, granular materials are generally required for backfill and compaction.

Backfill in the upper 1.0m from road subgrade or in settlement sensitive areas should be placed in maximum 200mm thick lifts and compacted to 98% SPMDD. Beyond these zones, a 95% SPMDD compaction criterion is considered acceptable.

Water lines installed outside of heated areas should be provided with a minimum of 1.8m soil cover or equivalent for frost protection.

11. Pavement Design

The functional life of a pavement depends directly on the subgrade conditions and the load carrying capacity of the pavement structure. Typical flexible pavement designs are presented in Table 4.

Table 4: Minimum Flexible Pavement Structure Thicknesses

PAVEMENT LAYER	COMPACTED THICKNESSES	
	LIGHT DUTY PARKING	DRIVEWAYS & HEAVY DUTY PARKING
Asphalt top course, HL-3	40mm	40mm
Asphalt base course, HL-8	40mm	60mm
Granular 'A' or 20mm crusher run limestone base	150mm	150mm
Granular 'B' or 50mm crusher run limestone sub-base	200mm	300mm

The pavement structure should also meet the minimum municipal design requirements, if any, for the proposed development.

The above thicknesses are applicable for dry and stable subgrade conditions during summer season construction only. If construction is carried out during winter, and for unstable subgrade conditions, the thicknesses of granular materials may have to be increased.

The granular base materials should conform to O.P.S.S. Form 1010 specifications and be compacted to at least 98% of their SPMDD's. Similarly, asphaltic concretes should meet O.P.S.S. Form 1150 requirements for specified grades and be compacted to at least 97% of their Marshall Densities.

The subgrade should be prepared as described previously in subsection 7.3. Prior to placement of granular bases, the finished sub-grade should be contoured to eliminate depressions and sloped at a minimum of 2% towards the catch basins or perimeter ditches to facilitate drainage of subgrade and base materials.

Water should not be allowed to accumulate at/near the pavement edges. The importance of sub-grade drainage and regular maintenance and repairs cannot be over-emphasized.

12. EXCAVATION / VIBRATION MONITORING

It is understood that two stage tie backs will likely be required for the proposed soldier pile/lagging support purposes. It should be noted that encroachment agreements will be required with adjacent property owners. If the above agreements are not feasible/achievable then raker pads may be used for the soldier pile support purposes.

Zone of influence for excavation wall movements/displacements can be estimated as 12m or depth of excavation, whichever is greater beyond the property lines. All control network points should be located outside the above zone of influence. Reflective targets should be installed at the top of each soldier pile and for each tie-back to monitor the movement of shored walls during and after excavation. Precision targets should be installed on the neighbouring structures, if any within the zone of influence to ensure they are not being impacted by the construction activities on the subject site.

Construction activities for the proposed development such as drilled caissons, soil compaction etc. may generate vibrations which could be perceptible to nearby residents or sensitive to the adjacent structures or infrastructure. Construction induced vibrations must be limited to the maximum peak particle velocity (PPV) as outlined/regulated by the local/regional/provincial authorities or an expert/qualified person in vibration monitoring and control. Frequency & duration of monitoring and zone of influence due to vibration should also be established by or in accordance with the recommendations by the qualified person.

Pre and post construction surveys should be undertaken to document existing conditions of properties/infrastructure/structures prior to the start of construction and at the end of project for determining/establishing any substantial changes resulting from construction within the zones of influence.

13. CHEMICAL ANALYSES

Two soil samples from BH1 and BH3 at depths of 1.52-1.98m were submitted to Fisher Environmental laboratories for chemical analyses related to potential sulphate attack on buried concrete. The results of tests are presented in Appendix C.

The chemical analyses show that the sulphate concentration in the soil samples varies from 25.5mg/kg to 122.4mg/kg or 0.00255% to 0.01224%. According to CSA-A23 1-09 Table 3, the results indicate that sulphate concentrations are well below the S-3 exposure values of 0.10-0.20%.

The results from the chloride tests show that the subsurface strata generally have a mild chloride environment and are not aggressive to concrete. Water-cement ratio in concrete should not exceed 0.5. Additionally, subsurface concrete for footings and exterior walls should have minimum 28-day and 56-day compressive strengths of 25 and 30 MPa respectively. The pH analyses show that the pH levels are within acceptable range for groundwater in soils.

14. LIMITATIONS

This report is limited in scope to those items specifically referenced in the text. The discussions and recommendations presented in this report are intended only as guidance for the named client and their design engineers.

The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction.

Localized variations in the subsoil conditions, and particularly the fill material, may be present between and beyond the boreholes on which the recommendations are made and will have to be verified during construction. As more specific subsurface information becomes available during excavations on the subject Site, this report should be updated.

Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of the subsurface soils and the potential reuse of these soils on / off Site.

Contractors must draw their own conclusions as to how the near surface and subsurface conditions may affect them.

APPENDIX A: SITE LOCATION MAP, BOREHOLE LOCATIONS & SITE PLANS



FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

N

LEGEND

SITE BOUNDARY

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1396 Guelph Line,
BURLINGTON,ONTARIO

FIGURE A1:

SITE LOCATION PLAN

SHEET NO.

PROJECT NO.

FE-P22-11967

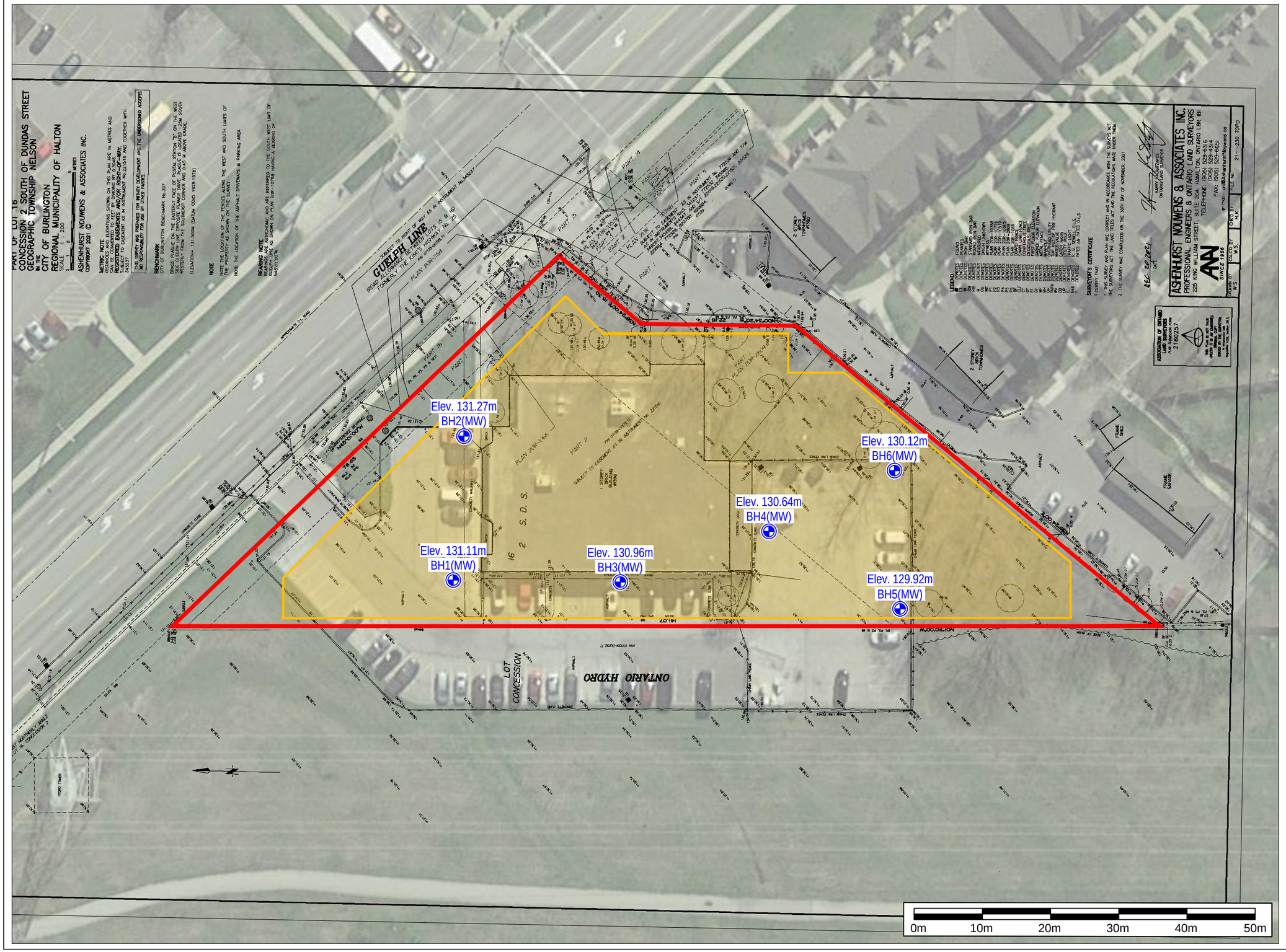
DATE

MARCH 2022

SCALE

AS SHOWN

A1



PART OF LOT 15
CONCESSION 2 SOUTH OF DUNDAS STREET
GEOGRAPHIC TOWNSHIP NELSON
IN THE
CITY OF BURLINGTON
REGIONAL MUNICIPALITY OF HALTON
SCALE 1 : 200
ASHENHURST NOUWENS & ASSOCIATES INC.
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METRIC NOTE
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.
PLAN REFERENCED TO UTM GRID (ZONE 17) NAD 83 (CSRS) 1997.
SUBJECT TO EASEMENT AS IN INSTRUMENT No.221514 AND TOGETHER WITH A RIGHT OF WAY.

BENCHMARK
CITY OF BURLINGTON BENCHMARK No.397
BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION 'B' ON THE WEST SIDE OF GUELPH LINE, 0.5 METRES SOUTH OF THE CENTRELINE OF DUNDAS STREET AND 0.45 METRES WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.
ELEVATION= 131.500M (DATUM GSC) 1928-1978)

NOTE
NOTE THE LOCATION OF THE FENCES ALONG THE WEST AND SOUTH LIMITS OF THE PROPERTY AS SHOWN ON THE SURVEY.
NOTE THE LOCATION OF THE ASPHALT DRIVEWAYS & PARKING AREA

BEARING NOTE
BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE SOUTH WEST LIMIT OF GUELPH LINE AS SHOWN ON PLAN 20R-10704 HAVING A BEARING OF N45°51'00"W

SURVEYOR'S CERTIFICATE
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 30TH DAY OF NOVEMBER, 2021
HARRY KANTAKIOS
ONTARIO LAND SURVEYOR
DATE

ASHENHURST NOUWENS & ASSOCIATES INC.
PROFESSIONAL ENGINEERS & ONTARIO LAND SURVEYORS
225 KING WILLIAM STREET, SUITE 204, HAMILTON, ONTARIO L8R 1B1
TELEPHONE: (905) 529-6662 FAX: (905) 529-6663
SINCE 1956
DRAWN BY: WS | CHK'D BY: HK | DATE: 21-11-30 | FILE No.: TOPO

LEGEND
PROPERTY BOUNDARY
PROPOSED BUILDING FOOTPRINT (PARKING GARAGE BELOW)
BOREHOLE WITH MONITORING WELL LOCATION

NORTH

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

PROJECT NAME AND ADDRESS
GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS
1396 Guelph Line,
Burlington, ON

FIGURE 1.1:
SITE PLAN WITH BOREHOLE MONITORING WELL LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 22-11966/67	A2
DATE: 4 March 2022	
SCALE: AS SHOWN	



Infinity Development Group

1396 Guelph Line
Burlington, Ontario

21-027

March 08, 2022

zedd
ARCHITECTURE

ARCHITECTURE | DESIGN | PLANNING
zedd architecture inc Z-627 maitland street london ontario N5Y 2V7 519 518 9333 www.zeddarchitecture.com info@zeddarchitecture.com



PROJECT STATISTICS

PROJECT#: 21-027
MARCH 04 2022

1396 GUELPH LINE
BURLINGTON

SITE

	Acre	Hectare	ft²	m²
TOTAL SITE AREA	**1.03**	**0.4168**	**44,867**	**4,168**

LOT COVERAGE (%)	33% (1,392 m²)
BUILDING HEIGHT (m)	42.37 (11 STOREYS)
VEHICLE PARKING	236 (1.00 PER UNIT)
BICYCLE PARKING	85 (0.36 PER UNIT)
DENSITY (UNITS PER HECTARE)	566
FLOOR SPACE RATIO (m²) (ABOVE GRADE GFA / SITE AREA)	4.02
OUTDOOR AMENITY	1,807 m² (7.66 m² PER UNIT)
INDOOR AMENITY	446 m² (1.89 m² PER UNIT)

BUILDING

FLOOR AREAS (m²)	**BELOW GRADE**	**ABOVE GRADE**
P.03	3,326	0
P.02	3,326	0
P.01	3,326	0
LV.01	0	1,392
LV.02-LV.06 (x5)	0	1,679 (8,395)
LV.07-.LV.10 (x4)	0	1,450 (5,800)
LV.11	0	1,160
TOTAL GFA 26,725	**9,978**	**16,747**

UNITS	**TOTAL**	**3 BED**	**2 BED**	**1 BED**	**BACHELOR**
LV.01	5	0	0	5 (100%)	0
LV.02-LV.06 (x5)	26 (130)	0	5 (25) (19%)	20 (100) (77%)	1 (5) (4%)
LV.07-.LV.10 (x4)	21 (84)	0	6 (24) (28%)	13 (52) (62%)	2 (8) (10%)
LV.11	17	0	7 (41%)	10 (59%)	0
TOTAL UNITS	**236**	**0**	**56 (24%)**	**167 (70%)**	**13 (6%)**

AMENITY (m²)	**BALCONIES & TERRACES**	**INTERIOR SPACE**
LV.01	60	446
LV.02-LV.06 (x5)	218 (1,090)	0
LV.07	393	0
LV.08-LV.10 (x3)	114 (342)	0
LV.11	315	0
TOTAL AMENITY	**1,807**	**446**

PARKING	**BICYCLE**	**BARRIER-FREE (2.75m x 5.6m)**	**STANDARD (2.6m x 5.6m)**
P.01	80	4	88
P.02	0	4	90
P.03	0	1	41
LV.01	5	0	8
TOTAL PARKING 236V / 85B	**85**	**(4%) 9**	**227**

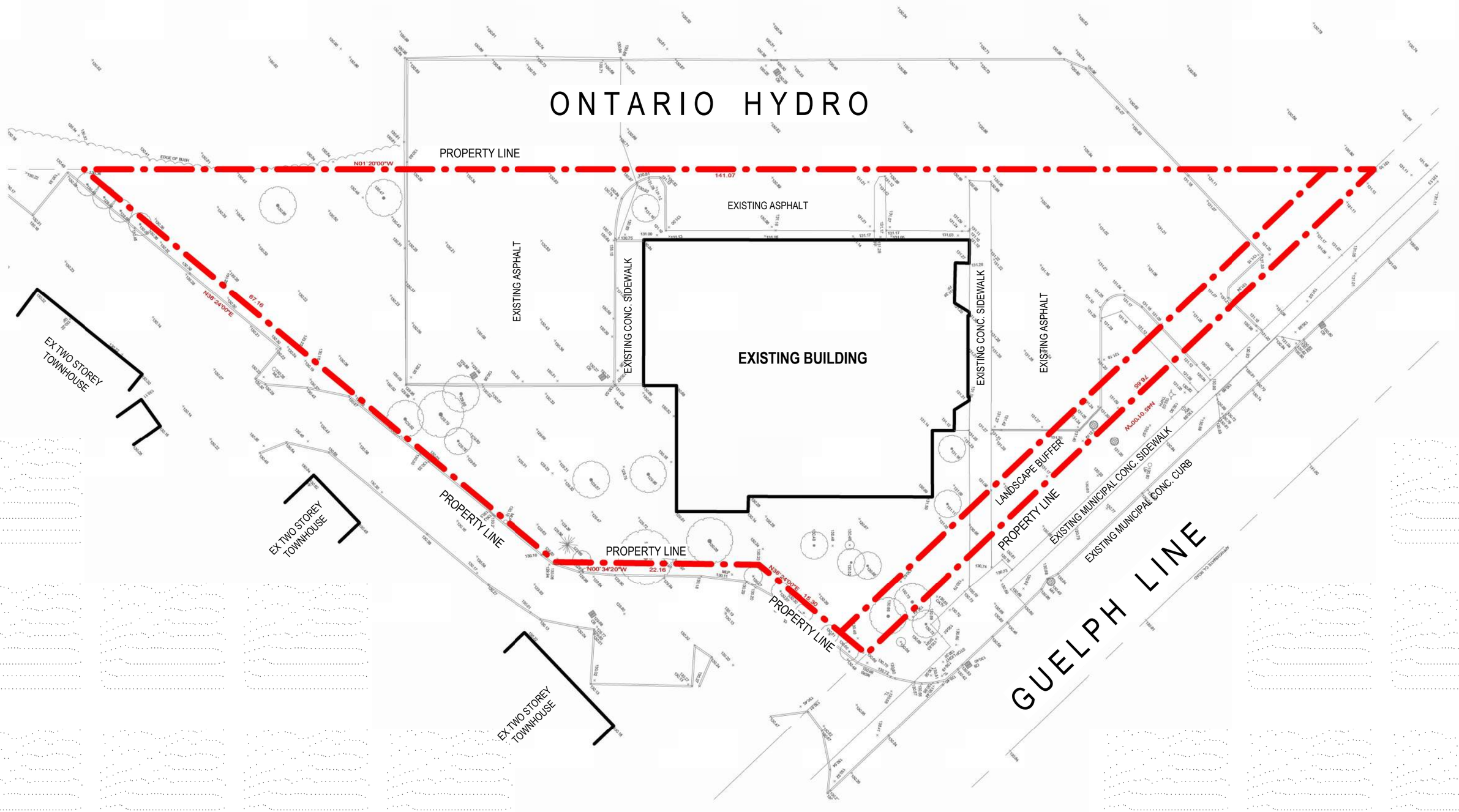
NOTE:
- GROSS FLOOR AREA INCLUDES ALL BELOW AND ABOVE GRADE SPACES WITHIN EXTERIOR WALLS AND IS CALCULATED TO THE EXTERIOR FACE OF EXTERIOR WALL.
- ROOM CALCULATIONS ARE MADE TO INTERIOR FACE OF DEMISING, CORRIDOR AND EXTERIOR WALLS.
- AMENITY AREAS ARE CALCULATED TO CENTERLINE OF DEMISING WALLS, EXTERIOR FACE OF CORRIDOR AND EXTERIOR WALLS.

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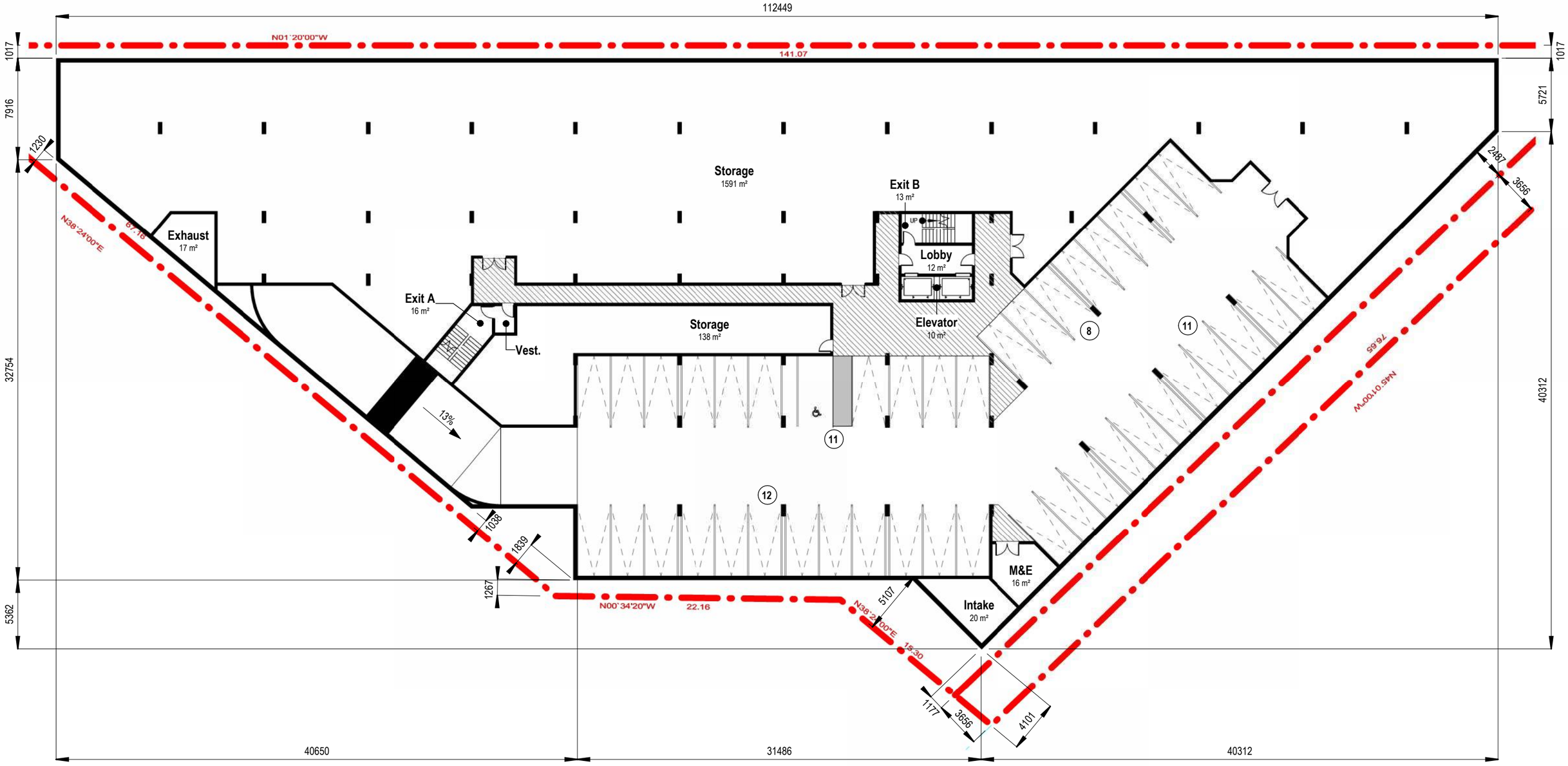


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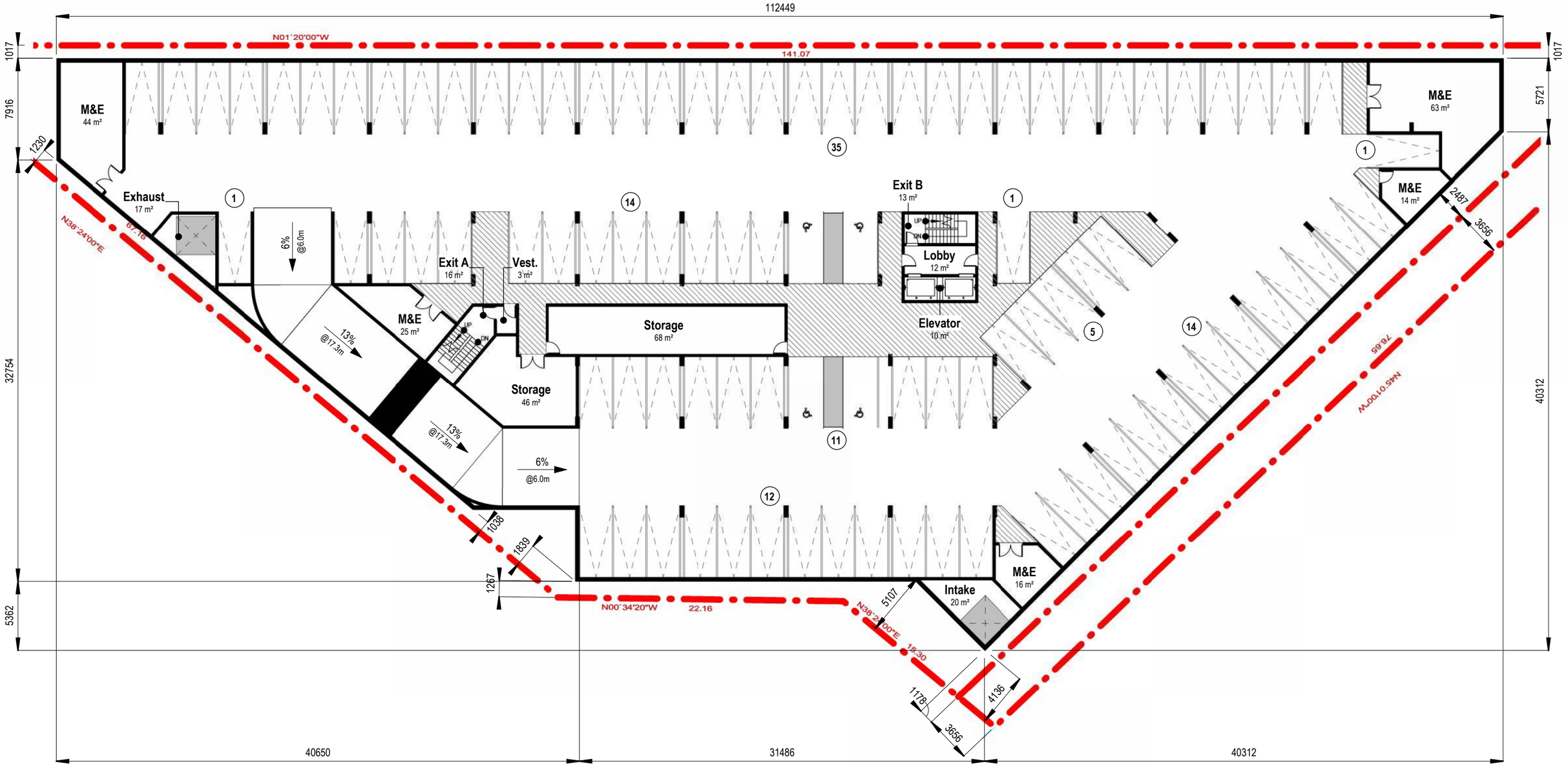
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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | Parking Level P3 Floor Plan | March 08, 2022 | SD2.1

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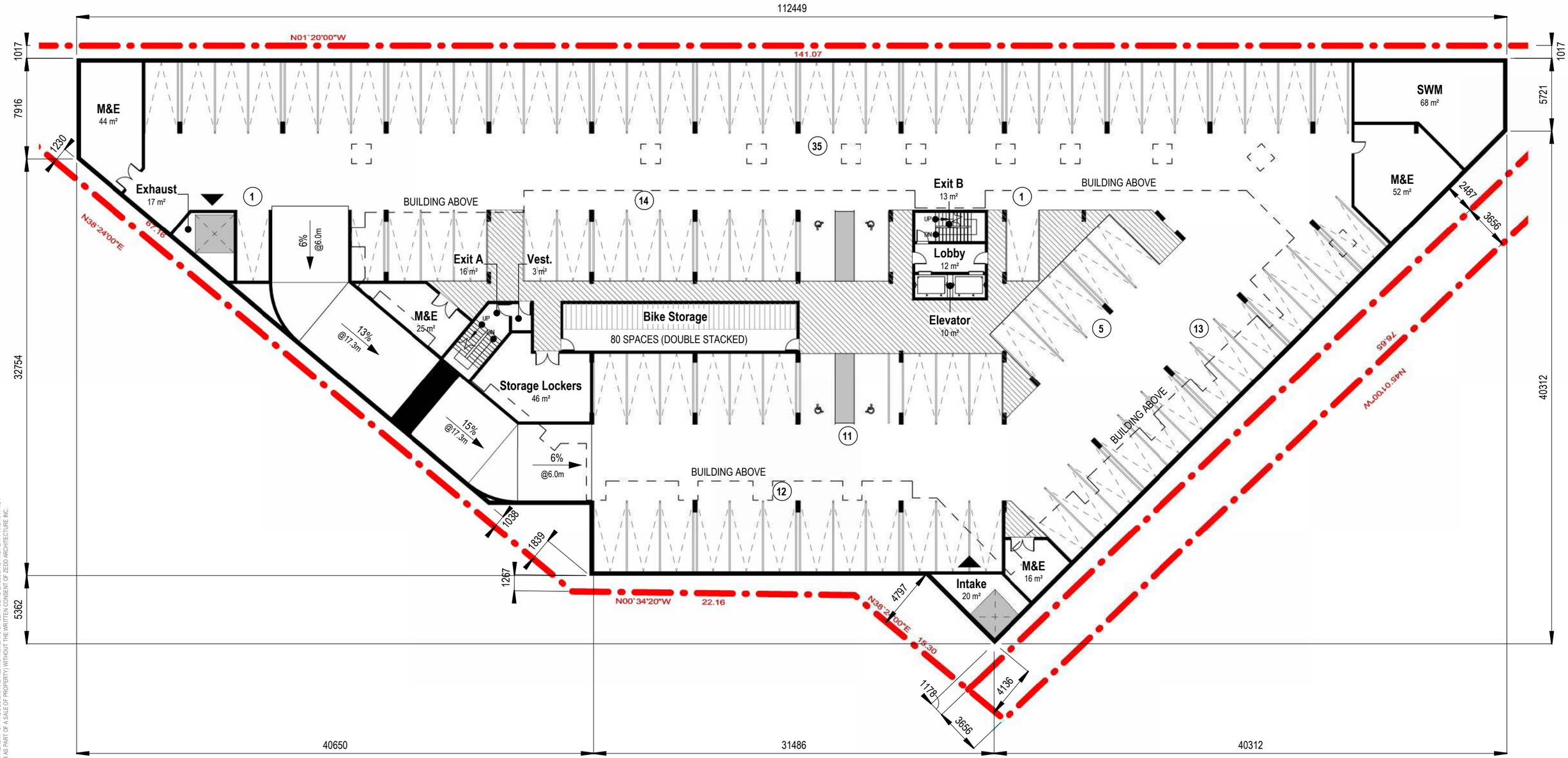


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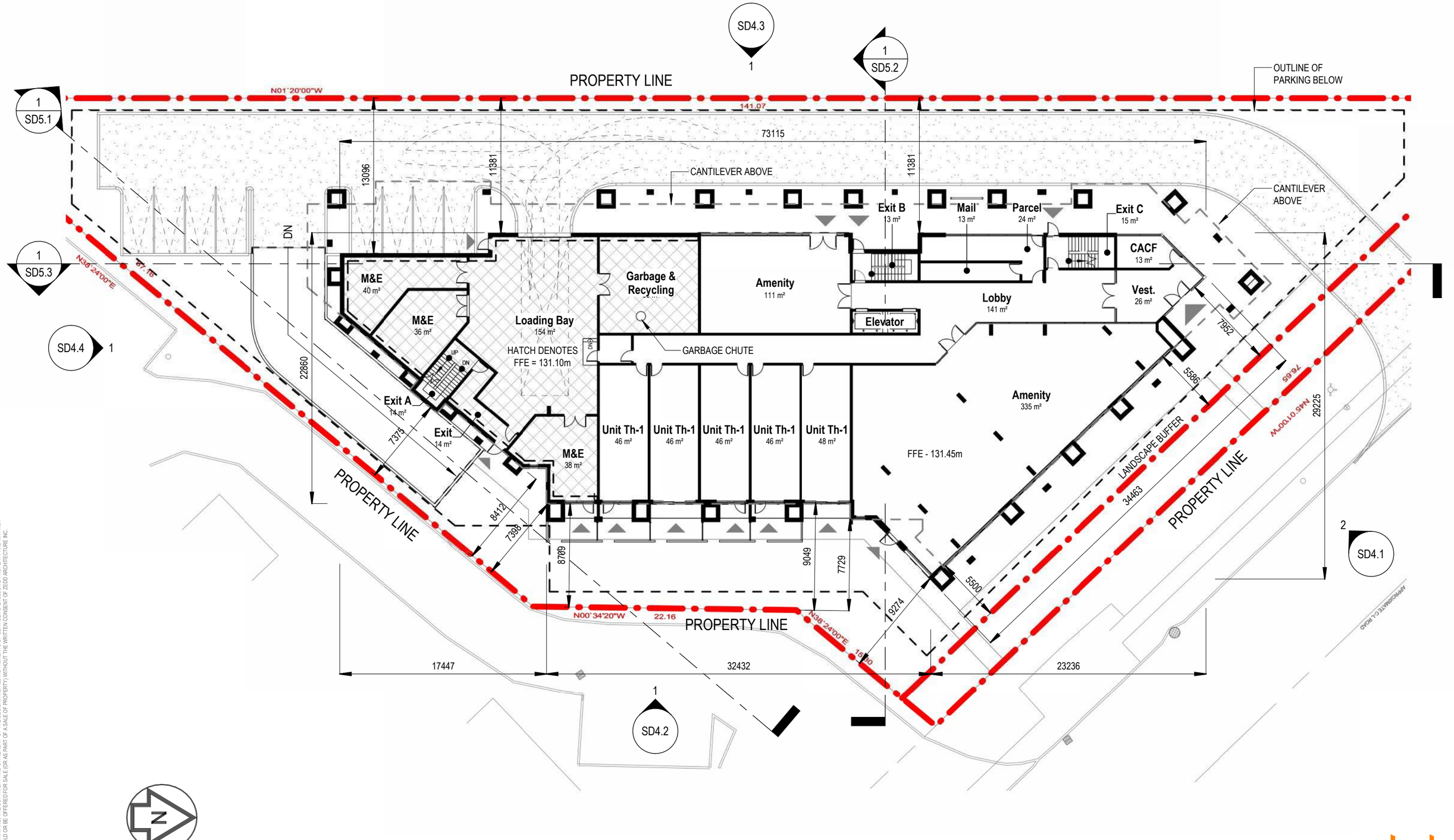


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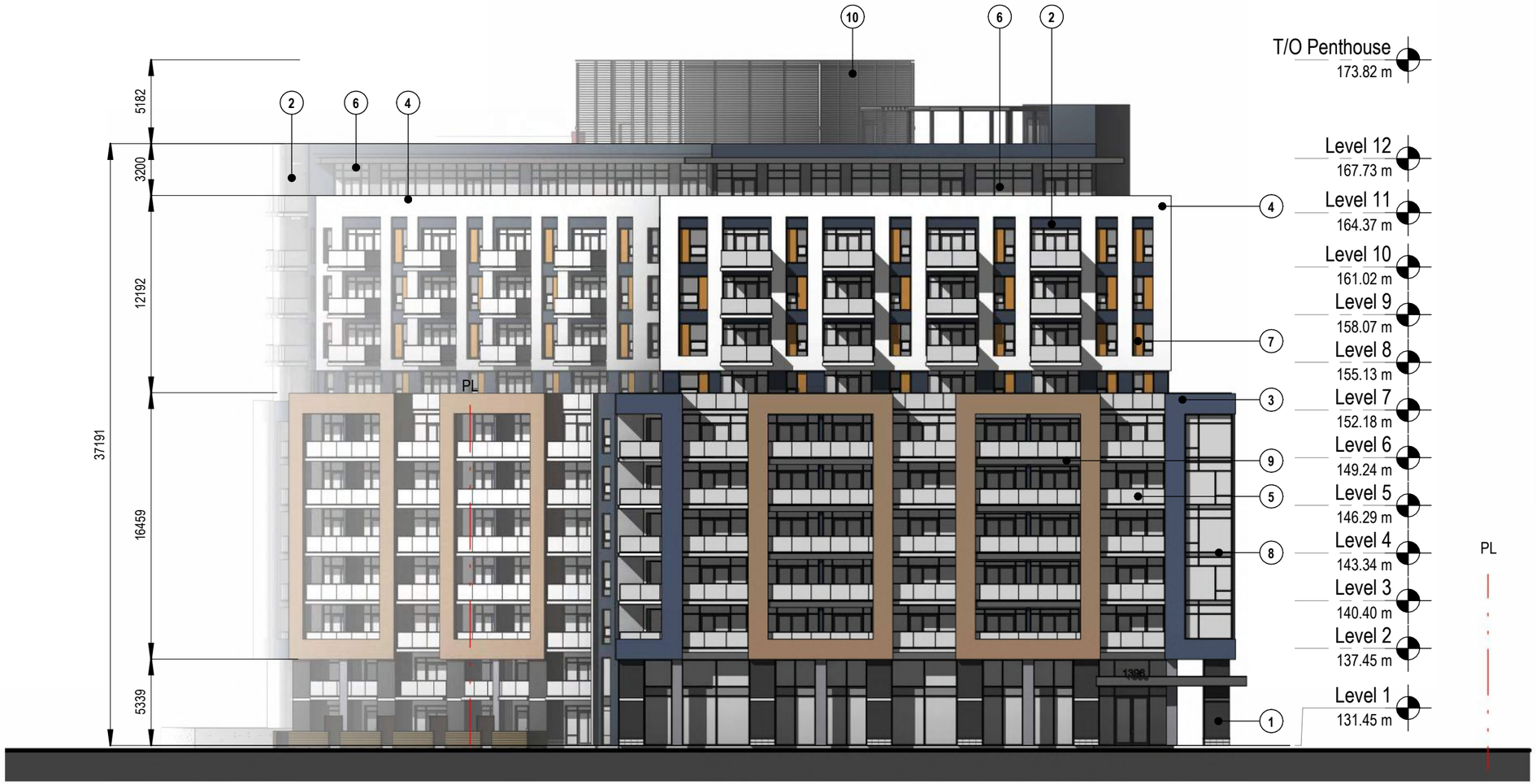


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Exterior Finish Legend

1	BRICK
2	PAINT
3	ARCHITECTURAL PANEL 1
4	ARCHITECTURAL PANEL 2
5	VISION GLASS HANDRAIL
6	DOUBLE GLAZED ALUMINUM VISION GLASS
7	ALUMINUM FRAME WITH METAL SPANDREL PANEL - WOOD GRAIN PANEL
8	DOUBLE GLAZED ALUMINUM ALUMINUM WINDOW WALL SYSTEM
9	METAL SLAB EDGE COVER
10	EXTRUDED ALUMINUM PENTHOUSE

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Scale : As indicated

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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | East Elevation | March 08, 2022 | SD4.2

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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	West Elevation	March 08, 2022	SD4.3

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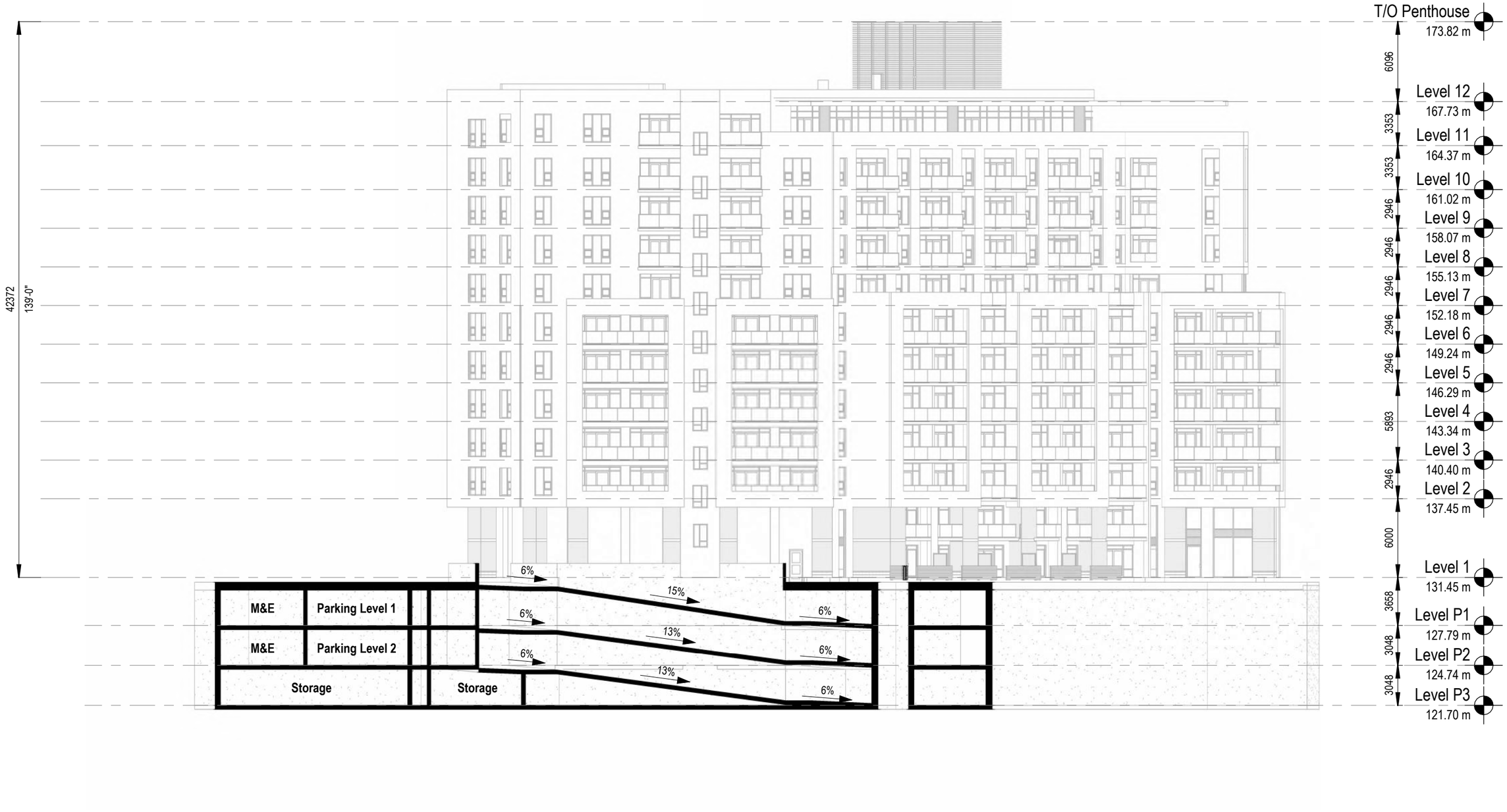


Scale : 1 : 300

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	South Elevation	March 08, 2022	SD4.4

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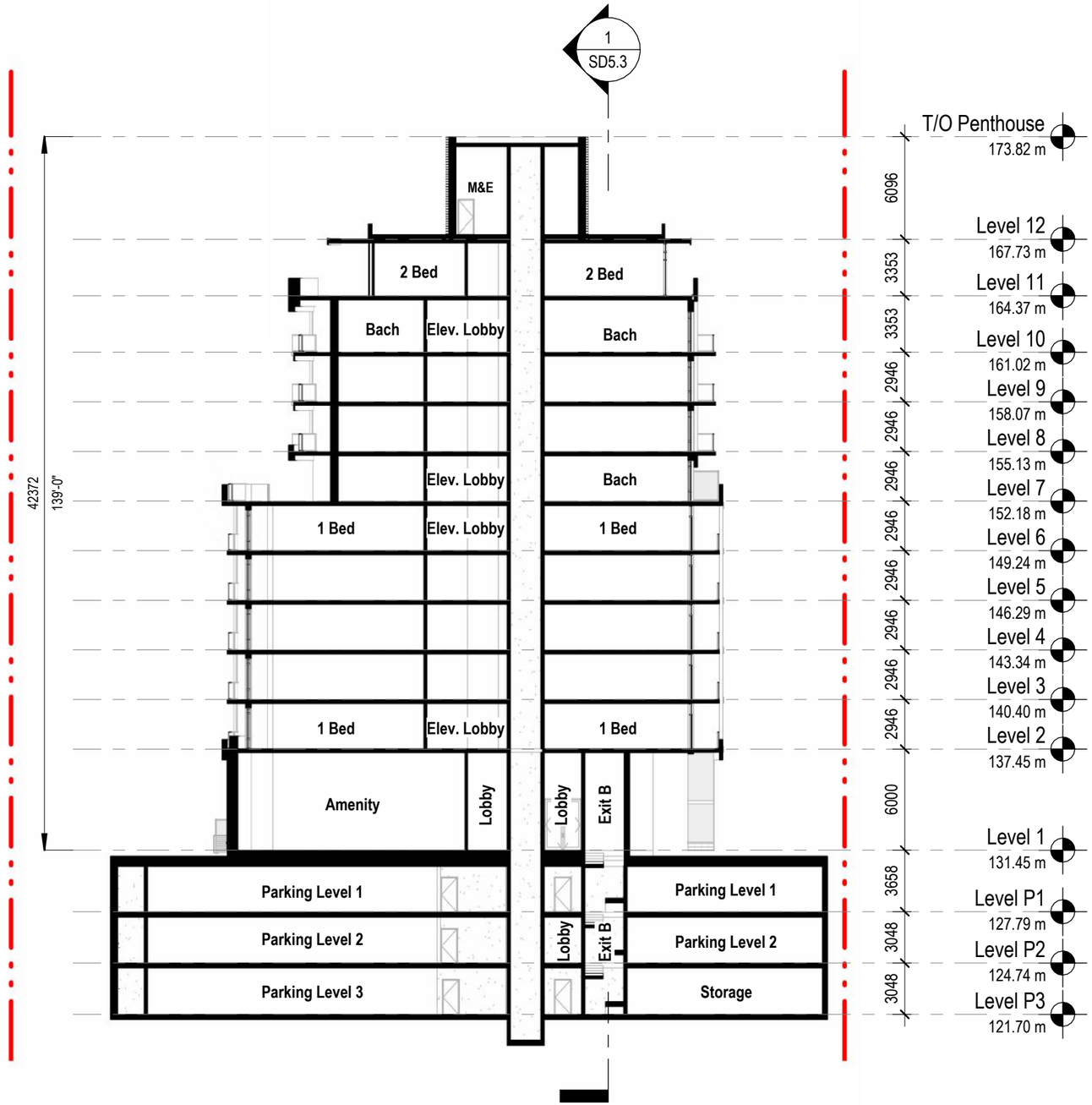
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21-027 | Infinity Development Group | 1396 Guelph Line, Burlington, Ontario | Parking Ramp Section | March 08, 2022 | SD5.1

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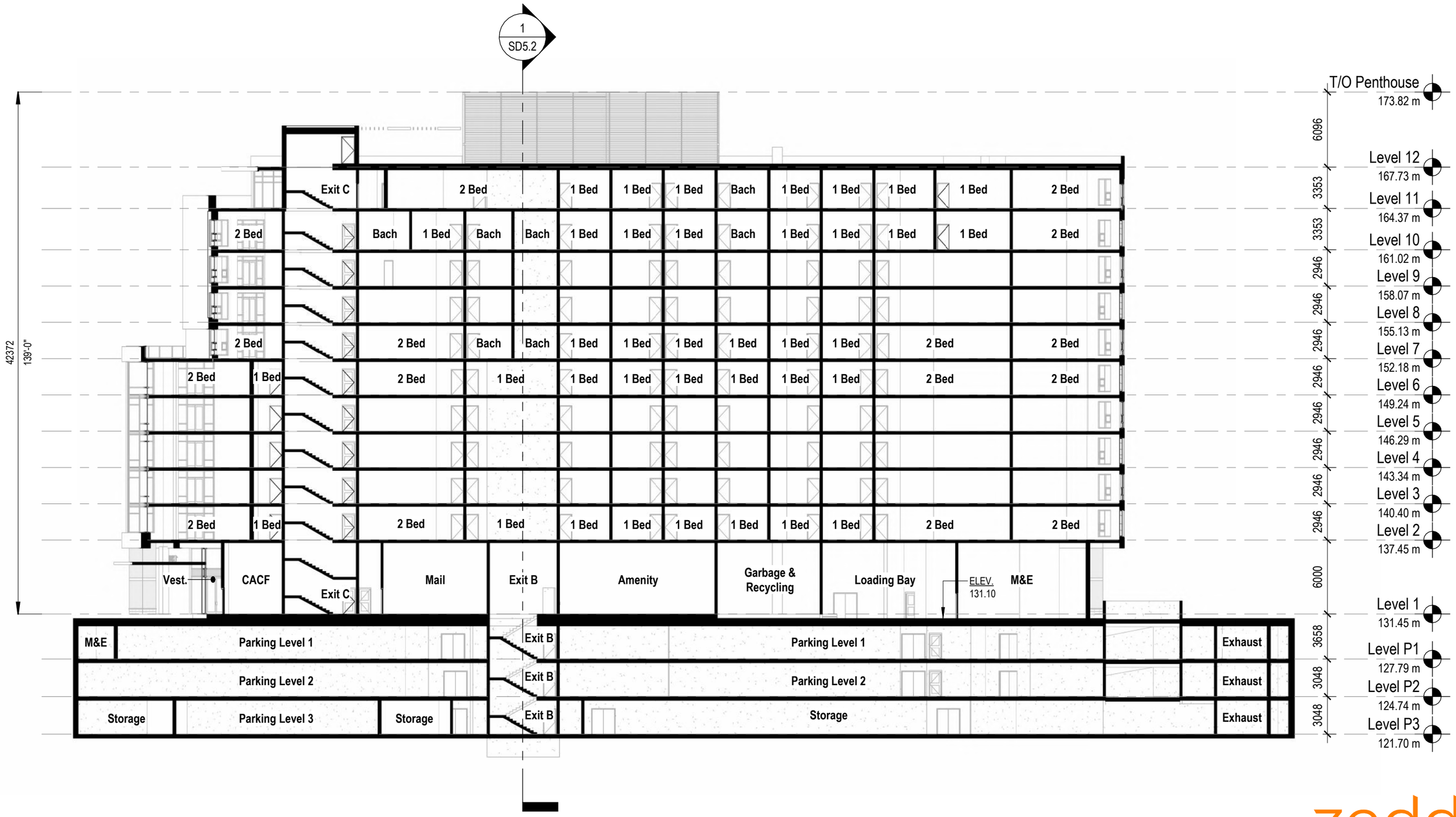
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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | Building Section | March 08, 2022 | SD5.2

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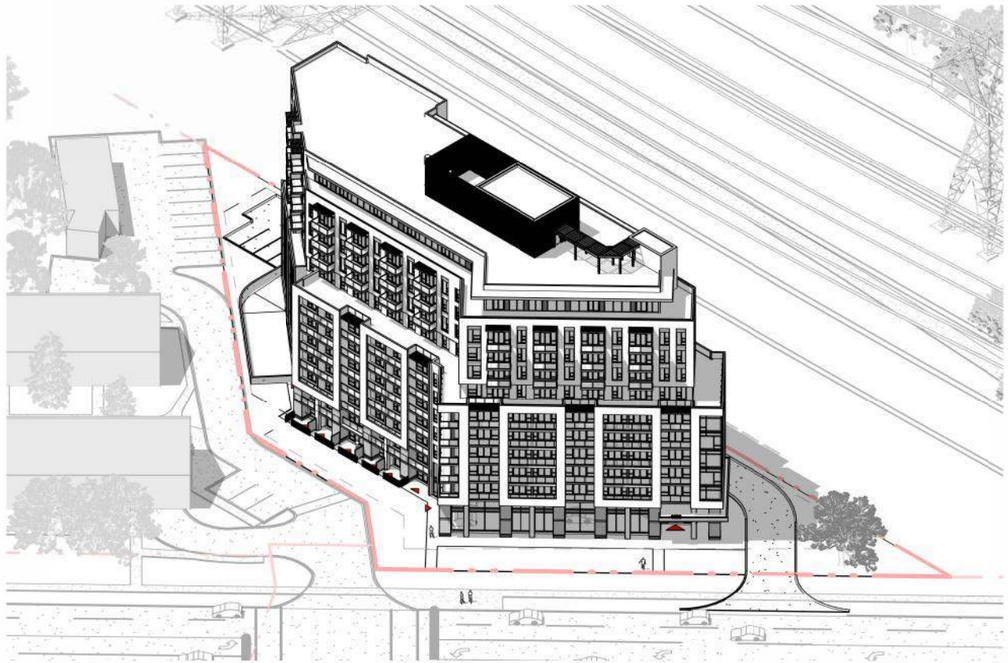


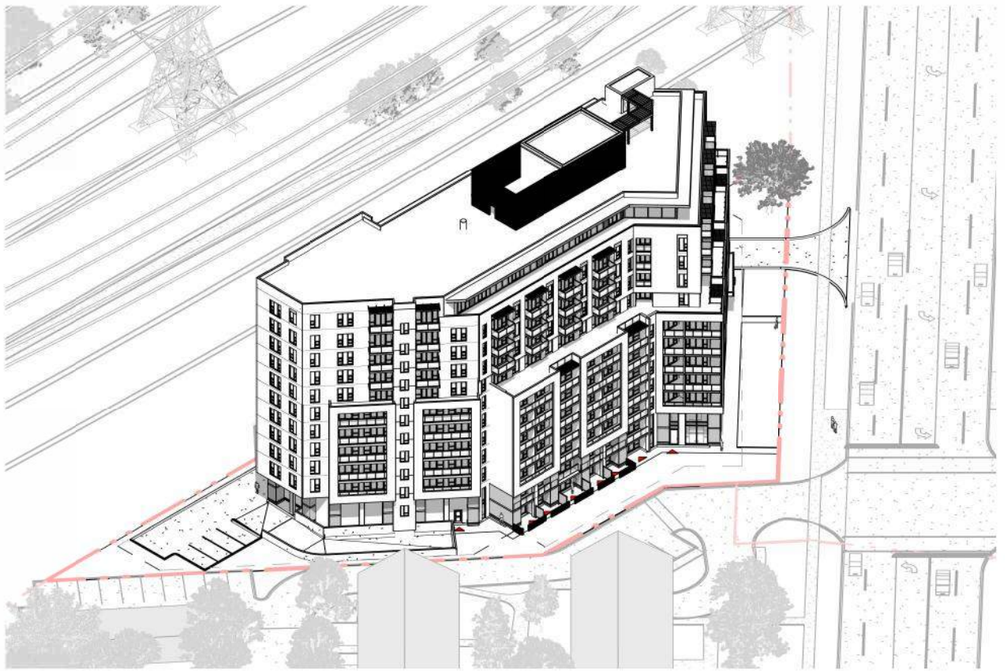
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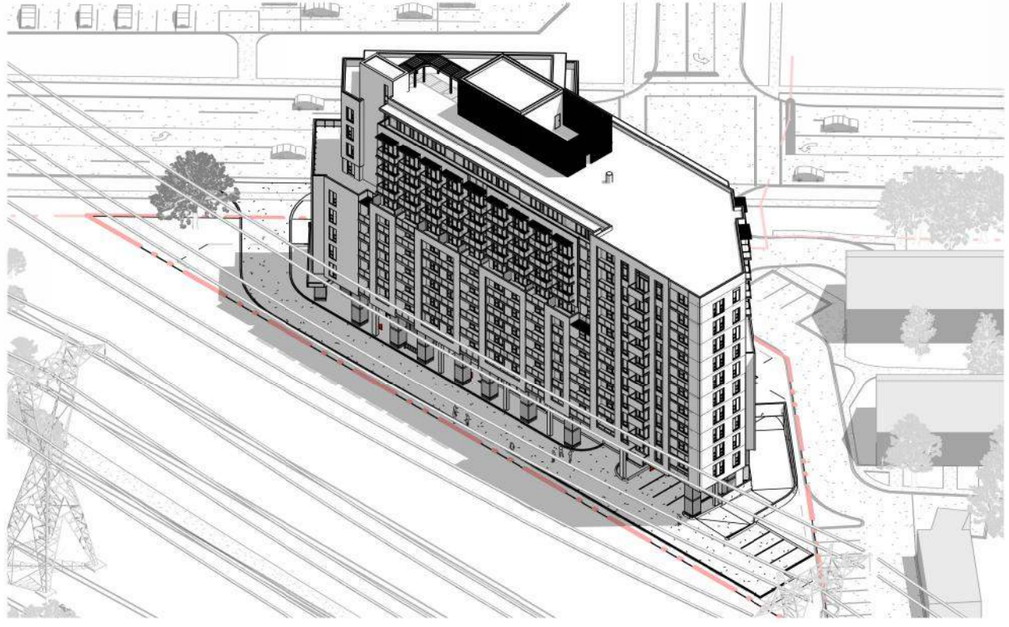
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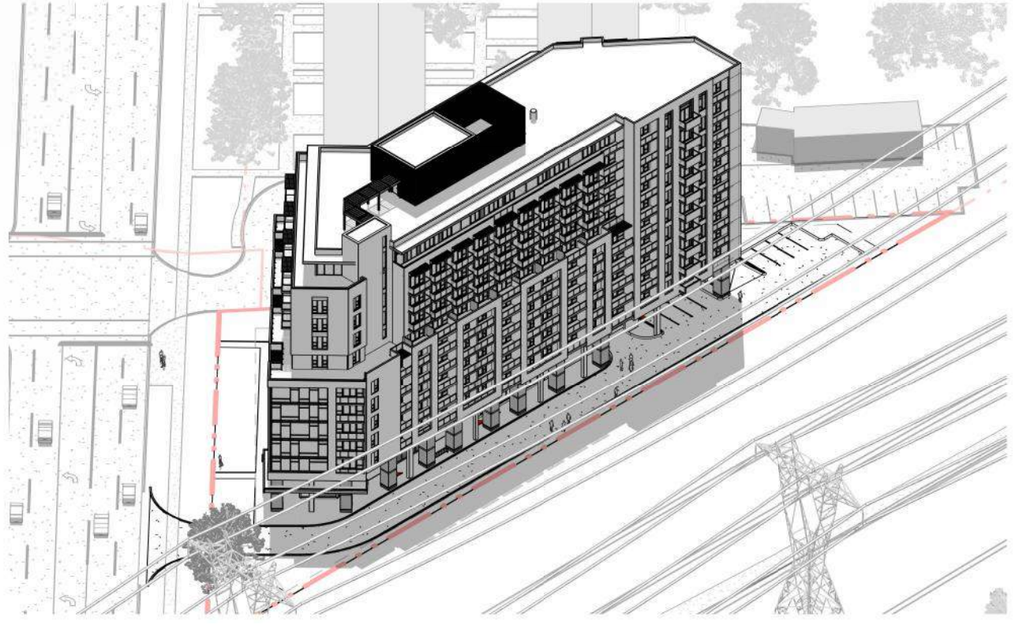
21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Building Section	March 08, 2022	SD5.3

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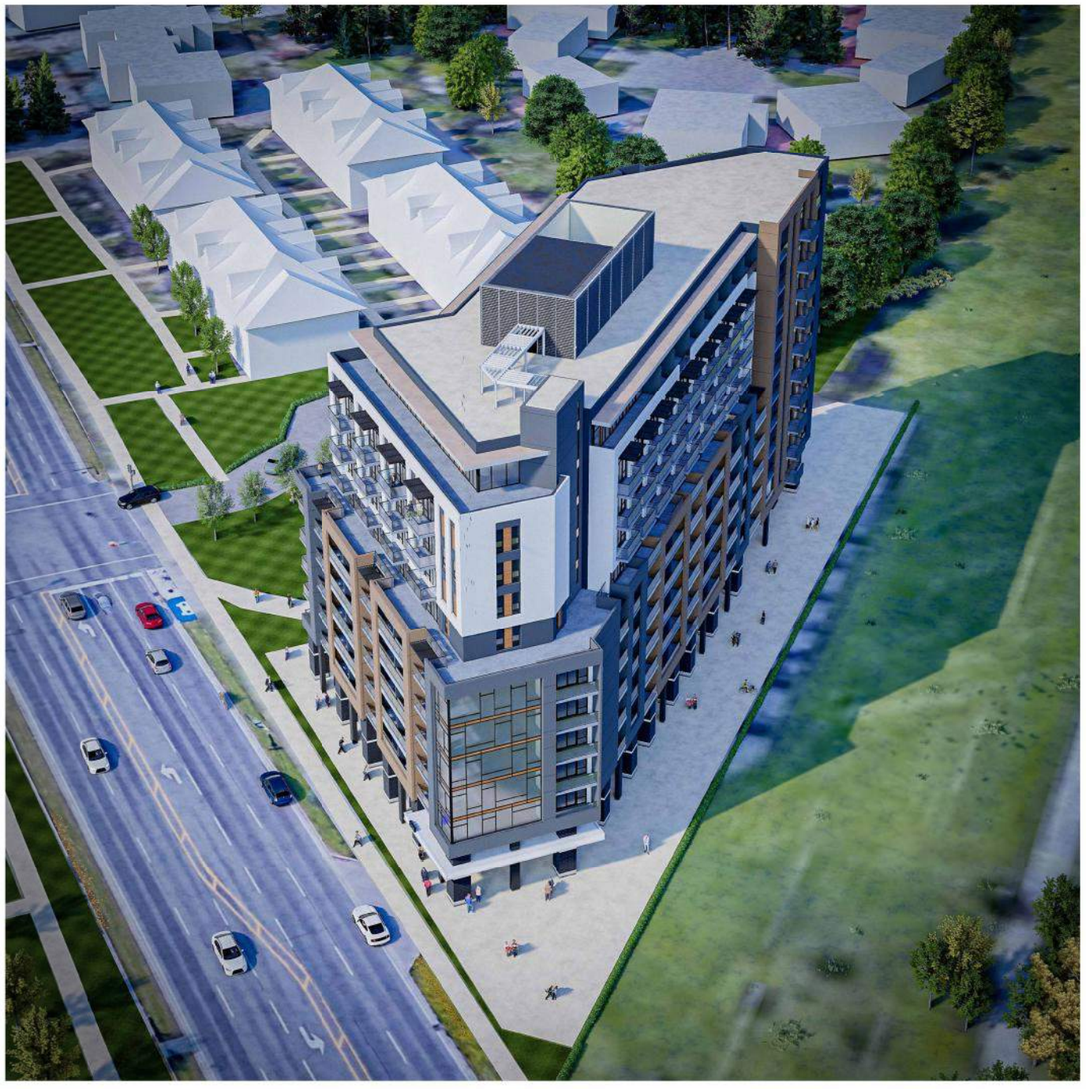


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Scale :

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	B&W Isometric	March 08, 2022	SD6.0

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NORTHWEST ISOMETRIC



SOUTHWEST ISOMETRIC

Scale :

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Render Isometrics	March 08, 2022	SD6.2

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APPENDIX B: LOG OF BOREHOLES

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		131.11			
0	0	2" ASPHALT GRANULAR MATERIAL		130.60/ 0.51		SS-1	56
2	1	FILL: Dark grey to black clayey silt, trace gravel & organics, moist, stiff		130.20/ 0.91		SS-2	11
4		SANDY SILT TILL: Grey, trace clay & gravel, moist, compact		129.13/ 1.98	22-8059-1	SS-3	24
6	2	SILT TO CLAYEY SILT TILL: Reddish brown, trace sand, pieces of shale/cobbles, slightly moist to dry, hard to very stiff				SS-4	31
8					22-8059-2	SS-5	42
10	3						
12	4						
14					22-8059-3	SS-6	23
16	5						
18				125.32/ 5.79			
20	6	WEATHERED SHALE: Red with grey seams/layers, slightly moist to dry, hard				SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

13.7

12.5

10.8

PIEZOMETER OR WELL CONSTRUCTION

Concrete

1.39m

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: dry; on March 9, 2022: 1.39m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey seams/layers, slightly moist to dry, hard					
34				120.36/ 10.75			
36	11	Refusal to auger at 10.75m				SS-10	100+
		End of Borehole at 10.75m					
38	12						
40							
42	13						
44							
46	14						
48							
50	15						
52	16						
54							
56	17						
58							
60	18						
62							
64	19						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

2" Slotted Pipe

Silica Sand

10.67m bgs

Groundwater Depth (m): on completion: dry; on March 9, 2022: 1.39m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		131.27			
0	0	1½" ASPHALT		130.93/ 0.34		SS-1	31
2		GRANULAR FILL: Grey gravelly sand, moist, dense					
4	1	SANDY SILT TILL: Grey to brown, trace clay, trace gravel, moist, compact Signs of oxidation @ 1.52m				SS-2	24
6	2					SS-3	25
				129.14/ 2.13			
8		SILT TO CLAYEY SILT TILL: Reddish brown, trace sand, pieces of shale/cobbles, slightly moist to dry, hard				SS-4	38
10	3					SS-5	59
12	4						
14							
16	5					SS-6	32
18							
20	6			125.17/ 6.10		SS-7	100+
22		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
24	7						
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

1.05m

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: 5.18m; on March 9, 2022: 1.05m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard Grey shale at the bottom		120.91/ 10.36			
34		Refusal to auger at 10.36m					
36	11	End of Borehole at 10.36m					
38	12						
40							
42	13						
44							
46	14						
48							
50	15						
52							
54	16						
56							
58	17						
60							
62	18						
64	19						

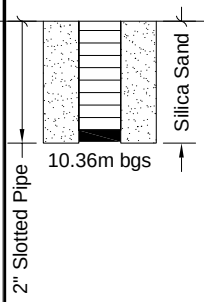
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 9, 2022: 1.05m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

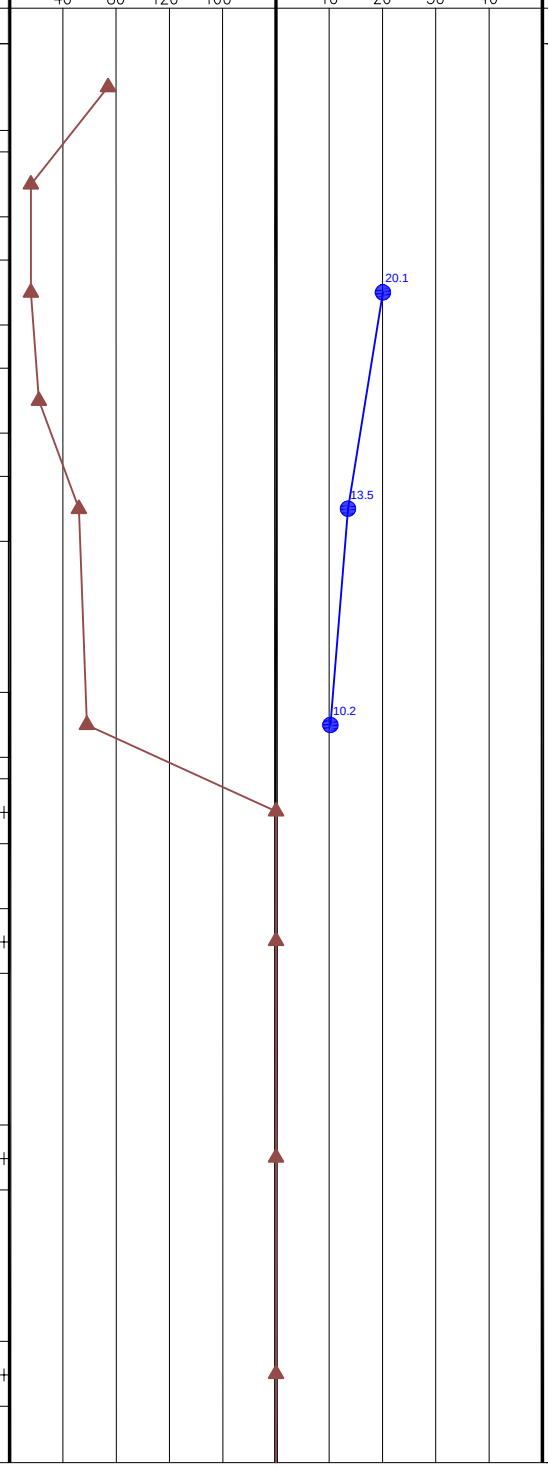
PROJECT NAME: Geotechnical & Hydrogeological Investigations

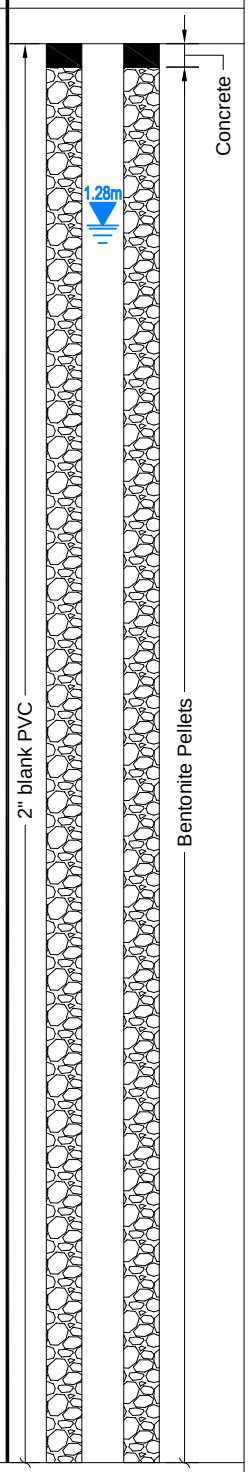
LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.96			
0	0	1½" ASPHALT				SS-1	37
2		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		130.50/ 0.46			
4	1	FILL: Dark grey clayey silt, trace gravel, brick, organics & rootlets, moist, loose				SS-2	8
6	2	CLAYEY SILT TILL: Grey, trace gravel, moist, firm to stiff		129.28/ 1.68	22-8059-4	SS-3	8
8		SILTY SAND: Light brown, trace gravel, wet, compact		128.52/ 2.44		SS-4	11
10	3	SANDY TO CLAYEY SILT TILL: Reddish brown, with pieces of shale, moist, compact to very dense (very stiff to hard)		127.91/ 3.05	22-8059-5	SS-5	26
12	4						
14							
16	5				22-8059-6	SS-6	29
18		Mixed with weathered red shale @ 5.33m				SS-7	100+
20	6	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.86/ 6.10		SS-8	100+
22	7						
24							
26	8					SS-9	100+
28							
30	9					SS-10	100+
32	10						





Groundwater Depth (m): on completion: dry; on March 2, 2022: 12.64m; on March 9, 2022: 1.28m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-11	100+
38							
40	12					SS-12	100+
42	13						
44							
46	14					SS-13	100+
48							
50	15	Augered to 15.24m		115.59/ 15.37		SS-14	100+
		End of Borehole at 15.37m					
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

14.63m bgs

Groundwater Depth (m): on completion: dry; on March 2, 2022: 12.64m; on March 9, 2022: 1.28m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.64			
0	0	2" ASPHALT					
		FILL: Granular fill, gravelly sand, moist Dark brown to black, brown stones, fill material mixed of asphalt, wooden pieces				SS-1	20
2	1					SS-2	4
4				129.12/ 1.52			
		FILL: Dark brown clayey silt, moist, firm				SS-3	8
6	2			128.35/ 2.29			
		SANDY SILT TILL: Grey, trace gravel, moist, dense				SS-4	40
8				127.59/ 3.05			
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard				SS-5	44
12	4						
14							
16	5					SS-6	47
18							
20	6			124.54/ 6.10			
		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard				SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32							
	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: 5.18m; on March 2, 2022: 11.17m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-10	100+
38							
40	12					SS-11	100+
42	13						
44							
46	14					SS-12	100+
48							
50	15	Augered to 15.24m		115.40/ 15.24			
		End of Borehole at 15.24m				SS-13	100+
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

SOIL PROFILE | SAMPLES

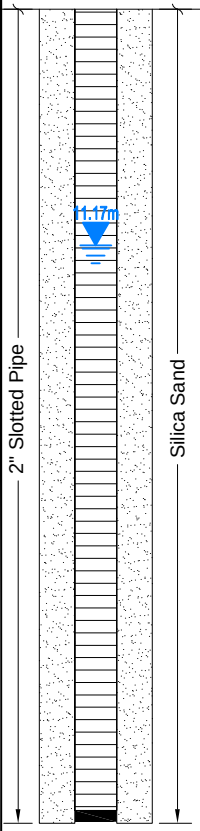
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 2, 2022: 11.17m

DRAWN: DC | LOGGED: BS | CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		129.92			
0	0	1½" ASPHALT		129.62/ 0.30		SS-1	15
2		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		129.31/ 0.61			
4	1	FILL: Brown sandy silt, trace clay & gravel, moist, compact				SS-2	25
6	2	SANDY SILT TILL: Grey, trace gravel, moist, compact				SS-3	29
8						SS-4	28
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard to very stiff		126.87/ 3.05		SS-5	38
12	4						
14							
16	5			124.74/ 5.18		SS-6	27
18		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
20	6					SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

2" blank PVC

Bentonite Pellets

Groundwater Depth (m): on completion: dry

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-10	100+
38							
40	12					SS-11	100+
42	13						
44				116.12/ 13.80			
46	14	Refusal to auger at 13.80m End of Borehole at 13.80m				SS-12	100+
48							
50	15						
52	16						
54							
56	17						
58							
60	18						
62							
64	19						

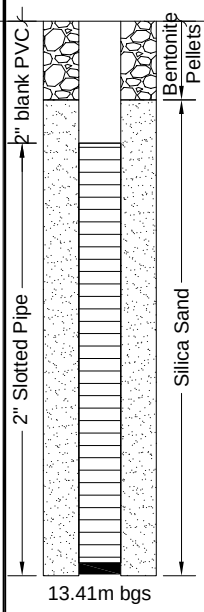
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: dry

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH6(MW) SHEET. 1 of 1

PROJECT NO.: FE-P 22-11966/67

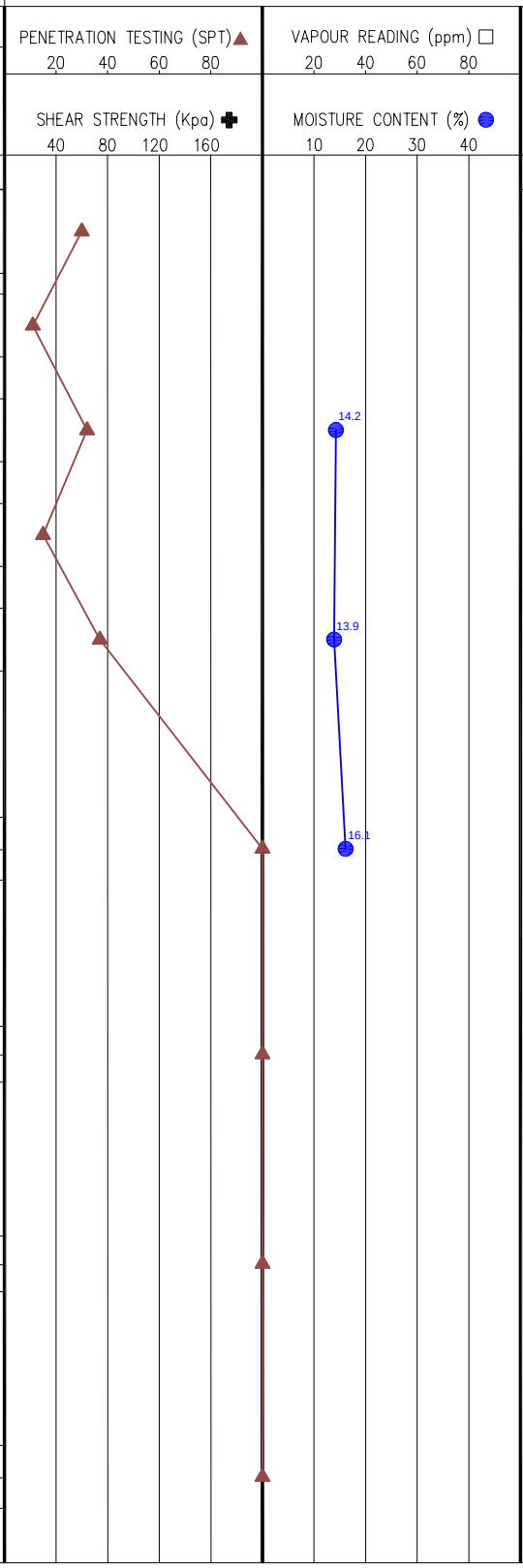
PROJECT NAME: Geotechnical & Hydrogeological Investigations

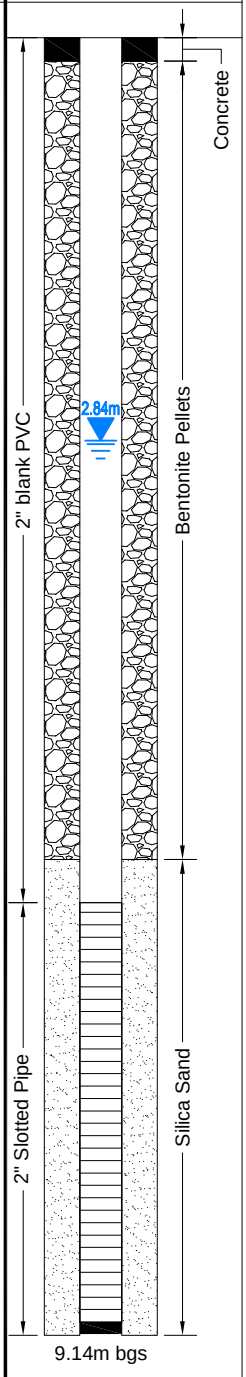
LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.12			
0	0	3" ASPHALT					
		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		129.76/ 0.36		SS-1	30
2	1	FILL: Black sandy silt, trace clay, gravel, topsoil & organics, moist, compact		129.21/ 0.91		SS-2	11
4				128.75/ 1.37			
6	2	FILL: Grey silty sand, trace gravel & rootlet, moist, loose			22-8059-7	SS-3	32
8		SANDY SILT TILL: Grey, trace gravel, moist, compact to dense				SS-4	15
10	3			126.77/ 3.35	22-8059-8	SS-5	37
12	4	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard					
14							
16	5	Wet @ 4.57m			22-8059-9	SS-6	100+
18		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.63/ 5.49			
20	6					SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9			120.87/ 9.25		SS-9	100+
32	10	End of Borehole at 9.25m					





Groundwater Depth (m): on completion: 4.57m; on March 2, 2022: 2.84m

DRAWN: DC LOGGED: BS CHECKED: CW

APPENDIX C: GRAIN SIZE, HYDROMETER and CHEMICAL ANALYSES

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Client:	Infinity Development Group	***F.E. Job #:***	22-8059
Address:	101-2275 Upper Middle Road	***Project Name:***	Geotechnical
	Oakville, ON	***Project ID:***	FE-P 22-11966
	L6H 0C3	***Date Sampled:***	N/A
Tel.:		***Date Received:***	3-Mar-2022
Email:		***Date Reported:***	4-Mar-2022
Attn.:		***Location:***	1396 Guelph Line
			Burlington, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
pH	Soil	2	4-Mar-22	4-Mar-22	pH-EC-SAR F-16	SW-846, 9045D
Chloride	Soil	2	N/A	4-Mar-22	Chloride F-20	SM 4500-Cl-E
Sulphate	Soil	2	4-Mar-22	4-Mar-22	Sulphate F-21	SM 4500-SO_4
Moisture Content	Soil	9	N/A	4-Mar-22	Support Procedures F-99	Carter (1993)
Grain Size	Soil	3	N/A	4-Mar-22	Grain Size F-28	ASTM D6913-04

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:

Roger Lin, Ph. D., C. Chem.
Laboratory Manager



Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (***Rush***)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				**Soil Standards** *
pH *(pH unit)*	8.60	6.59				(5-11) 5-9

* Surface soil pH value from 5 - 9, Sub-surface soil pH value from 5-11.

QA/QC Report

Parameter	**LCS**	**AR**	**Duplicate**	**AR**		
	Absolute Difference *(pH Unit)*					
pH *(pH unit)*	7.21	7.00-7.40	0.04	<0.3		

LEGEND:
LCS - Laboratory Control Sample
AR - Acceptable Range

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				
	Concentration (µg/g)					
Chloride in Soil	160.97	795.54				

< result obtained was below RL (Reporting Limit).

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**MS**	**AR**
	(µg/g)		**Recovery (%)**		**Recovery (%)**	
Chloride in Soil	<10	10	96	70-130	87	70-130

Parameter	**Duplicate**	**AR**				
	RPD (%)					
Chloride in Soil	8.7	0-20				

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				
Sulphate *(mg/kg)*	25.5	122.4				

QA/QC Report

Parameter	**Blank**	**RL**	**LCS/Spike**	**AR**	**Duplicate**	**AR**
	(mg/kg)		**Recovery (%)**		**RPD (%)**	
Sulphate	<1	1	100	70-130	4	0-30

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-2*** BH1 SS5 3.05-3.51m	***22-8059-3*** BH1 SS6 4.57-5.03m	***22-8059-4*** BH3 SS3 1.52-1.98m	***22-8059-5*** BH3 SS5 3.05-3.51m	***22-8059-6*** BH3 SS6 4.57-5.03m
Geo Moisture Content (%)	13.7	12.5	10.8	20.1	13.5	10.2

Parameter	***22-8059-7*** BH6 SS3 1.52-1.98m	***22-8059-8*** BH6 SS5 3.05-3.51m	***22-8059-9*** BH6 SS6 4.57-5.03m			
Geo Moisture Content (%)	14.2	13.9	16.1			

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**Duplicate**	**AR**
			Recovery (%)		**RPD (%)**	
Geo Moisture Content (%)	<0.1	0.1	100	70-130	14.5	0-20

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

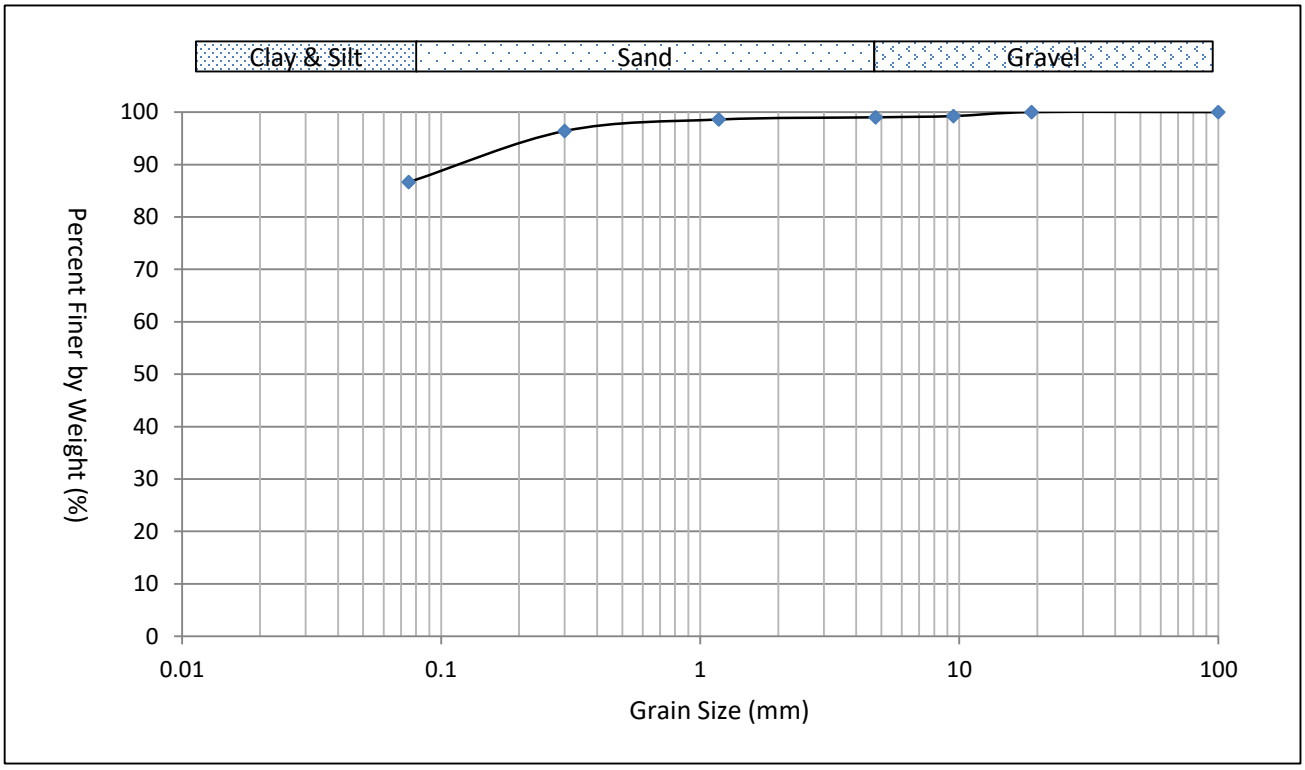
Parameter	***22-8059-4*** BH3 SS3 1.52-1.98m	***22-8059-5*** BH3 SS5 3.05-3.51m	***22-8059-6*** BH3 SS6 4.57-5.03m			
Grain Size (%)						
>19mm	0.0	0.0	0.0			
9.5mm-19mm	0.8	0.0	0.0			
4.75mm-9.5mm	0.2	4.3	4.6			
1.18m-4.75mmm	0.4	6.8	10.7			
300um-1.18mm	2.2	5.5	8.5			
75um-300um	9.8	10.2	8.5			
<75um	86.7	73.2	67.7			
Clay & Silt	**87**	**73**	**68**			
Sand	**12**	**23**	**28**			
Gravel	**1**	**4**	**5**			

Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m

Clay & Silt: 87% Sand: 12% Gravel: 1%

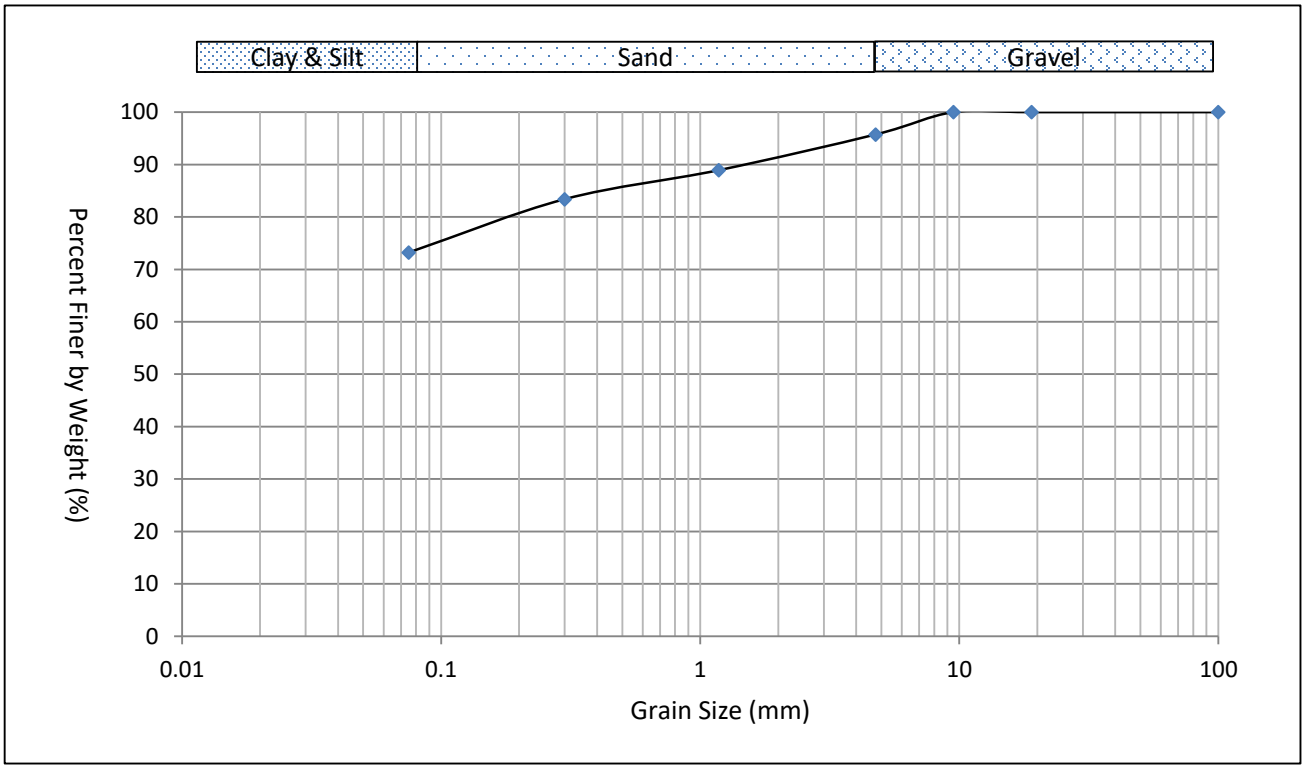


Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-5 BH3 SS5 3.05-3.51m

Clay & Silt: 73% Sand: 23% Gravel: 4%

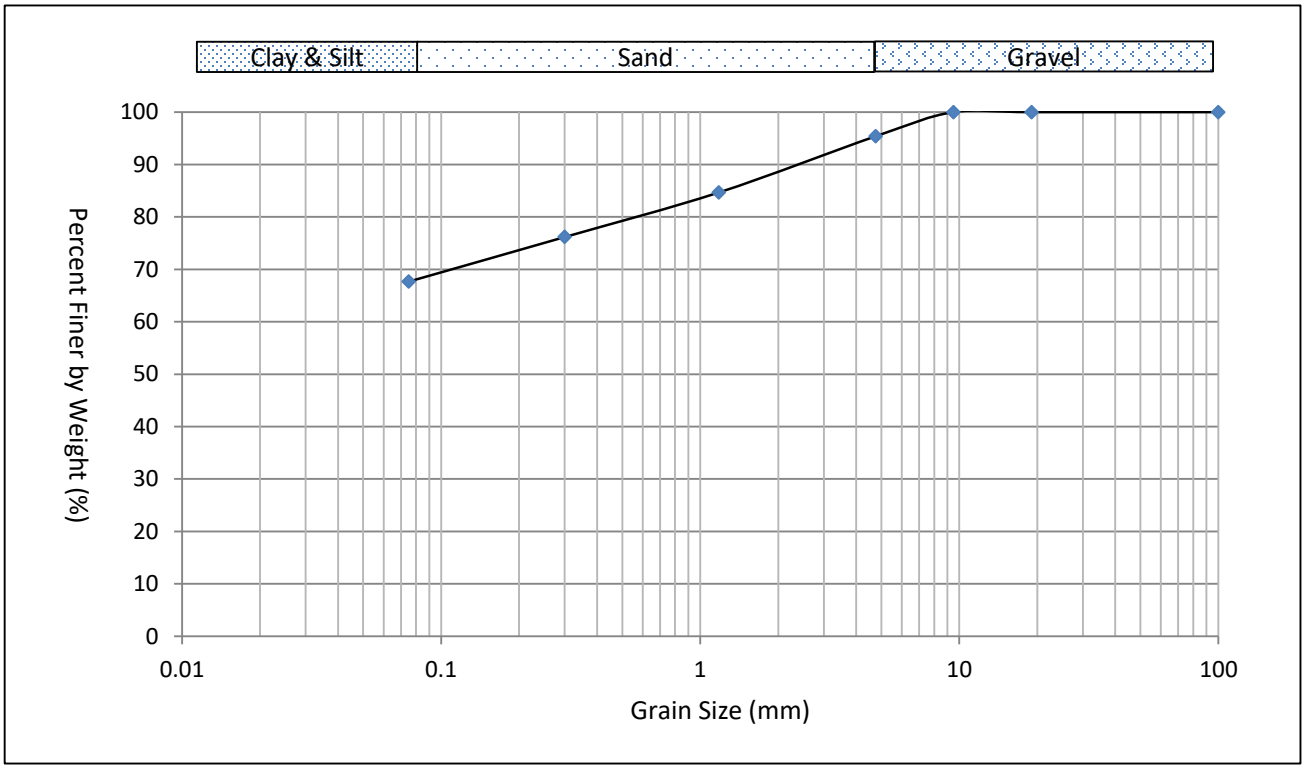


Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-6 BH3 SS6 4.57-5.03m

Clay & Silt: 68% Sand: 28% Gravel: 5%



Results related only to the items tested

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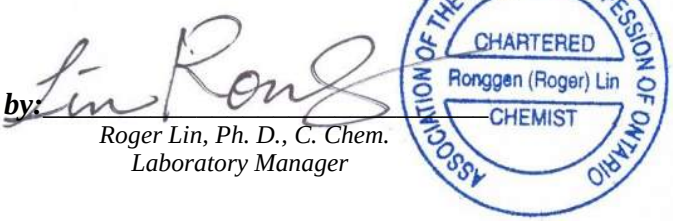
Client:	Infinity Development Group	***F.E. Job #:***	22-8059B
Address:	101-2275 Upper Middle Road	***Project Name:***	Geotechnical
	Oakville, ON	***Project ID:***	FE-P 22-11966
	L6H 0C3	***Date Sampled:***	N/A
Tel.:		***Date Received:***	3-Mar-2022
Email:		***Date Reported:***	10-Mar-2022
Attn.:		***Location:***	1396 Guelph Line
			Burlington, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
Hydrometer	Soil	1	N/A	9-Mar-22	Hydrometer SOP	ASTM D7928-17

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:



Roger Lin, Ph. D., C. Chem.
Laboratory Manager

Client: Infinity Development Group ***F.E. Job #:*** 22-8059B

Certificate of Analysis

Analysis Requested:	Hydrometer
Sample Description:	1 Soil Sample(s)

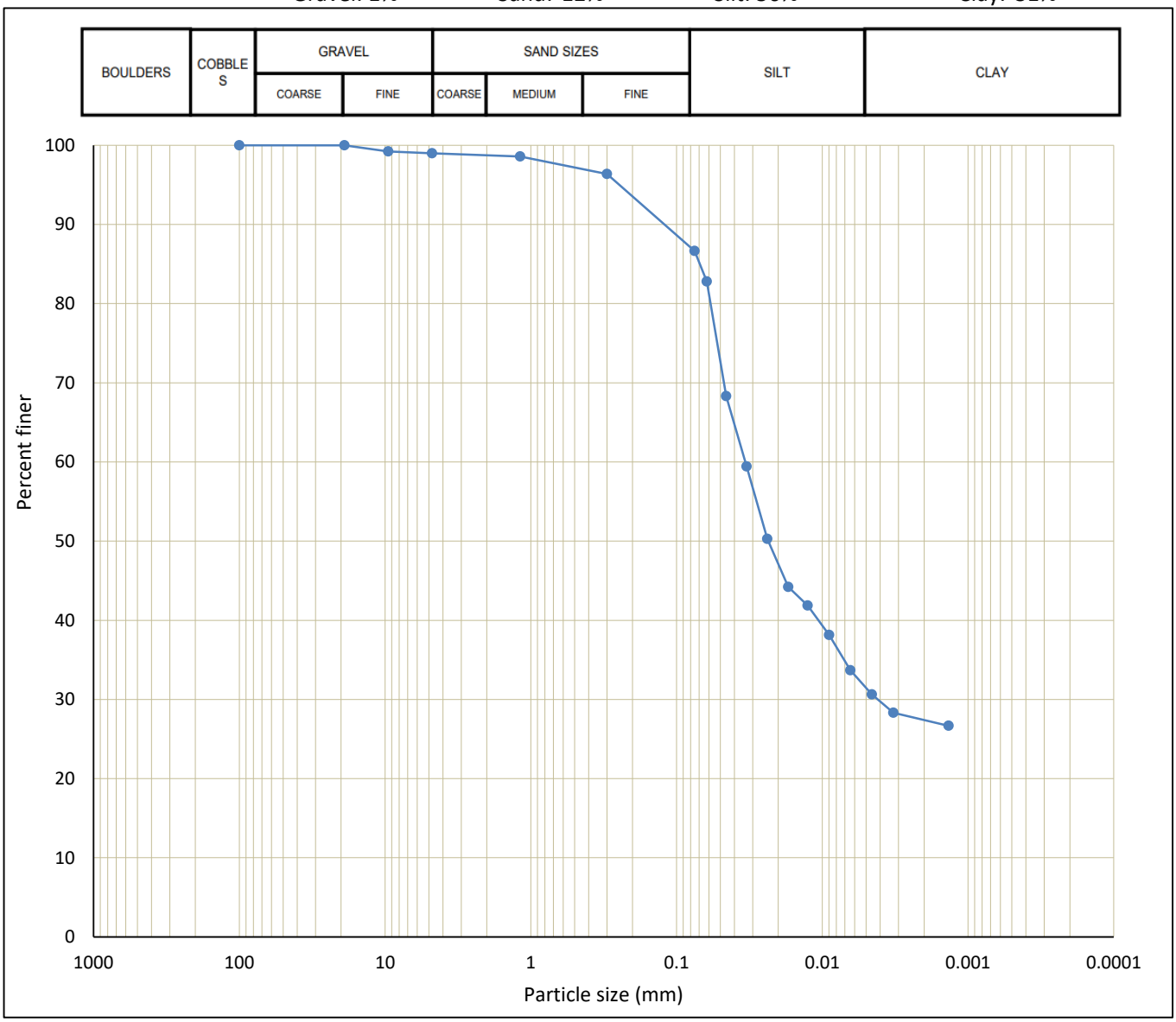
Parameter	***22-8059-4*** BH3 SS3 1.52-1.98m					
Grain Size (%)						
>19mm	0.0					
9.5mm-19mm	0.8					
4.75mm-9.5mm	0.2					
1.18mm-4.75mm	0.4					
300um-1.18mm	2.2					
75um-300um	9.8					
5um-75um	56					
2um-5um	4					
<2um	27					
Clay	**31**					
Silt	**56**					
Sand	**12**					
Gravel	**1**					

Client: Infinity Development Group ***F.E. Job #:*** 22-8059B

Grain Size Distribution

Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m

Gravel: 1% Sand: 12% Silt: 56% Clay: 31%



Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m		
Diameter	***Weight (%)***	***Grain Size***
>4.75mm	1.0	Gravel
1.18mm-4.75mm	0.4	Coarse Sand
300um-1.18mm	2.2	Medium Sand
75um-300um	9.8	Fine Sand
5um-75um	56	Silt
2um-5um	4	Clay
<2um	27	

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CHAIN OF CUSTODY 2588

Page ____ of ____

CLIENT INFORMATION
Company Name:
Contact: Clive 416-605-9722
Address: Rajindra 647-784-2727

Phone:
Fax: Fax results? Y/N
Email: Email results? Y/N

PROJECT INFORMATION
Project Name: 1396 Guelph Line
Project ID: 22-11966
Sampled By:

TURNAROUND TIME (TAT) REQUIRED

STD - Standard (5-7 working days) ✓		Working Time: Monday-Friday 9:00am-5:00pm
SR - Semi Rush (48 hours)	50%	Surcharges apply; Sample received after 2pm will be considered received the next business day
R - Rush (24 hours)	75%	
SD - Same Day - 100%	100%	

BILLING INFORMATION
Purchase Order #:
Verbal Authorization:
Credit Card (type):
Credit Card #:
Expiry Date:

LAB SAMPLE ID	CLIENT'S SAMPLE ID AND DESCRIPTION	SAMPLING DATE/TIME	SAMPLE MATRIX	CONTAINER # & TYPE	TAT (Above)	ANALYSIS REQUESTED (Check or Specify) Metals	PHCs	VOCs	PAHs	PCBs	Asbestos	Moist	Grain	NOTES
1	BH1 SS3 5-6.5'											✓		+ (CL, SO4, PH)
2	SS5 10-11.5'											✓		
3	SS6 15-16.5'											✓		
4	BH3 SS3 5-6.5'											✓	✓	+ (CL, SO4 + PH)
5	SS5 10-11.5'											✓	✓	
6	SS6 15-16.5'											✓	✓	
7	BH6 SS3 5-6.5'											✓		
8	SS5 10-11.5'											✓		
9	SS6 15-16.5'											✓		

Relinquished by: (Signature & Print) Behnam Sayad Pour
Date & Time: March 3, 22
Method of Shipment:

Client's Comments:

Received by: (Signature & Print) Bo
Date & Time: Mar 3. 22

Arrival Temperature (°C): 4°C
Laboratory Remarks:

Regulatory Requirements

Reg. 153
Table ____
☐ Residential / Parkland
☐ Industrial / Commercial
☐ Agricultural
Soil Texture
☐ Coarse ☐ Med/Fine

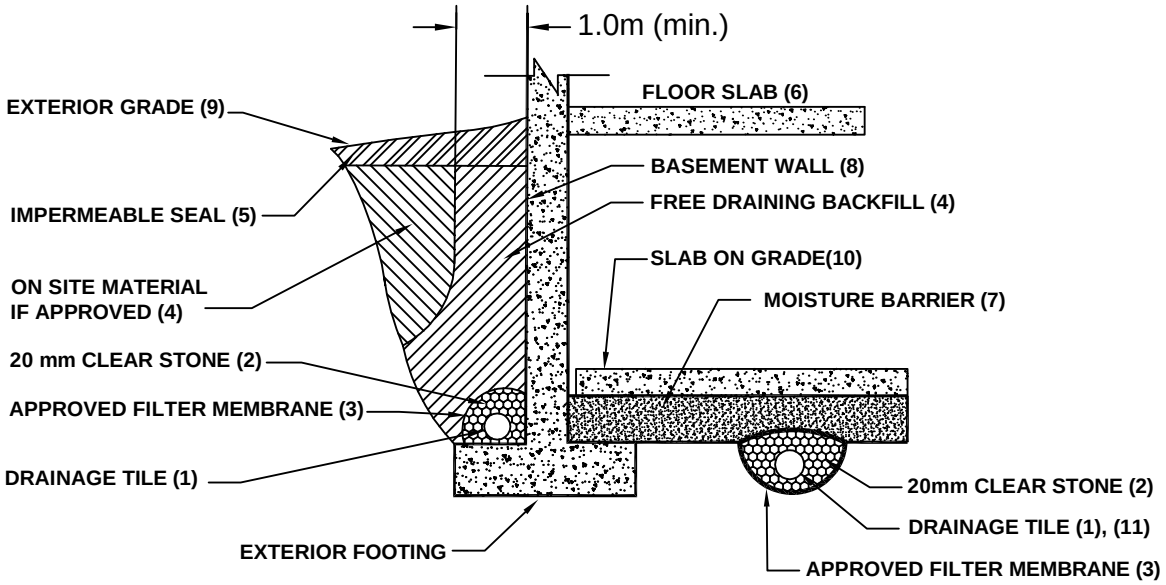
Sewer Use
☐ Sanitary
☐ Storm
Region ____

Reg. 558
☐ TCLP

Revision: 2.2

APPENDIX D – DRAINAGE and BACKFILL RECOMMENDATION

FISHER ENGINEERING



NOTES:

(1) DRAINAGE TILE TO CONSIST OF 100mm (4") DIAMETER WEEPING TILE OR EQUIVALENT PERFORATED PIPE LEADING TO A POSITIVE SUMP OR OUTLET.

(2) 20mm (3/4") CLEAR STONE - 150mm (6") TOP AND SIDE OF DRAIN. IF DRAIN IS NOT ON FOOTING, PLACE 100mm (4") OF STONE BELOW DRAIN.

(3) WRAP THE CLEAR STONE WITH AN APPROVED FILTER MEMBRANE (TERRAFIX 279R OR EQUIVALENT).

(4) FREE DRAINING BACKFILL - OPSS GRANULAR B OR EQUIVALENT COMPACTED TO THE SPECIFIED DENSITY. DO NOT USE HEAVY COMPACTION EQUIPMENT WITHIN 1.8m (6') OF WALL.

(5) IMPERMEABLE BACKFILL SEAL - COMPACTED CLAY, CLAYEY SILT OR EQUIVALENT. IF ORIGINAL SOIL IS FREE-DRAINING, SEAL MAY BE OMITTED. MAXIMUM THICKNESS OF SEAL TO BE 0.5m.

(6) DO NOT BACKFILL UNTIL WALL IS SUPPORTED BY BASEMENT AND FLOOR SLABS OR ADEQUATE BRACING.

(7) MOISTURE BARRIER TO BE AT LEAST 200mm (8") OF COMPACTED CLEAR 20mm (3/4") STONE OR EQUIVALENT FREE DRAINING MATERIAL. A VAPOUR BARRIER MAY BE REQUIRED FOR SPECIALTY FLOORS.

(8) BASEMENT WALL TO BE DAMP PROOFED.

(9) EXTERIOR GRADE TO SLOPE AWAY FROM BUILDING.

(10) SLAB ON GRADE SHOULD NOT BE STRUCTURALLY CONNECTED TO THE WALL OR FOOTING

(11) UNDERFLOOR DRAIN INVERT TO BE AT LEAST 300mm (12") BELOW UNDERSIDE OF FLOOR SLAB. DRAINAGE TILE PLACED IN PARALLEL ROWS 6 TO 8m (20-25') CENTERS ONE WAY. PLACE DRAIN ON 100mm (4") CLEAR STONE WITH 150mm (6") OF CLEAR STONE ON TOP AND SIDES. ENCLOSE STONE WITH FILTER FABRIC AS NOTED IN (3)

(12) THE ENTIRE SUBGRADE TO BE SEALED WITH APPROVED FILER FABRIC (TERRAFIX 270R OR EQUIVALENT) IF NON-COHESIVE(SANDY) SOILS BELOW GROUND WATER TABLE ENCOUNTERED.

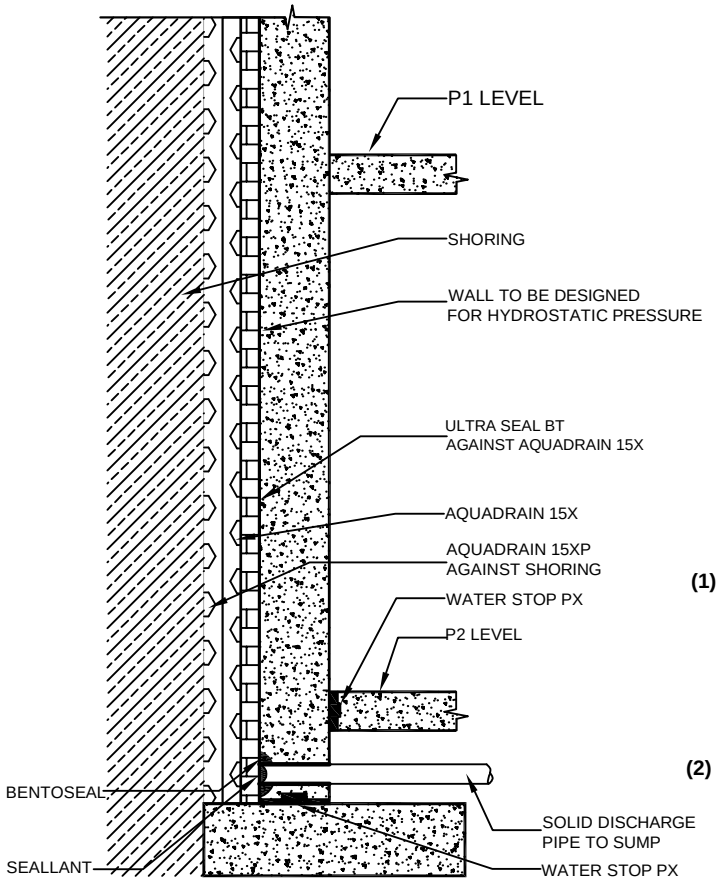
(13) DO NOT CONNECT THE UNDERFLOOR DRAINS TO PERIMETER DRAINS.

(14) REVIEW THE GEOTECHNICAL REPORT FOR SPECIFIC DETAILS.

DRAINAGE AND BACKFILL RECOMMENDATIONS

BASEMENT WITH UNDERFLOOR DRAINAGE

(NOT TO SCALE)



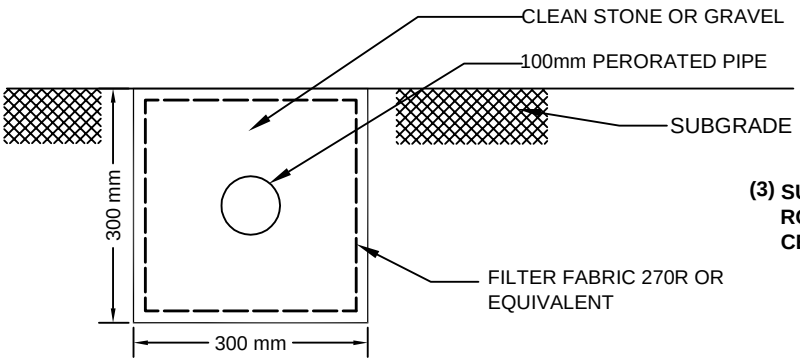
NOTES:

(1) ALL PERMANENT DRAINAGE PIPES MUST HAVE GEOTEXTILE FILTER SLEEVE TO PREVENT LONG TERM SILTING. TO FURTHER MINIMIZE SILTATION OF THE DRAINAGE SYSTEM, ALL DRAINAGE PIPE CONNECTION MUST BE SOLID PVC ELBOWS AND Ts. NO "BUTT" END CONNECTIONS SHOULD BE PERMITTED.

(2) PERIMETER COLLECTION PIPE TO BE SOLID PIPE,

SUGGESTED EXTERIOR DRAINAGE AGAINST SHORING

(NOT TO SCALE)



(3) SUBGRADE DRAIN TO BE PLACED IN PARALLEL ROWS 6-8 m (20'-25'), FROM CENTERLINE TO CENTERLINE.

DETAIL OF SUBGRADE DRAIN

(NOT TO SCALE)

APPENDIX E

HYDROGEOLOGICAL INVESTIGATION

FISHER ENGINEERING

ENGINEERING

Professional Engineers Ontario

LABORATORY

CALA
Canadian Association for Laboratory Accreditation Inc.

HYDROGEOLOGICAL INVESTIGATION



1396 GUELPH LINE, BURLINGTON, ONTARIO

Prepared for:

INFINITY DEVELOPMENT GROUP

Project No. FE-P 22-11967H

March 11, 2022

400 Esna Park Drive, Unit 15
Markham, ON
L3R 3K2

Tel: (905) 475-7755
Fax: (905) 475-7718
www.fisherenvironmental.com

Issued to:	Infinity Development Group 2275 Upper Middle Road East Oakville, ON L6H 0C3
Contact:	Arjun Anand arjun.anand@infinitydevelopment.ca
Project Name:	Hydrogeological Investigation for Proposed Development
Project Address:	1396 Guelph Line, Burlington, ON.
Project Number:	FE-P 22-11967H
Issued on:	March 11, 2022
Report Prepared By:	 Clive Wiggan, PhD., PMP., Project Manager clive@fishereng.com
Report Reviewed By:	 Frank Fan, PEng., Geotechnical Engineer frank@fishereng.com

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APPENDIX G – BACKFILL AND DRAINAGE DESIGN ..... G

1. INTRODUCTION

Fisher Engineering Limited was retained by Infinity Development Group to carry out a Hydrogeological Investigation for the proposed redevelopment at the property located at 1396 Guelph Line in Burlington, Ontario, hereinafter referred to as the 'Site'.

The purpose of the Hydrogeological Investigation was to evaluate groundwater conditions with respect to the redevelopment of the site.

The report has been prepared specifically and solely for the proposed development regarding hydrogeological aspects for design and construction.

The Hydrogeological Review has been prepared in accordance with the Ontario Water Resources Act, Ontario Regulation 387/04 and the Ontario Halton Sanitary and Storm Sewer By-Law No. 02-03.

2. SITE AND PROJECT DESCRIPTIONS

Site Settings

Guelph line is taken as running in a north-south direction for the purpose of this report. The site is located on the west side of Guelph Line, in a mixed commercial-residential neighbourhood, approximately 1.5km north of the onramp with Queen Elizabeth Way and is bounded by Guelph Line to the east, residential properties to the south, a hydro corridor to the west and north, beyond which are houses.

At the time of the investigation, the site was occupied by a single-storey commercial building with loading area located at the rear. The remaining areas of the site were mainly covered with asphalt pavement and utilized for parking.

Topography

The site is mostly flat and graded for drainage towards catch basins.

Proposed Development

It was understood that the existing building will be demolished to permit the construction of a new eleven-storey residential building, with three levels of underground parking. Finished Floor Elevation (FFE) is expected at 131.45m asl with TOS for P3 at 9.75m below (121.70m asl) according to the Site Plans prepared by Zedd Architecture dated March 8, 2022.

3. SCOPE OF HYDROGEOLOGICAL INVESTIGATION

The Hydrogeological Investigation works were required to:

1) Establish groundwater conditions for the design of dewatering works, if required, prior to construction of the proposed building.
2) Determine the need for permanent drainage and
3) Conduct calculations/analyses of the groundwater quantity and quality to be used for the necessary applications for permits prior to proceeding with construction dewatering and design of permanent drainage, if necessary.

The scope of this work generally consisted of the following:

- **Drilling/locating Monitoring Wells.** Drilling of monitoring wells and reviewing / compiling the borehole logs and onsite / laboratory testing.
- **Data Evaluation.** Evaluating the results of soil types, groundwater static levels, ground surface elevation, groundwater quality, flow direction and other available hydrogeological data for the site and their potential impact on the proposed development.
- **Hydraulic Conductivity Tests.** Conduct single well response tests and record groundwater level drawdown and recovery to model/calculate hydraulic conductivity.
- **Groundwater Quality Analysis.** Carry out laboratory analyses on groundwater to determine compliance with the Ontario Halton Sewer Use Bylaws No. 02-03 (Mar 2003) – Halton Sanitary Sewer and Halton Storm Sewer.
- **Groundwater Level Monitoring.** Conduct long-term monitoring of the groundwater levels to determine the seasonal high-water levels.
- **Hydrogeological Report.** Prepare and submit a report detailing the findings and recommendations of the Hydrogeological Investigation.

4. FIELD AND LABORATORY WORKS

Subsurface exploration for the hydrogeological investigation was carried out concurrent with drilling for the geotechnical investigation on March 2 and 3, 2022 and consisted of (6) borehole advanced to depths of 9.12m to 15.32m below prevailing grade. All boreholes were instrumented as monitoring wells with 3.05m (10') long, 51mm diameter PVC slotted screen pipes. A clean silica sand pack was placed around each well screen which was isolated with bentonite extending to slightly below existing grade as shown on the Log of Boreholes in Appendix B.

A CME-55 Truck mounted drill rig equipped with solid stem augurs, supplied by Terra Firma Services, was used for all drilling work under direct supervision of Fisher Engineering personnel. Soil samples, in the overburden soils, were taken at regular intervals using a split–spoon sampler advanced by means of the Standard Penetration Test (SPT) which was conducted in general accordance with ASTM Specification D1586. Field tests to determine engineering parameters of the soils were carried out during drilling, which included Standard Penetration Tests (SPT). Approximate locations of the boreholes are shown on the Borehole Location Plan in Appendix A.

Laboratory Analyses

The soil samples were taken to the Fisher Environmental laboratory for further visual assessment and classification. Three (3) representative soil samples from BH1, BH3 and BH6 were submitted for grain size analyses and nine (9) samples for moisture content tests. Two (2) samples were submitted for pH, Chloride and Sulphate analyses to determine impact on concrete. The laboratory samples were tested and classified in general accordance with the Unified Soil Classification System, ASTM D 2487, and Standard Practice for Classification of Soil for Engineering Purposes. The laboratory results, which are presented in Appendix C, confirm the field description for subsurface soils discussed in Section 5.0.

One (1) groundwater sample from MW6 was submitted to ALS Environmental laboratory for analyses of water quality under the Ontario Halton Sewer Use Bylaws No. 02-03 (Mar 2003) – Halton Sanitary Sewer and Halton Storm Sewer. The results are presented in Appendix D.

The soil samples recovered during the investigation will be stored in the Fisher Environmental laboratory for a period of 30 days after submitting this report and will be discarded thereafter unless instructed otherwise by the client.

Site Survey

Elevations at borehole/monitoring well locations were interpolated from a topographic survey plan, prepared by Ashenhurst Nouwens & Associates Inc, dated December 20, 2021.

5. SUBSOIL CONDITIONS

Surface and subsurface conditions encountered at borehole locations are shown in Appendix B - Log of Boreholes and are summarized in the following sections. The logs include soil stratification at borehole locations along with detailed soil descriptions. Variations in soil stratification may occur and should be expected between borehole locations and elsewhere on the site.

Asphalt/Fill - Approximately 1.5" to 3" of asphalt pavement was encountered at the surface of all boreholes and was underlain by granular material consisting generally of moist, dense gravelly sand to sand and gravel. Fill soils consisting of dark grey to black clayey silt to brown sandy silt with trace gravel, pieces of concrete and asphalt and some organic materials were encountered below the granular material in BH1, BH3, BH5 and BH6. A layer of dark brown, moist, firm clayey silt at 0.91m to 2.29m in BH4 could not be positively identified and was described as 'possibly fill'. Fill depths and elevations are presented in Table 1.

Table 1: Fill Depths and Elevations

Borehole No.	Surface Elevation (m asl)	Depth of Borehole (m bgs)	Ele at Bottom of Borehole (m asl)	Depth of Fill (m bgs)	Ele at Bottom of Fill (m asl)
BH1	131.11	10.75	120.36	0.91	130.20
BH2	131.27	10.36	120.91	0.46	130.81
BH3	130.96	15.37	115.59	1.68	129.28
BH4	130.64	15.24	115.40	1.52	129.12
BH5	129.92	13.80	116.12	0.61	129.31
BH6	130.12	9.25	120.87	1.37	128.75

Grey to Brown Sandy Silt Till – A layer of grey/grey to brown, generally moist, compact, sandy silt till, with trace gravel and trace clay was encountered below the fill of BH1, BH2, BH4 (possibly fill), BH5 and BH6 and below clayey silt till in BH3. The sandy silt layer extended to depths of 1.98m (BH1) to 3.35m (BH6).

Reddish Brown Silt to Clayey Silt Till - Reddish brown, moist to dry, hard to very stiff, clayey silt till with trace sand and pieces of shale/cobbles was encountered generally below the sandy silt till extending to depths of 5.18m (BH5) to 6.10m (BH2 & BH4).

Light Brown Silty Sand - A pocket of light brown, wet, silty sand was encountered at depth of 2.44m to 3.05m bgs in BH3.

Red Weathered Shale – Red, moist to dry, hard, weathered shale was encountered beneath the overburden soils in all boreholes at depths of 5.18m (BH5) to 6.10m (BH2, BH3 & BH4). Power auguring was undertaken to refusal in the weathered shale to borehole termination depths of 9.25m (BH6) to 15.37m (BH3).

6. HYDROGEOLOGICAL STUDY

A hydrogeological study for the subject site was conducted based on the boreholes/wells' exploration, observation and site/laboratory testing. Groundwater details from the six (6) newly installed monitoring wells were used in the Hydrogeological Study. The wells were constructed with 3.05m (10') long, 51mm diameter PVC slotted screen pipes, with the bases at approximate depths below existing grade as shown in Appendix B. Clean silica sand packs were placed around each well screen which was isolated with bentonite extending to slightly below existing grade.

Standing water was measured at 5.18m in BH2 and BH4 and at 4.57m bgs in BH6 on completion of drilling. The other open boreholes were observed to be dry. A pocket of wet silty sand was observed between 2.44m and 3.05m bgs while wet seams were observed at 4.57m bgs in BH6.

6.1 Hydrogeological Conditions

Review of the available surficial geological and hydrogeological information for the area shows that the site is underlain generally with clay to silt-textured till (derived from glaciolacustrine deposits or shale). Underlying bedrock is represented by shale, limestone, dolostone and siltstone of the Queenston Formation and is generally less than 10m below prevailing grade. Surficial geology and bedrock maps are presented in Appendix A.

The subsoils and hydrogeological conditions were observed and recorded during both the geotechnical and hydrogeological investigations. Based on the boreholes/wells' exploration, the saturated soil layers on the site were dominated by light brown silty sand and silt seams embedded in the predominantly clayey silt till and sandy silt till.

All monitoring wells were purged/developed and allowed to fully recover prior to carrying out groundwater level measurements and sampling. Measured groundwater depths and elevations are summarized in Table 2.

Comments on Table 2:

The following general comments regarding groundwater conditions at the site are based on the groundwater level data and the geotechnical investigation:

- Static groundwater levels approximately one week after drilling (March 9, 2022) were observed at 2.70m to 10.15m below grade (elevations of 127.70m to 120.96m).
- Pockets of perched and seepage water from more pervious soils may be expected on the site.
- Roseland Creek is located approximately 1.3km southeast of the site while several several smaller creeks are located within a 3km radius of the site.
- The site is located in a developed residential/commercial area, with no indication of active domestic wells within a 500m radius measured from the centre of the property. Water supply in the area is generally via municipal water system.
- Groundwater levels are being monitored biweekly during the rainy season to determine highwater levels at the site.

Table 2: Groundwater Depths and Elevations

Well No.		MW1	MW2	MW3	MW4	MW5	BH6
Elev. at Ground (m asl)		131.11	131.27	130.96	130.64	129.92	130.12
Depth of MW	m bgs	10.67	10.36	14.63	15.24	13.41	9.15
Elev. at bottom of well	m asl	120.44	120.91	116.33	115.40	116.51	120.97
On Completion	GW level, m bgs	Dry	5.18	Dry	5.18	Dry	4.57
	GW Ele, m asl	-	126.09	-	125.46	-	125.55
2-Mar-22	GW level, m bgs	n/a	n/a	12.64	11.17	n/a	2.84
	GW Ele, m asl	-	-	118.32	119.47	-	127.28
9-Mar-22	GW level, m bgs	10.15	3.57	4.00	3.95	6.05	2.70
	GW Ele, m asl	120.96	127.70	126.96	126.69	123.87	127.42

6.2 Hydraulic Conductivity K Modeling Results

Single Well Response Tests

Single well response tests (SWRT) were conducted in MW3, MW4 and MW6 on March 2, 2022. The water bearing media mainly consisted of occassional pockets/seams of silty sand and silt seams interbedded in the sandy silt till and clayey silt till at various intervals, and were assumed to be unconfined, homogenous, isotropic and of uniform thickness. It was also assumed that the wells fully penetrated the water bearing soils. Water bearing weathered shale seams may also be expected at further depths. Data from the single well response tests were used to calculate the hydraulic conductivity values using Luthin's method.

Calculated values for hydraulic conductivity (k) are summarized in Table 3 and are representative of the water bearing soil characteristic consisting of pockets/seams of silty sand/silt embedded in the till soils and or wet lenses/seams in the weathered shale at the screened depths. Details of the hydraulic conductivity analyses are presented in Appendix C.

Table 3: Summary of screen interval, Single Well Response Tests and Hydraulic Conductivity Results

Test Wells	Well Surface Elevation (m asl)	Groundwater Depth (m)	Screen Elevation (m asl)	Variance of water head created (m)	Minutes/ Recovery Percentage	Hydraulic Conductivity, K (Luthin's Method)	
						m/s	m/day
MW1	131.11	10.15	120.44 – 123.45	n/a	n/a	n/a	n/a
MW2	131.27	3.57	120.91 – 123.96	n/a	n/a	n/a	n/a
MW3	130.96	12.64	116.33 – 120.90	1.76	31 min / 15%	3.03×10^{-7}	0.026
MW4	130.64	11.17	115.40 – 121.50	2.18	31 min / 11%	1.06×10^{-7}	0.009
MW5	129.92	6.05	116.51 – 119.55	n/a	n/a	n/a	n/a
MW6	130.12	2.84	120.97 – 124.02	6.10	31 min / 13%	3.03×10^{-7}	0.026

6.3 Grain Size Analysis for Hydraulic Conductivity K

Representative samples from BH3 were selected and submitted to Fisher Environmental Laboratory for grain size distribution analyses. The laboratory results are presented in Appendix C and summarized in Table 4.

Based on the field soil description (Unified Soil Classification System) and grain size distribution, the overburden soils within the excavation depths can by classified as: SC – Clayey sands, sand-clay mixtures to SM – Silty sands, sand-silt mixtures with estimated coefficient of permeability k and corresponding percolation times T as shown in Table 4 based on Table 2 of the Supplementary Guidelines to the Ontario Building Code, 1997. These values are generally consistent with field observation and hydraulic conductivity tests.

Table 4: Hydraulic Conductivity Estimated from Grain Size Analysis

Location	Depth of soil sample (m)	Soil Classification	Permeability and Percolation Time (Suplementary Guidelines to the OBC)	
			Coefficient of permeability, k in cm/s	Percolation Time, T in mins/cm
BH3	5 - 6½'	Clay & Silt, some Sand, trace Gravel (Till)	10^{-4} - 10^{-6}	12 - 50
	10 – 11½'	Clay & Silt, some Sand, trace Gravel (Till)	10^{-4} - 10^{-6}	12 - 50
	15 – 16½'	Sandy Clay & Silt, trace Gravel (Till)	10^{-3} - 10^{-5}	8 - 20

7. CONSTRUCTION DEWATERING & PERMANENT DRAINAGE

7.1 Construction Dewatering

It was understood that the development will consist of a mid-rise residential building with three underground levels. Subsoil conditions were observed to be generally consistent across the site. FFE is 131.45m with TOS for P3 at 121.70m asl. Conventional strip and or spread footings were recommended in the geotechnical report at 1.2m below TOS, 120.50m asl with elevator shaft expected at another 1.5m below. This means that the footings will likely extend below the groundwater levels observed during the investigation. The groundwater level should therefore be lowered to 1m below the designed footing depths to protect footing subgrade from hydraulic pressure disturbance during construction.

Construction dewatering flowrate of **20.23 m^3/day (20,230 L/day)** is recommended with three underground levels. Factored dewatering rate of **30.34 m^3/day (FS of 1.5)** should be used for planning purposes.

Seasonal High Groundwater Levels

Groundwater levels will be monitored during the rainy season, March through to June 2022, to determine seasonal highwater levels on the site. An average groundwater of the two highest groundwater levels from MW6 (2.77m asl) was used to calculate construction dewatering rate. The highest groundwater level was increased by 1.0m (1.70m bgs) and used to calculate permanent drainage rate.

Accounting for Accumulated Precipitation

Provisions should be made to pump accumulated water from the excavation areas during construction, particularly following a period of heavy rainfall. For example, 25mm rainfall in 24 hrs may result in accumulation of up to 83m^3 in the excavated area. Subsurface soils at the site are dominated by sandy to clayey silt till with occasional layer of silty sand and silt overlying shale. Consequently, some amount of ponding of rainwater may be expected. A conservative accumulated volume of **30 m^3/day** may therefore be assumed for planning purposes. Accumulated precipitation may be stored on site for subsequent disposal to an MOECC-licensed facility. If the water is to be discharged into the public sewer system, then an application for the discharge of private water will have to be made to Halton Region. The water quality, at the time of the application, will need to be ascertained to ensure compliance with Ontario Sewer Use Bylaws – Halton Sanitary Sewer Bylaw No. 02-03.

*Maximum construction discharge rates, taking into consideration accumulated precipitation volumes, are **50,230 L/day** (unfactored) and **60,340 L/day (factored**).*

7.2 Permanent Drainage

Permanent drainage rate of **17.81 m^3/day (17,810 L/day)** was obtained for three underground levels with the lowest P3 TOS elevation of approximately 121.70m asl. A factored permanent drainage rate of **26.72 m^3/day (FS of 1.5)** should be used for planning purposes.

An application for permission to discharge to the municipal/regional sewer system will be required unless the subsurface structure of the building is designed as watertight or onsite disposal facilities are implemented.

It is further recommended that the subsurface portion of the elevator shaft, below P3 level, be designed as watertight to prevent the need to have deeper groundwater sump pits for permanent drainage.

7.3 Permit to Take Water (PTTW)

As the calculated construction dewatering flowrate for the building, including accumulated precipitation, is more than 50 m^3/day, registration on the MOECC Environmental Activity and Sector Registry (EASR) for Water Taking will be required for construction. An application for permission to take water (PTTW) will not be required for neither construction dewatering nor permanent drainage as the daily flowrates are less than 400,000 and 50,000 L/day respectively.

7.4 Groundwater Quality

The results (March 3, 2022) of analyses for groundwater quality under the Ontario Halton Sanitary Sewer Bylaw No. 02-03 (Mar 2003) and Halton Storm Sewer By-law No. 02-03 show compliance with all parameters as shown in Appendix D.

Based on the results of the laboratory analyses,the groundwater in its present form may be discharged to the public storm and sanitary systems without treatment.

It should be noted however that testing of groundwater at the depths observed during the investigation would not be representative of the water that might accumulate during a high rainfall event. Any accumulation of precipitation occurring in the excavation during construction, that may require offsite discharge, will have to be tested at the time of the event to determine the quality of water for discharge.

7.5 Dewatering Influence Zone

The estimated construction dewatering quantities are based on the worst-case groundwater conditions that might occur during the construction period. Calculated dewatering influence zone is expected to be up to 7.64m from the edge of the dewatering point in the predominantly sandy silt till to clayey silt till and much lower in the weathered shale. Recharge was observed to be relatively slow during SWRT. Consequently, construction dewatering may be achieved by pumping from sump pits where necessay.

7.6 Hydrogeological Impact

During the investigation, it was determined that there will not be any negative impact to the natural environment, Halton Region Sewer works nor surrounding properties due to construction dewatering because of the depth at which groundwater was observed and the types of soil/rock on the site. No groundwater induced depression at surface level is expected. Consequently, it is not expected that construction will impact public infrastructure, the natural environment nor will there be any settlement issues.

8. DISCUSSION

Hydraulic conductivity values (k) calculated from onsite single well response tests are 1.06×10^{-7} to 3.03×10^{-7} m/s (0.009 to 0.026 m/day) in the wells screened within the silty sand/silt/ sandy silt till and clayey silt till and partly into the shale. These are representative of the water bearing soils comprising silty sand/silt layers/seams embedded in the till material and weathered shale at the expected excavation depths for footings based on the geotechnical and hydrogeological field investigations.

An approximate construction dewatering discharge rate of 20.23 m^3/day will be required for the recommended footing depths for three underground level. Permanent drainage of 17.81 m^3/day will be required. A factor of safety of 1.5 should be applied to construction dewatering and permanent drainage rates.

Registration on the MOECP's EASR Website for water taking will be required during construction however an application for PTTW will not be required under conditions observed on the site during the investigation.

The groundwater quality determined by laboratory analyses revealed compliance to parameters of the Halton Region sanitary and storm sewer. Groundwater may therefore be discharged to the Region's sanitary or storm systems without treatment.

It should be noted that if it is intended that any accumulated water, following periods of heavy rainfall, be discharged into the public sewer, then a permit to discharge would be required along with laboratory analyses to ensure compliance with relevant sewer bylaws.

The discharge rates for construction dewatering and permanent drainage, given in the preceding, are based on common practice and reasonable assumption for excavation depths and are subject to further modifications when details of the structures become available.

9. LIMITATIONS

This report is limited in scope to those items specifically referenced in the text. The discussions and recommendations presented in this report are intended only as guidance for the named client, design engineers and those directly associated with implementing, regulating and monitoring of the project. The information on which these recommendations are based is subject to confirmation by engineering personnel at the time of construction. Localized variations in the subsoil conditions may be present between and beyond the boreholes and should be verified during construction.

As more specific subsurface information becomes available during excavations on the Site, this report should be updated. Contractors bidding on or undertaking the work should decide on their own investigations, as well as their own interpretations of the factual borehole results. This concern specifically applies to the classification of the subsurface soil and the potential reuse of these soils on/off Site. Contractors should draw their own conclusions as to how the near surface and subsurface conditions may affect them.

APPENDIX A – SITE AND LOCATION MAPS AND PLAN



FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

N

LEGEND

SITE BOUNDARY

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1396 Guelph Line,
BURLINGTON,ONTARIO

FIGURE A1:

SITE LOCATION PLAN

SHEET NO.

PROJECT NO.

FE-P22-11967

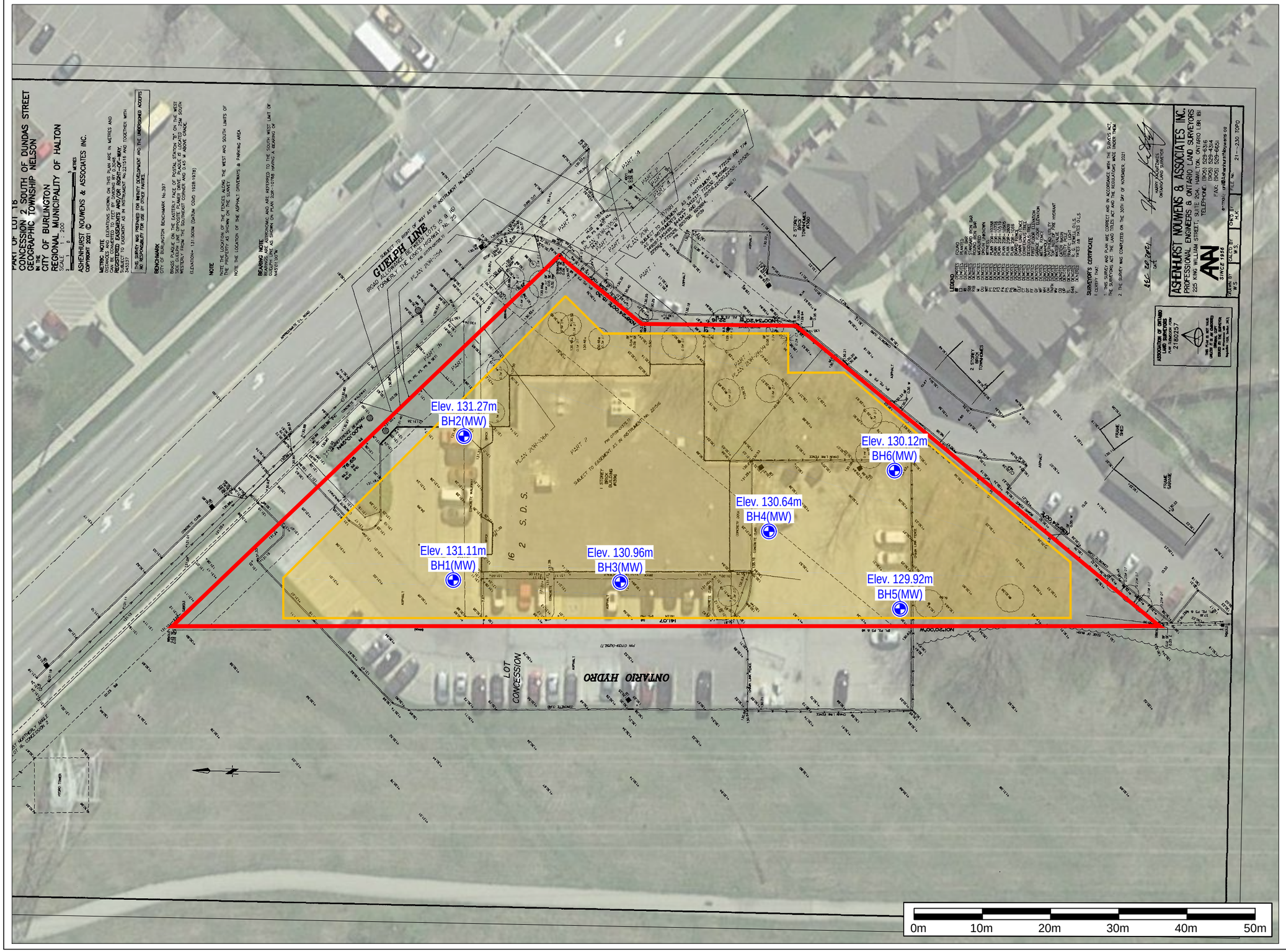
DATE

MARCH 2022

SCALE

AS SHOWN

A1



PART OF LOT 15
CONCESSION 2 SOUTH OF DUNDAS STREET
GEOGRAPHIC TOWNSHIP NELSON
IN THE
CITY OF BURLINGTON
REGIONAL MUNICIPALITY OF HALTON
SCALE 1 : 200
ASHENHURST NOUWENS & ASSOCIATES INC.
COPYRIGHT 2021 ©

METRIC NOTE
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.
PLAN REFERENCED TO UTM GRID (ZONE 17) NAD 83 (CSRS) 1997.
SUBJECT TO EASEMENT AS IN INSTRUMENT No.221514 AND TOGETHER WITH A RIGHT OF WAY.

BENCHMARK
CITY OF BURLINGTON BENCHMARK No.397
BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION 'B' ON THE WEST SIDE OF GUELPH LINE, 0.5 METRES SOUTH OF THE CENTRELINE OF DUNDAS STREET AND 0.45 METRES WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.
ELEVATION= 131.500M (DATUM GSC) 1928-1978)

NOTE
NOTE THE LOCATION OF THE FENCES ALONG THE WEST AND SOUTH LIMITS OF THE PROPERTY AS SHOWN ON THE SURVEY.
NOTE THE LOCATION OF THE ASPHALT DRIVEWAYS & PARKING AREA

BEARING NOTE
BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE SOUTH WEST LIMIT OF GUELPH LINE AS SHOWN ON PLAN 20R-10704 HAVING A BEARING OF N45°51'00"W

SURVEYOR'S CERTIFICATE
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT, THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 30TH DAY OF NOVEMBER, 2021
HARRY KANTAKIOS
ONTARIO LAND SURVEYOR
DATE

ASHENHURST NOUWENS & ASSOCIATES INC.
PROFESSIONAL ENGINEERS & ONTARIO LAND SURVEYORS
225 KING WILLIAM STREET, SUITE 204, HAMILTON, ONTARIO L8R 1B1
TELEPHONE: (905) 529-6662 FAX: (905) 529-6663
SINCE 1956
DRAWN BY: WS | CHK'D BY: HK | DATE: 21-11-30 | FILE No.: TOPO

LEGEND
PROPERTY BOUNDARY
PROPOSED BUILDING FOOTPRINT (PARKING GARAGE BELOW)
BOREHOLE WITH MONITORING WELL LOCATION

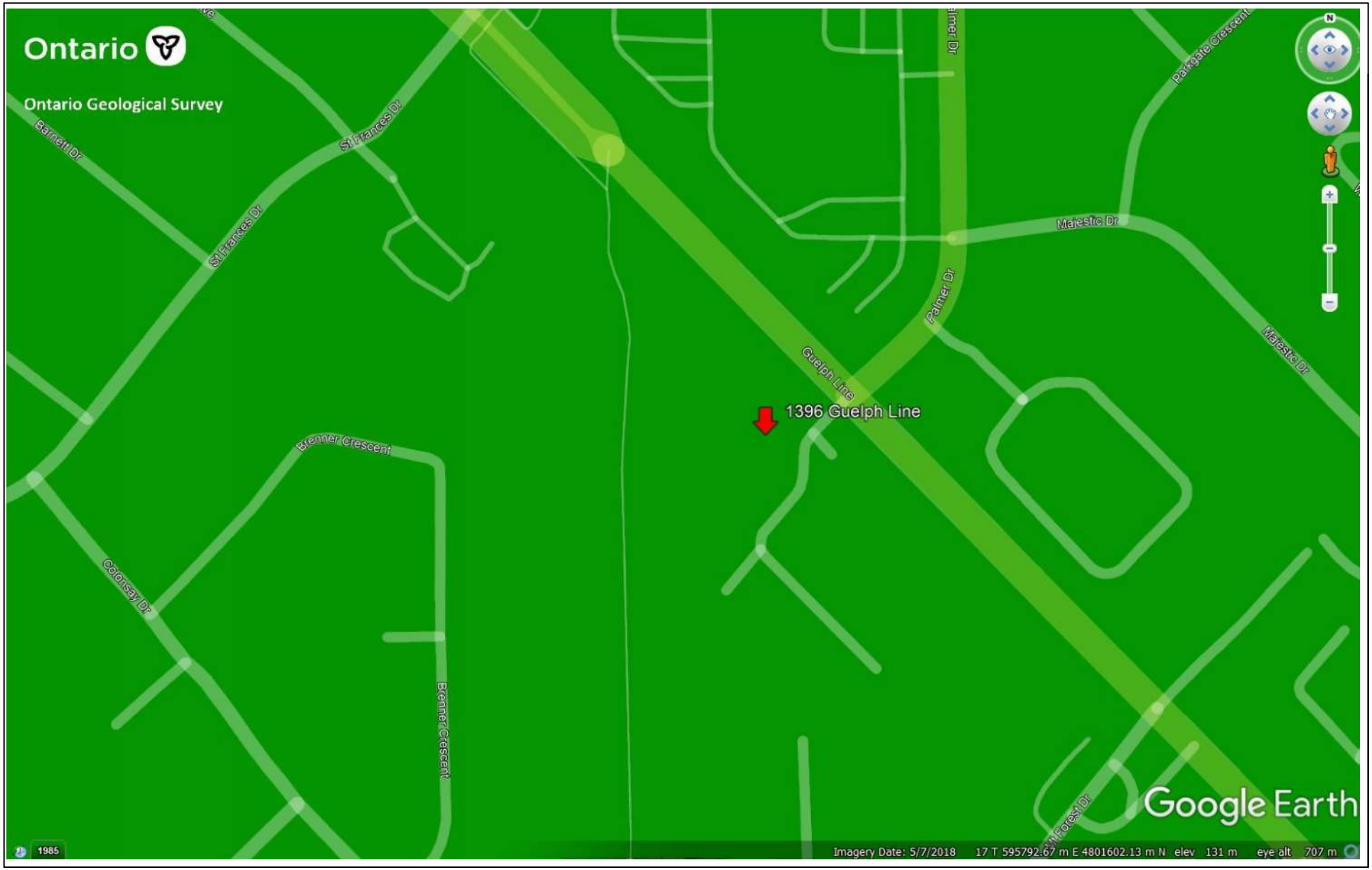
NORTH

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

PROJECT NAME AND ADDRESS
GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS
1396 Guelph Line,
Burlington, ON

FIGURE 1.1:
SITE PLAN WITH BOREHOLE MONITORING WELL LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 22-11966/67	A2
DATE: 4 March 2022	
SCALE: AS SHOWN	



FISHER ENGINEERING
400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

KEY PLAN

LEGEND

Clay to silt-textured till (derived from glaciolacustrine deposits or shale)

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1396 Guelph Line,
Burlington, Ontario

PROJECT NO. FE-P 21-11967H

DATE MARCH 2022

SCALE

A3

Surficial Geology Map



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Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

KEY PLAN

LEGEND

Shale, limestone, dolostone, siltstone from the Queenston Formation

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1396 Guelph Line,
Burlington, Ontario

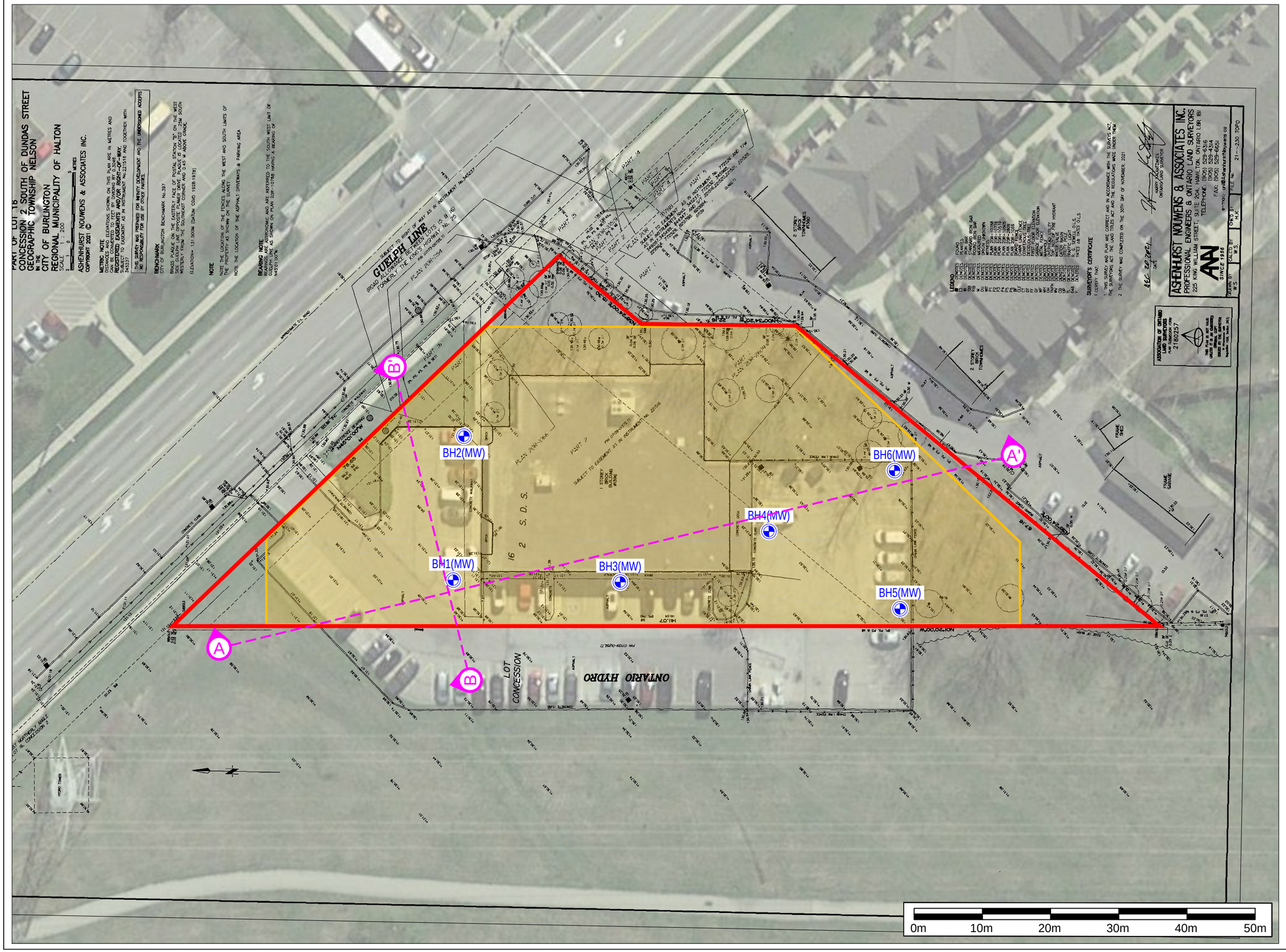
PROJECT NO. FE-P 22-11967H

DATE MARCH 2022

SCALE

A4

Bedrock Geology Map



PART OF LOT 16
CONCESSION 2 SOUTH OF DUNDAS STREET
GEOGRAPHIC TOWNSHIP NELSON
IN THE
CITY OF BURLINGTON
REGIONAL MUNICIPALITY OF HALTON
SCALE 1 : 200
ASHENHURST NOUWENS & ASSOCIATES INC.
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METRIC NOTE
DISTANCES AND ELEVATIONS SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

BENCHMARK
CITY OF BURLINGTON BENCHMARK No.397
BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION 'B' ON THE WEST SIDE OF GUELPH LINE, 0.3 METRES SOUTH OF THE CENTRELINE OF DUNDAS STREET, WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.
ELEVATION= 131.900M (DATUM GSC0 1928-1978)

NOTE
NOTE THE LOCATION OF THE FENCES ALONG THE WEST AND SOUTH LIMITS OF THE PROPERTY AS SHOWN ON THE SURVEY.
NOTE THE LOCATION OF THE ASPHALT DRIVEWAYS & PARKING AREA

BEARING NOTE
BEARINGS ARE ASTRONOMIC AND ARE REFERRED TO THE SOUTH WEST LIMIT OF GUELPH LINE AS SHOWN ON PLAN 20R-10709 HAVING A BEARING OF N45°01'00"W

LEGEND
DENOTES FOUND
DENOTES IRON BAR
DENOTES STANDARD IRON BAR
DENOTES MEASURED
DENOTES PLAN 20R-10709
DENOTES PLAN 20R-11078
DENOTES PLAN 20R-11079
DENOTES PLAN 20R-12869
DENOTES PLAN 20R-13263
DENOTES SHAW TRACE
DENOTES CONCRETE
DENOTES CONIFEROUS TREE
DENOTES DECIDUOUS TREE
DENOTES FINISHED FLOOR ELEVATION
DENOTES HYDRO TRANSFORMER
DENOTES MEASURED
DENOTES NATURAL GRADE
DENOTES PROPERTY LINE
DENOTES SANITARY MANHOLE
DENOTES SHRUB
DENOTES UTILITY POLE
DENOTES WATER VALVE
DENOTES WOOD FENCE
DENOTES 9.453 (AS PER) O.L.S.

SURVEYOR'S CERTIFICATE
I CERTIFY THAT:
1. THIS SURVEY AND PLAN ARE CORRECT AND IN ACCORDANCE WITH THE SURVEYS ACT, THE SURVEYORS ACT AND THE LAND TITLES ACT AND THE REGULATIONS MADE UNDER THEM.
2. THE SURVEY WAS COMPLETED ON THE 30TH DAY OF NOVEMBER, 2021

HARRY KANTAKOS
ONTARIO LAND SURVEYOR
DATE: Nov 30/2021

ASHENHURST NOUWENS & ASSOCIATES INC.
PROFESSIONAL ENGINEERS & ONTARIO LAND SURVEYORS
225 KING WILLIAM STREET, SUITE 204, HAMILTON, ONTARIO L8R 1B7
TELEPHONE: (905) 529-6662 FAX: (905) 529-6663
SINCE 1956
EMAIL: anda@ashenhurstnouwens.ca

DRAWN BY	CHK'D BY	FILE No.
W.S.	H.K.	21-230 TOPO

ASSOCIATION OF ONTARIO LAND SURVEYORS
2180257 TYM
THE TITLE OF THIS PLAN IS REGISTERED UNDER THE LAND TITLES ACT

FISHER ENGINEERING

400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2

Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

- PROPERTY BOUNDARY
- PROPOSED BUILDING FOOTPRINT
- BOREHOLE WITH MONITORING WELL LOCATION
- A - A' CROSS SECTION MARK

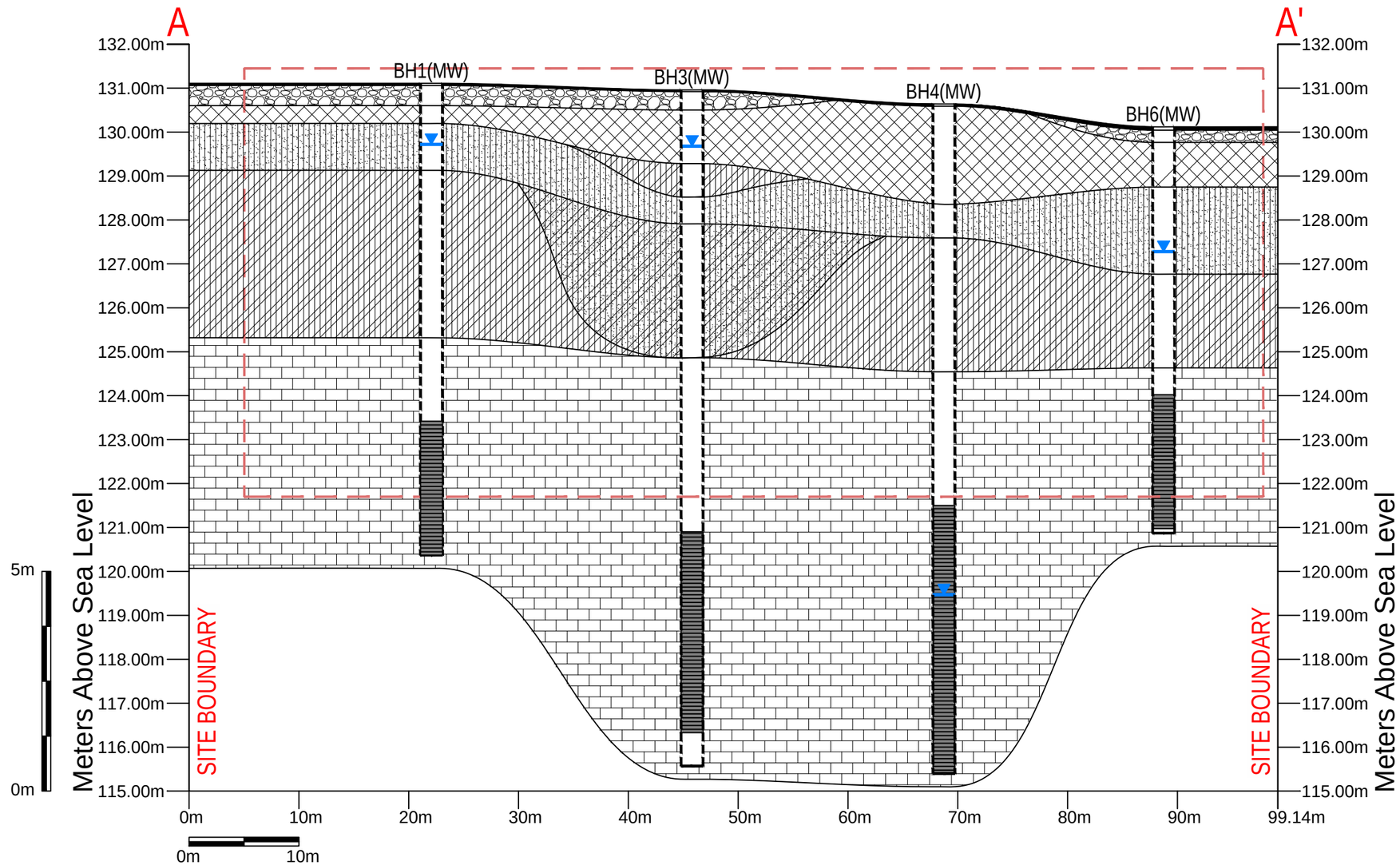
PROJECT NAME AND ADDRESS

GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

1396 Guelph Line,
Burlington, ON

FIGURE A5:
SITE PLAN WITH BOREHOLE MONITORING WELL LOCATIONS

PROJECT NO.	SHEET NO.
FE-P 22-11966/67	A5
DATE: 4 March 2022	
SCALE: AS SHOWN	



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Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

- ASPHALT
- GRANULAR MATERIAL
- FILL
- SAND
- SILT
- CLAY
- SHALE
- OUTLINE OF PROPOSED BUILDING UNDERGROUND PARKING GARAGE
- GROUNDWATER POTENTIOMETRIC LEVEL

PROJECT NAME AND ADDRESS

GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

1396 Guelph Line,
Burlington, ON

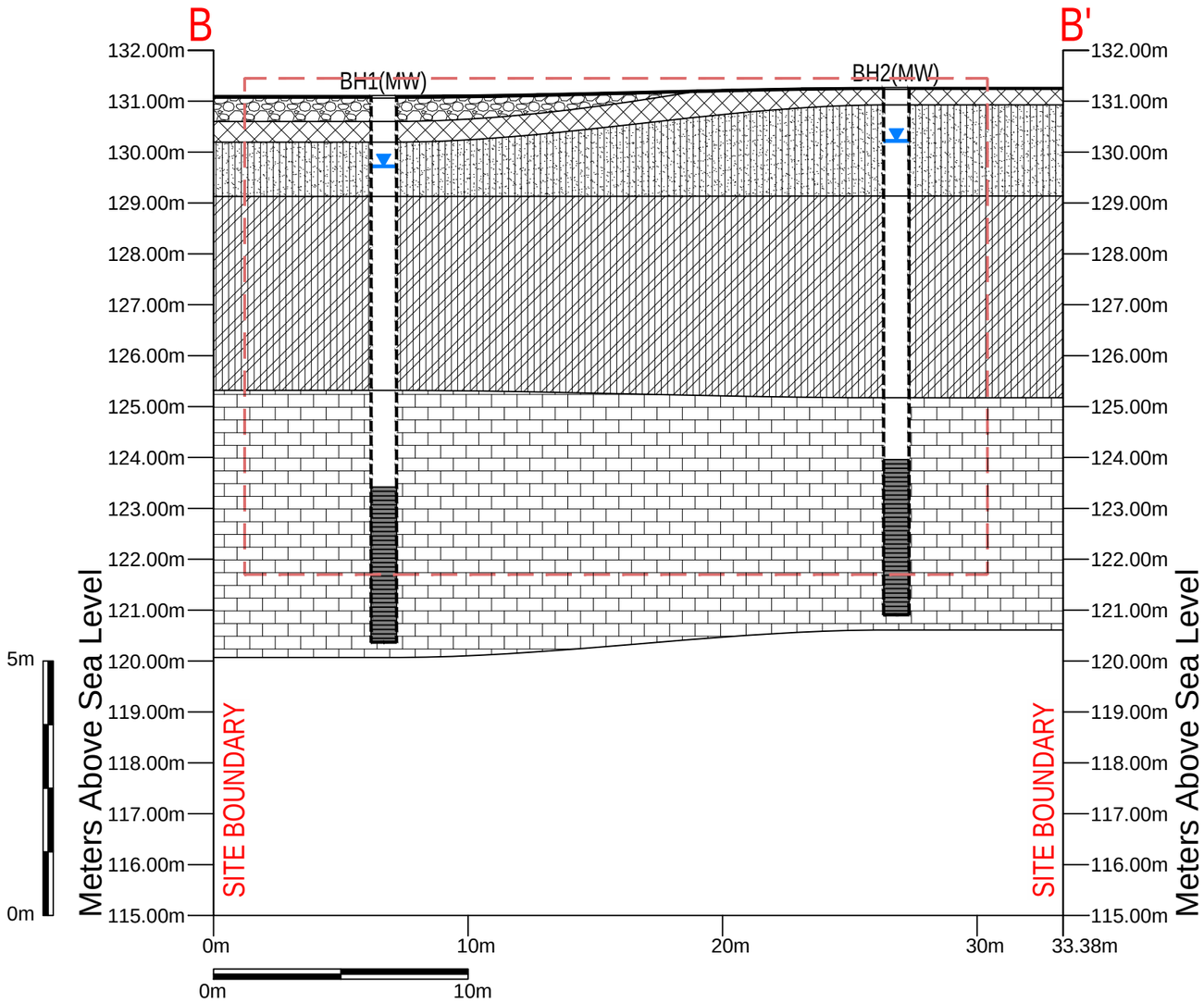
PROJECT NO.
FE-P 22-11966/67

DATE.
7 March 2022

SCALE.
AS SHOWN

FIGURE 5.1:
CROSS-SECTION A - A';

SHEET NO.
A5.1



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LEGEND

- ASPHALT
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- FILL
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- SILT
- CLAY
- SHALE
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- GROUNDWATER POTENTIOMETRIC LEVEL

PROJECT NAME AND ADDRESS

GEOTECHNICAL & HYDROGEOLOGICAL INVESTIGATIONS

1396 Guelph Line,
Burlington, ON

PROJECT NO. FE-P 22-11966/67

DATE. 7 March 2022

SCALE. AS SHOWN

FIGURE 5.2: **CROSS-SECTION B - B';**

SHEET NO. A5.2



Infinity Development Group

1396 Guelph Line
Burlington, Ontario

21-027

March 08, 2022

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ARCHITECTURE

ARCHITECTURE | DESIGN | PLANNING
zedd architecture inc Z-627 maitland street london ontario N5Y 2V7 519 518 9333 www.zeddarchitecture.com info@zeddarchitecture.com



PROJECT STATISTICS

PROJECT#: 21-027
MARCH 04 2022

1396 GUELPH LINE
BURLINGTON

SITE

	Acre	Hectare	ft²	m²
TOTAL SITE AREA	**1.03**	**0.4168**	**44,867**	**4,168**

LOT COVERAGE (%)	33% (1,392 m²)
BUILDING HEIGHT (m)	42.37 (11 STOREYS)
VEHICLE PARKING	236 (1.00 PER UNIT)
BICYCLE PARKING	85 (0.36 PER UNIT)
DENSITY (UNITS PER HECTARE)	566
FLOOR SPACE RATIO (m²) (ABOVE GRADE GFA / SITE AREA)	4.02
OUTDOOR AMENITY	1,807 m² (7.66 m² PER UNIT)
INDOOR AMENITY	446 m² (1.89 m² PER UNIT)

BUILDING

FLOOR AREAS (m²)	**BELOW GRADE**	**ABOVE GRADE**
P.03	3,326	0
P.02	3,326	0
P.01	3,326	0
LV.01	0	1,392
LV.02-LV.06 (x5)	0	1,679 (8,395)
LV.07-.LV.10 (x4)	0	1,450 (5,800)
LV.11	0	1,160
TOTAL GFA 26,725	**9,978**	**16,747**

UNITS	**TOTAL**	**3 BED**	**2 BED**	**1 BED**	**BACHELOR**
LV.01	5	0	0	5 (100%)	0
LV.02-LV.06 (x5)	26 (130)	0	5 (25) (19%)	20 (100) (77%)	1 (5) (4%)
LV.07-.LV.10 (x4)	21 (84)	0	6 (24) (28%)	13 (52) (62%)	2 (8) (10%)
LV.11	17	0	7 (41%)	10 (59%)	0
TOTAL UNITS	**236**	**0**	**56 (24%)**	**167 (70%)**	**13 (6%)**

AMENITY (m²)	**BALCONIES & TERRACES**	**INTERIOR SPACE**
LV.01	60	446
LV.02-LV.06 (x5)	218 (1,090)	0
LV.07	393	0
LV.08-LV.10 (x3)	114 (342)	0
LV.11	315	0
TOTAL AMENITY	**1,807**	**446**

PARKING	**BICYCLE**	**BARRIER-FREE (2.75m x 5.6m)**	**STANDARD (2.6m x 5.6m)**
P.01	80	4	88
P.02	0	4	90
P.03	0	1	41
LV.01	5	0	8
TOTAL PARKING 236V / 85B	**85**	**(4%) 9**	**227**

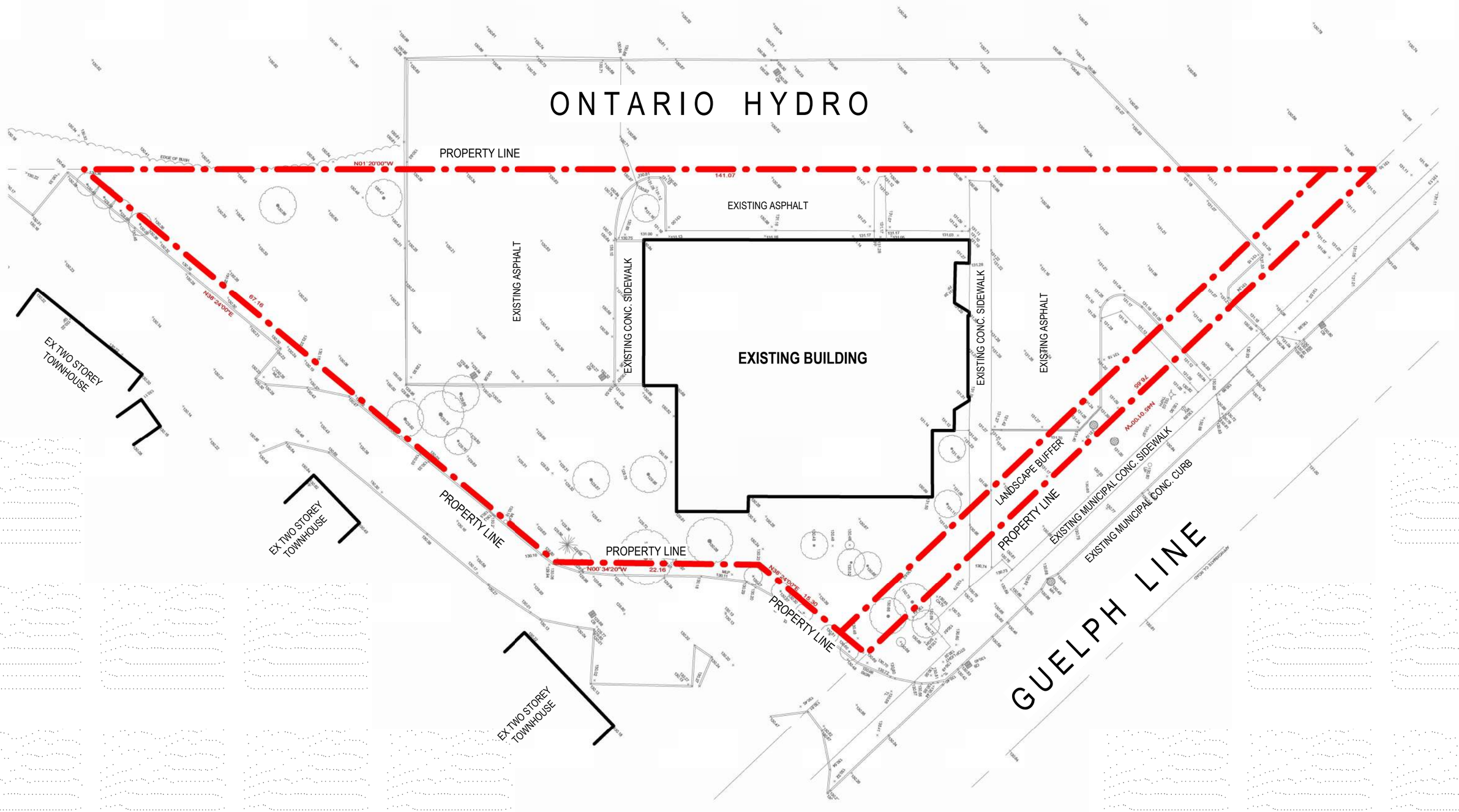
NOTE:
- GROSS FLOOR AREA INCLUDES ALL BELOW AND ABOVE GRADE SPACES WITHIN EXTERIOR WALLS AND IS CALCULATED TO THE EXTERIOR FACE OF EXTERIOR WALL.
- ROOM CALCULATIONS ARE MADE TO INTERIOR FACE OF DEMISING, CORRIDOR AND EXTERIOR WALLS.
- AMENITY AREAS ARE CALCULATED TO CENTERLINE OF DEMISING WALLS, EXTERIOR FACE OF CORRIDOR AND EXTERIOR WALLS.

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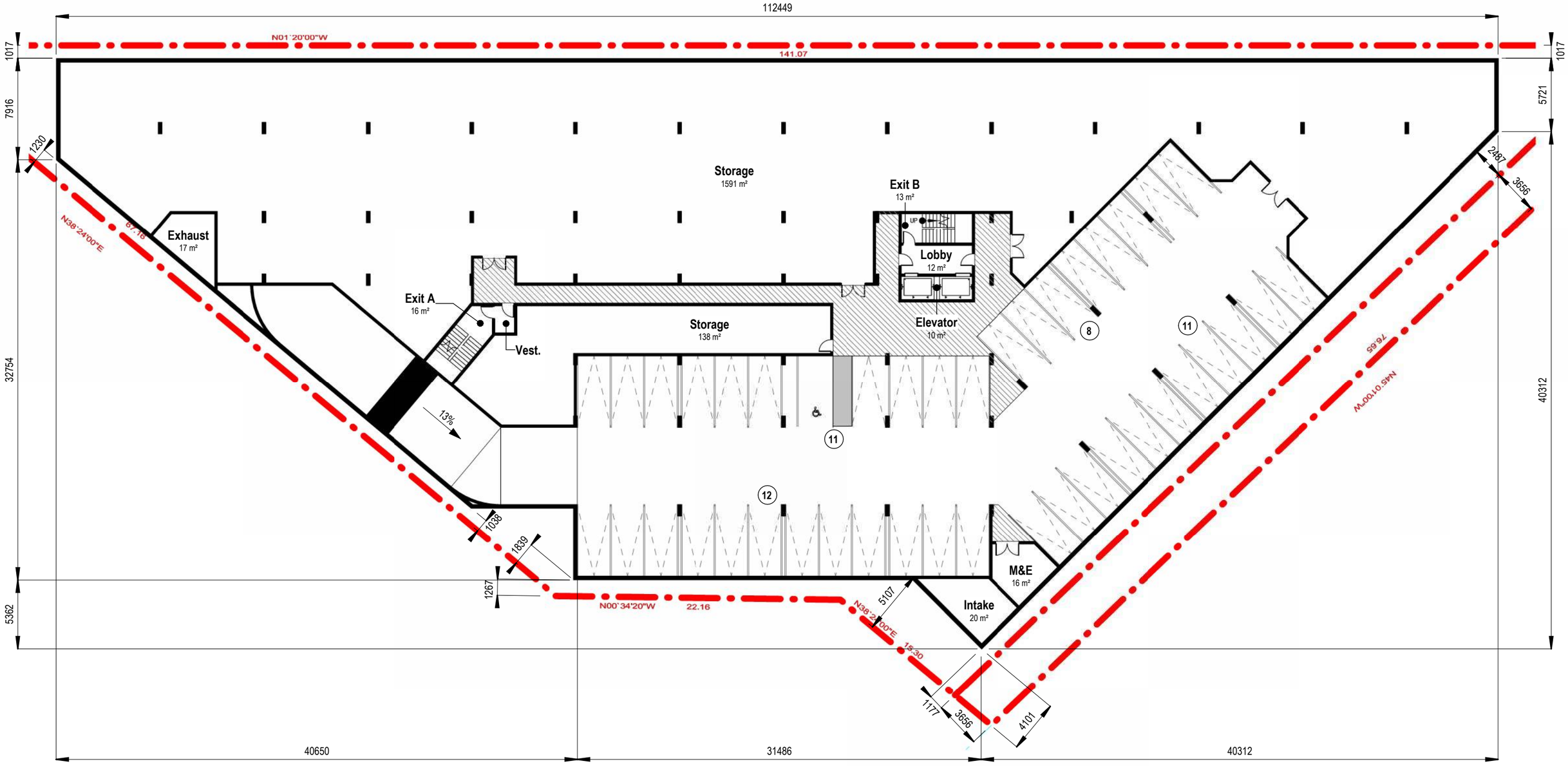


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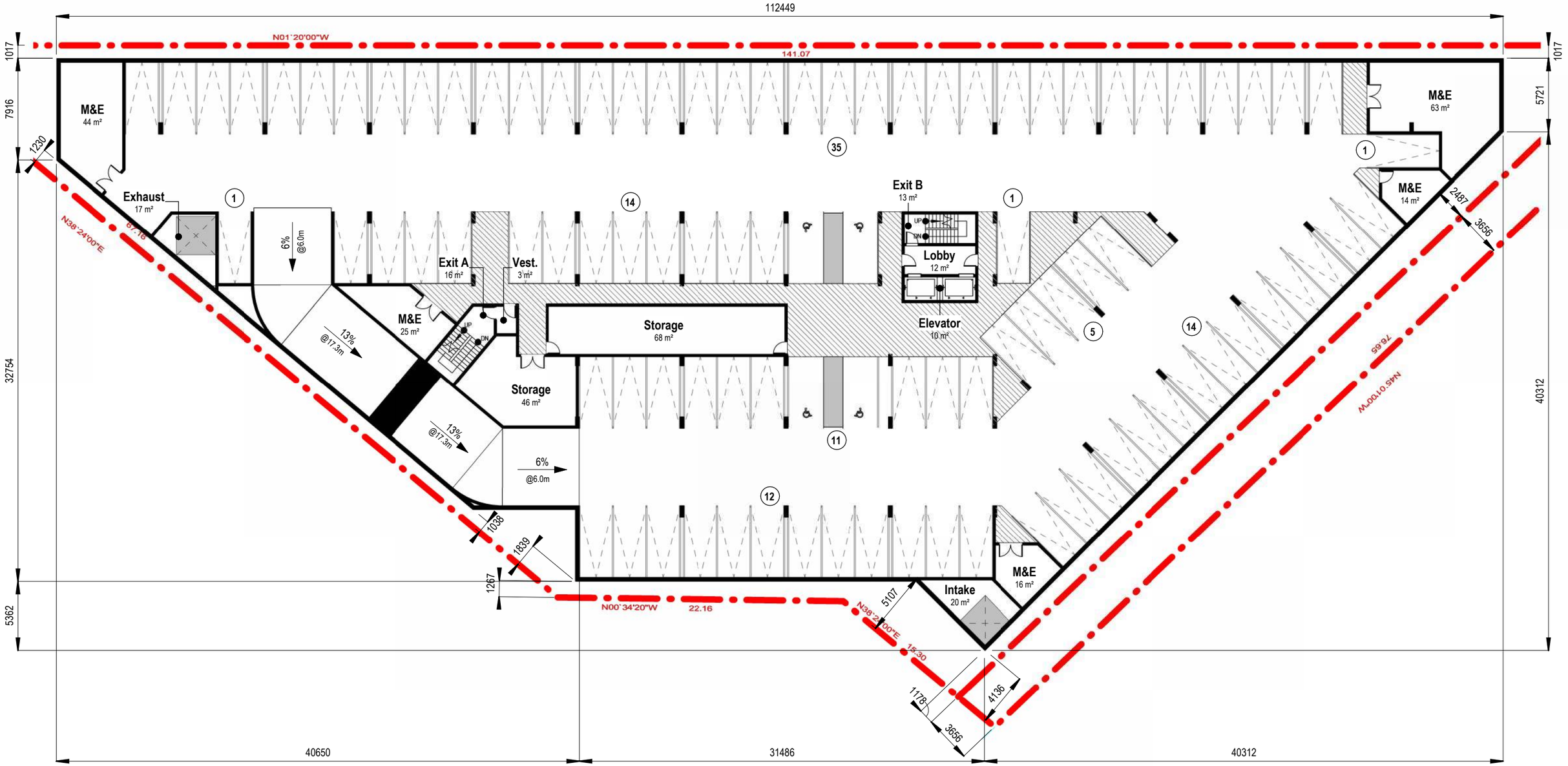
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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | Parking Level P3 Floor Plan | March 08, 2022 | SD2.1

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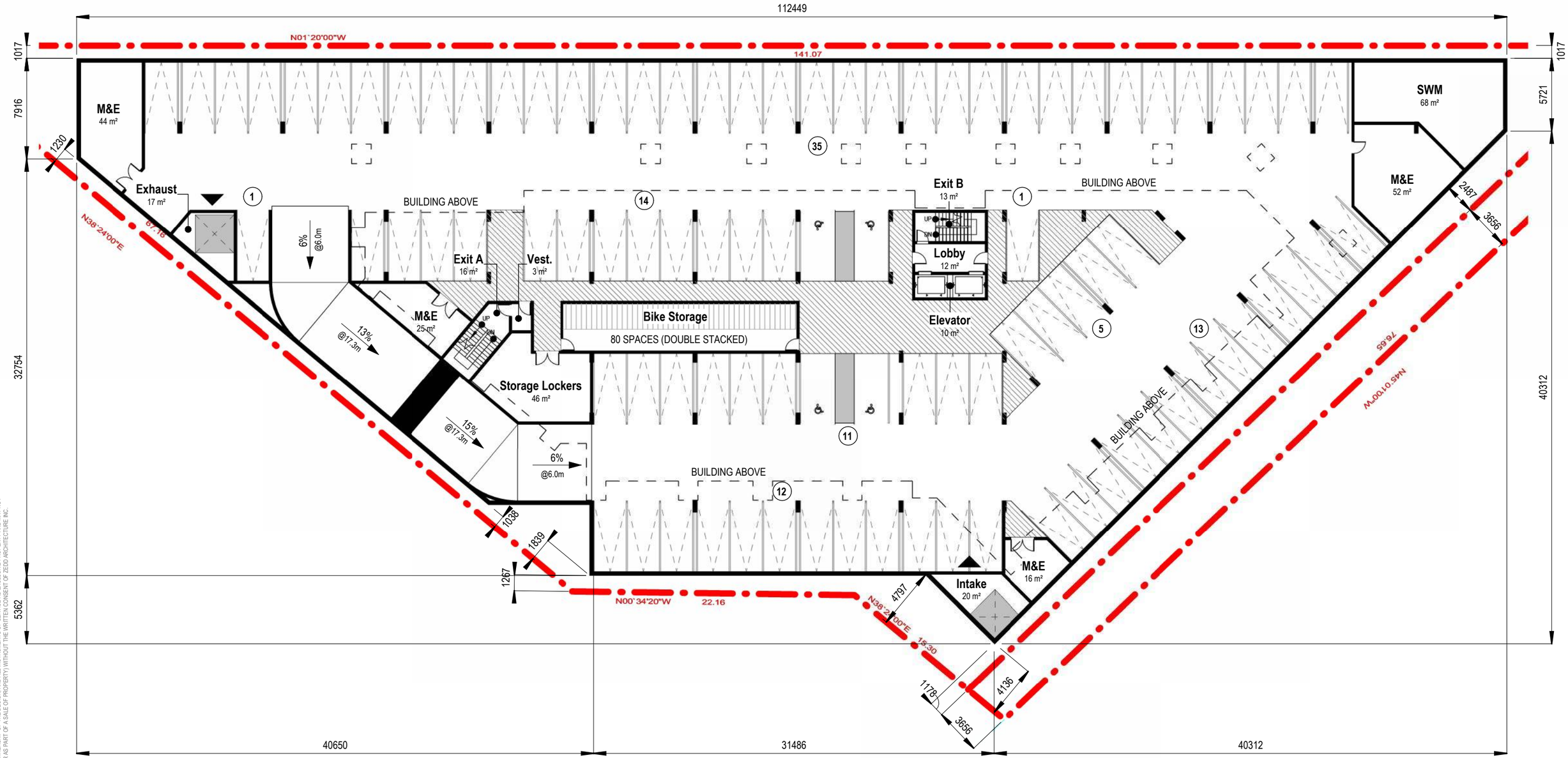


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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Parking Level P2 Floor Plan	March 08, 2022	SD2.2

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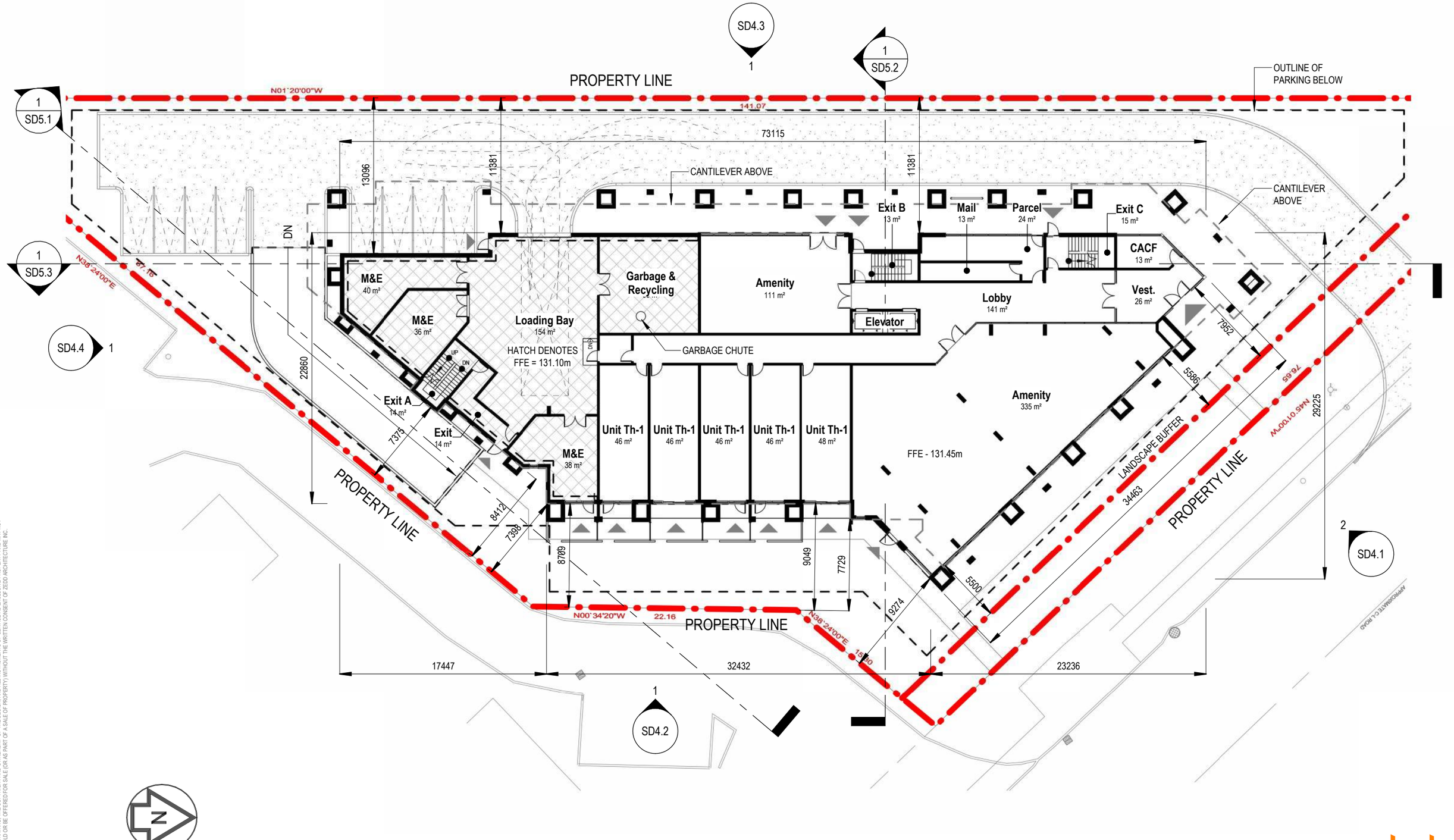


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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Parking Level P1 Floor Plan	March 08, 2022	SD2.3

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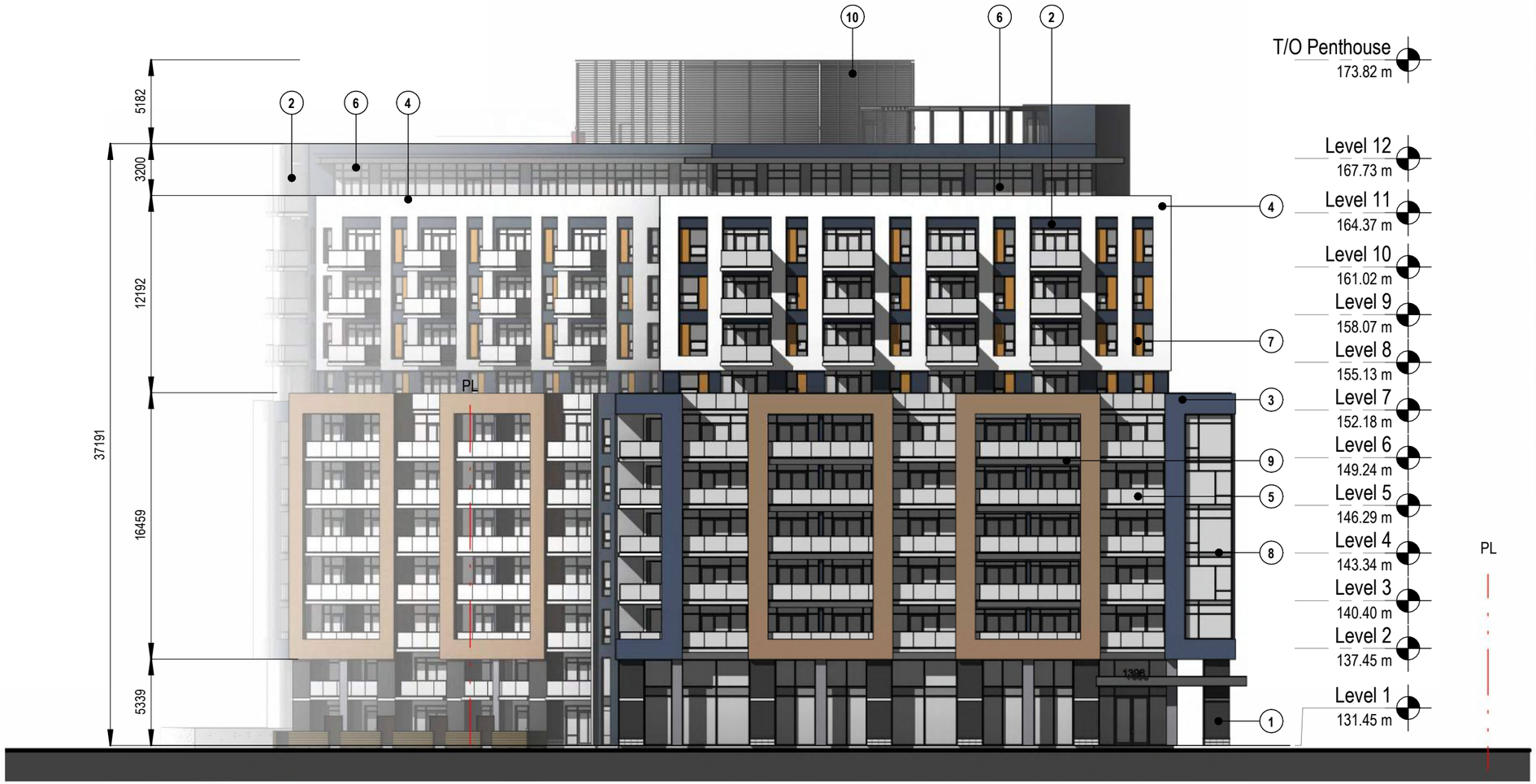


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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Level 1 Floor Plan	March 08, 2022	SD2.4

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Exterior Finish Legend

1	BRICK
2	PAINT
3	ARCHITECTURAL PANEL 1
4	ARCHITECTURAL PANEL 2
5	VISION GLASS HANDRAIL
6	DOUBLE GLAZED ALUMINUM VISION GLASS
7	ALUMINUM FRAME WITH METAL SPANDREL PANEL - WOOD GRAIN PANEL
8	DOUBLE GLAZED ALUMINUM ALUMINUM WINDOW WALL SYSTEM
9	METAL SLAB EDGE COVER
10	EXTRUDED ALUMINUM PENTHOUSE

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Scale : As indicated

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Northeast Elevation	March 08, 2022	SD4.1

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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | East Elevation | March 08, 2022 | SD4.2

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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	West Elevation	March 08, 2022	SD4.3

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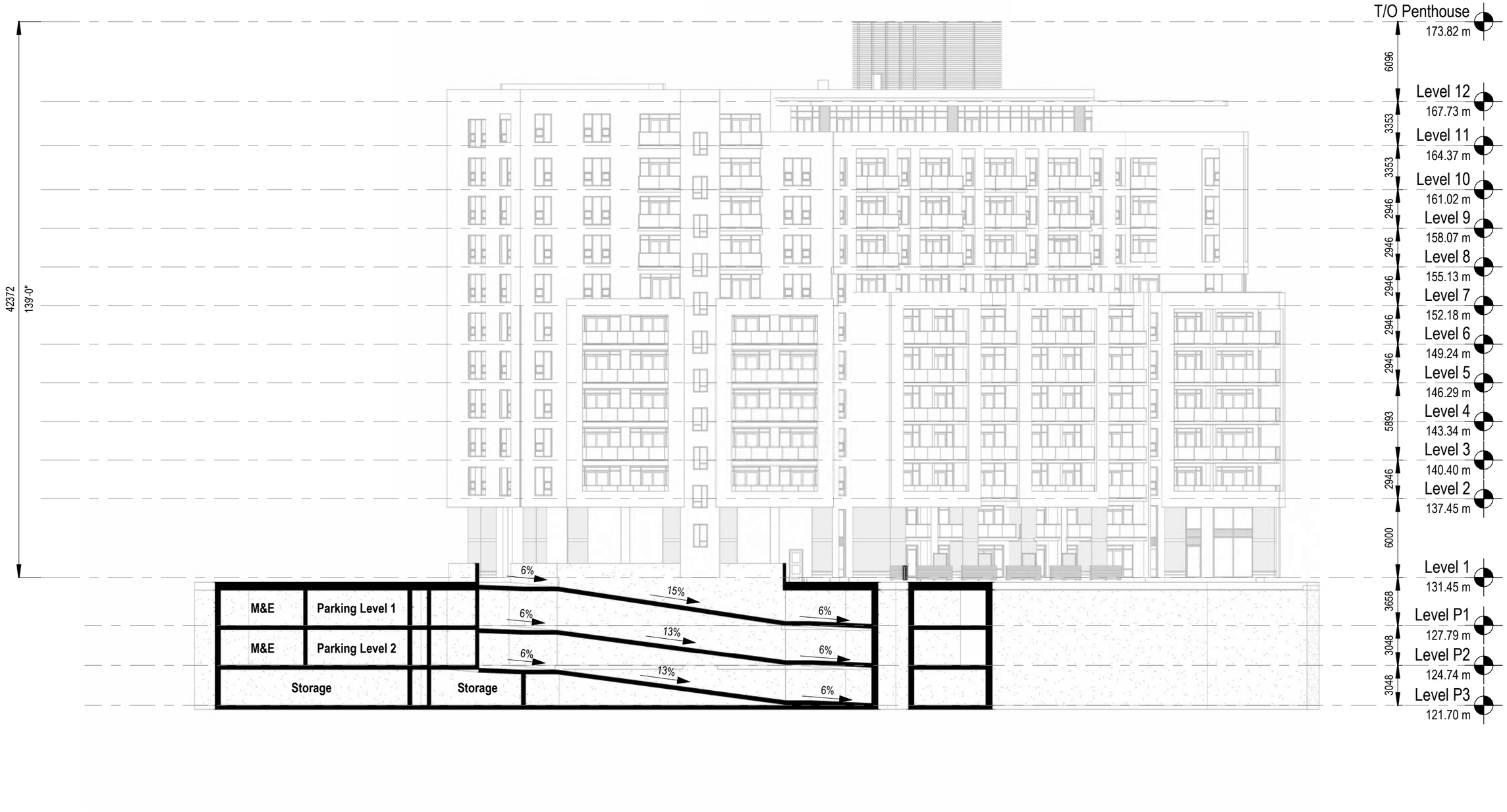


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21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	South Elevation	March 08, 2022	SD4.4

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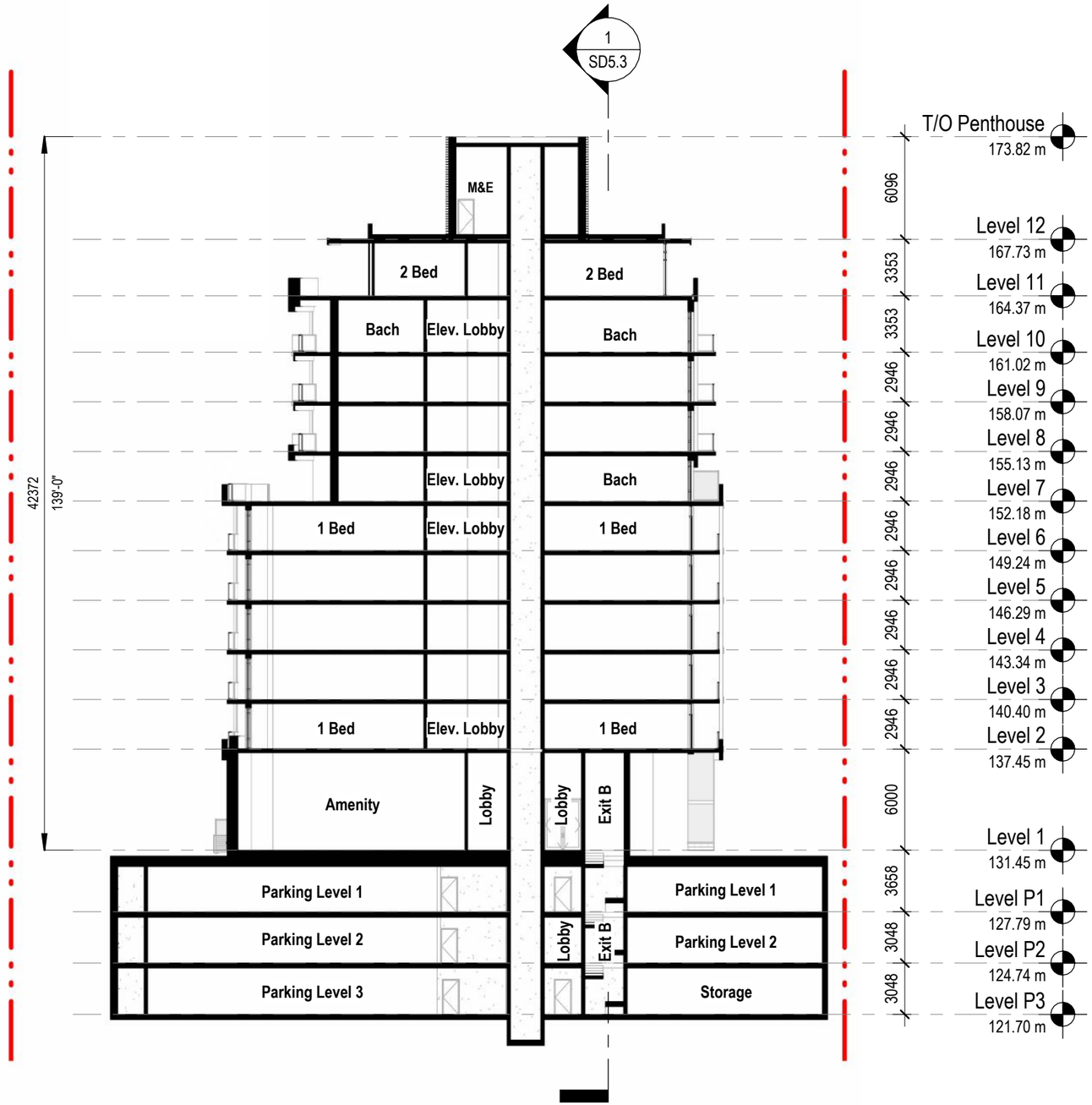
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21-027 | Infinity Development Group | 1396 Guelph Line, Burlington, Ontario | Parking Ramp Section | March 08, 2022 | SD5.1

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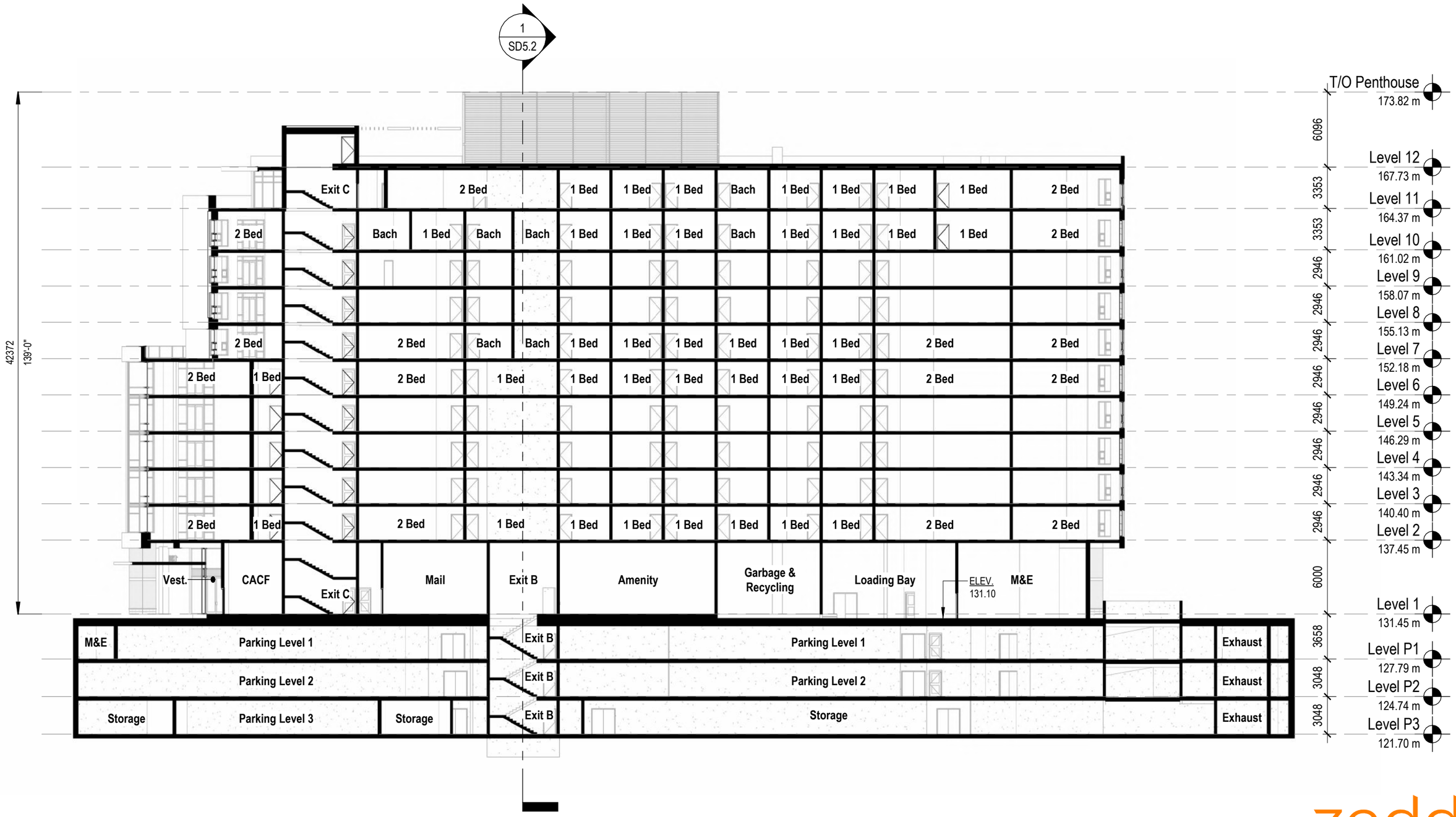
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21-027 | Infinity Development Group | 1396 Guelph Line Burlington, Ontario | Building Section | March 08, 2022 | SD5.2

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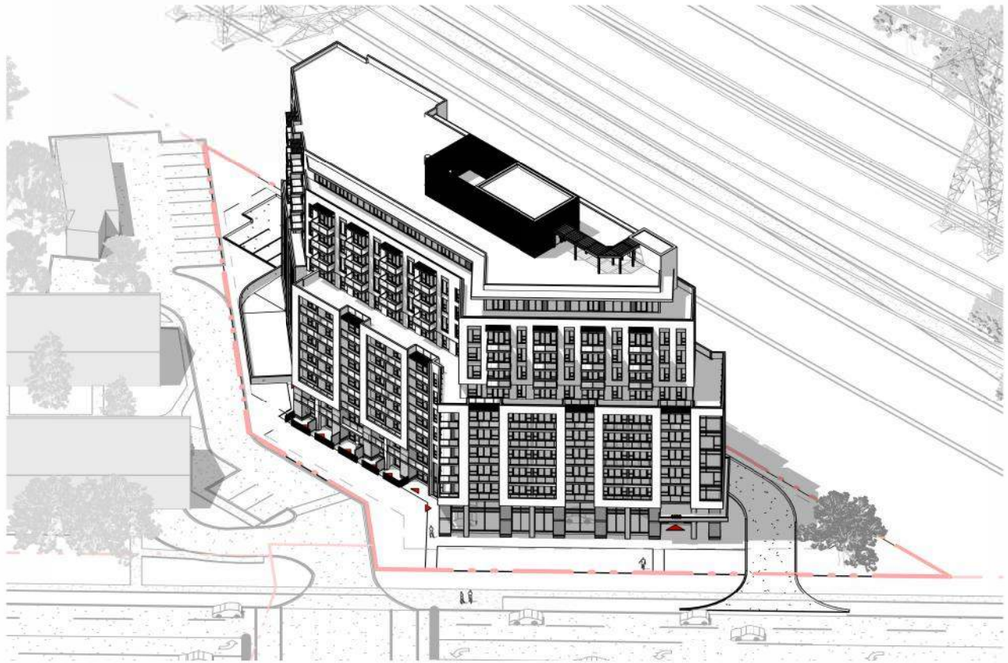


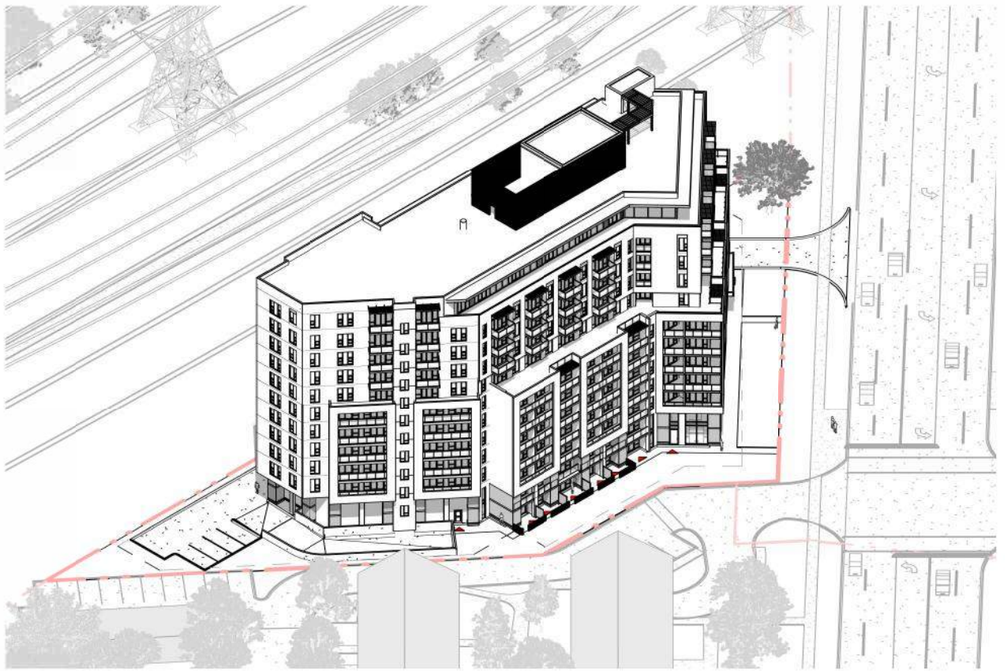
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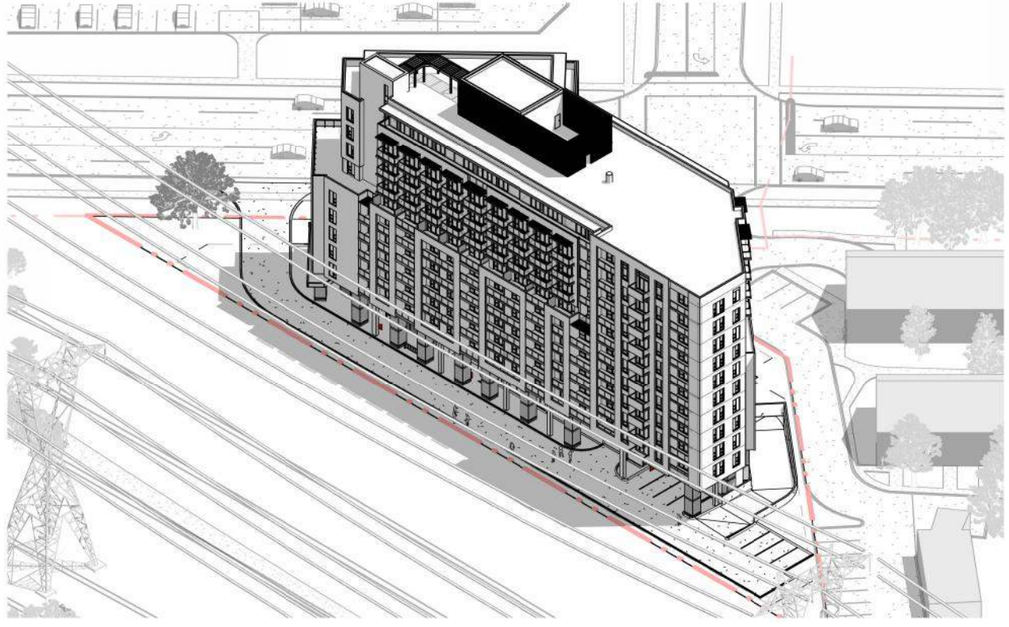
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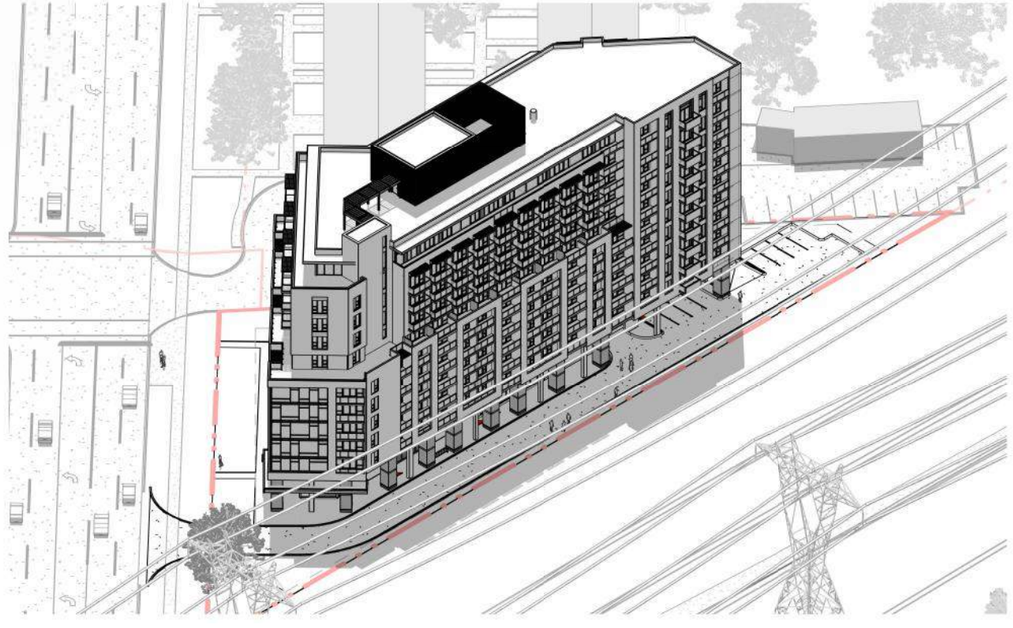
21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Building Section	March 08, 2022	SD5.3

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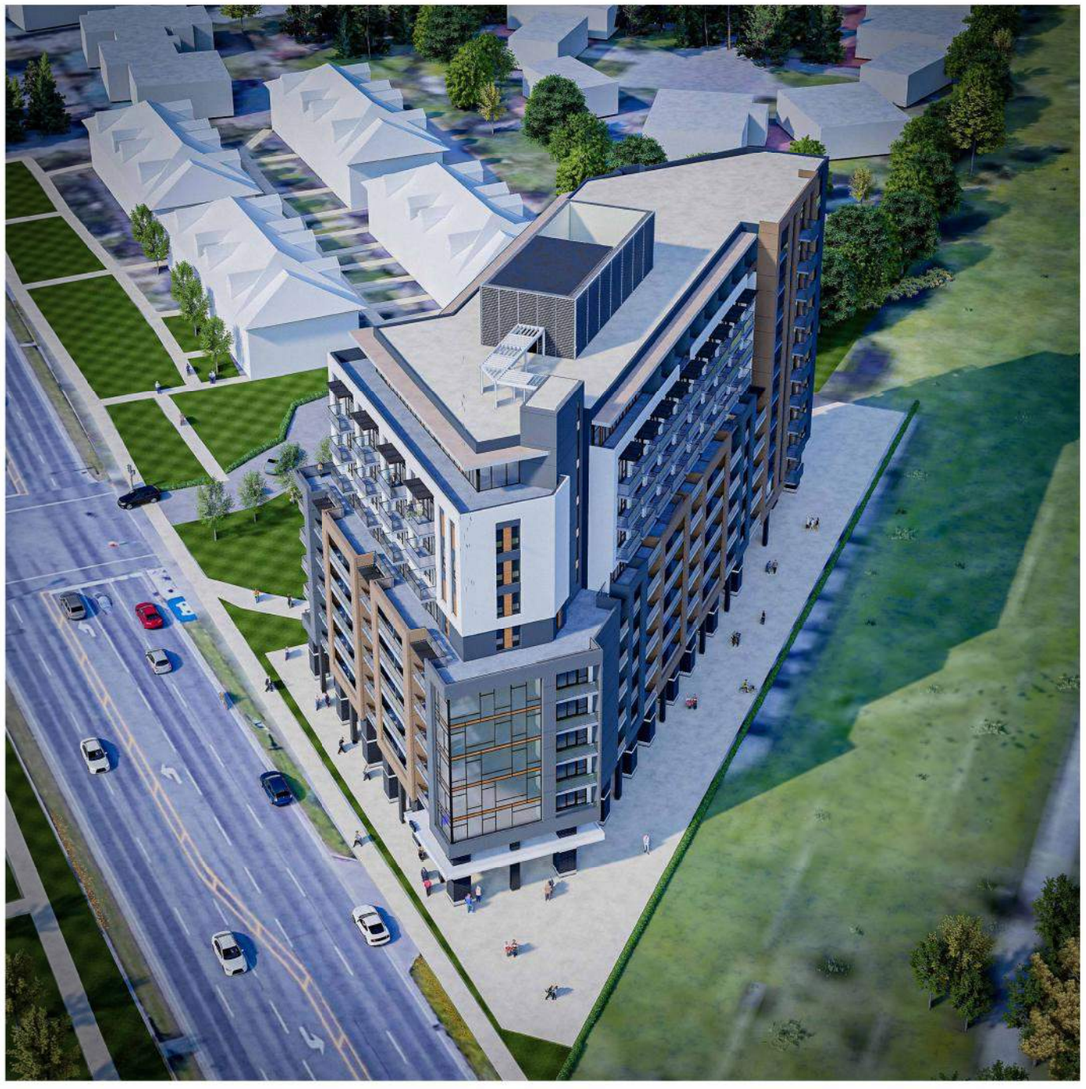


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Scale :

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NORTHWEST ISOMETRIC



SOUTHWEST ISOMETRIC

Scale :

21-027	Infinity Development Group	1396 Guelph Line Burlington, Ontario	Render Isometrics	March 08, 2022	SD6.2

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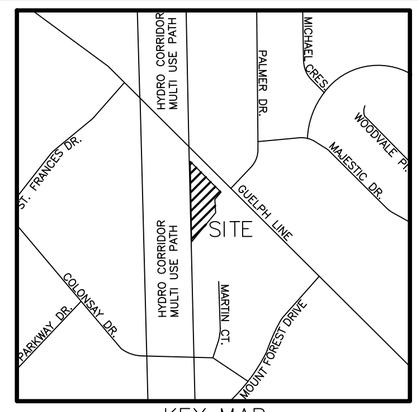
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EX. HYDRO CORRIDOR

EX. RESIDENTIAL LANDS

LEGEND:

- EXISTING GROUND ELEVATION
- PROPOSED GROUND ELEVATION
- PROPOSED ELEVATION TO MATCH EXISTING
- PROPOSED DIRECTION OF SHEET FLOW
- EXISTING CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED GATE VALVE
- EXISTING DIRECTION OF DRAINAGE
- PROPOSED EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED DRAINAGE BREAK LINE
- PROPOSED SILTATION CONTROL FENCE
- PROPOSED CATCHBASIN SILT SACK
- PROPOSED SWALE
- PROPOSED SWALE WITH SUBDRAIN



KEY MAP
N.T.S.

PROP. MH1 T/G 131.30
PROP. SILT SACK (TYP)
PROP. AD1 (NYLOPLAST) T/G 130.95
PROP. AD2 (NYLOPLAST) T/G 131.95
PROP. AD3 (NYLOPLAST) T/G 130.95
PROP. AD4 (NYLOPLAST) T/G 131.00
PROP. AD5 (NYLOPLAST) T/G 131.30
PROP. AD6 (NYLOPLAST) T/G 131.20
PROP. AD7 (NYLOPLAST) T/G 131.20
PROP. CB1 (OPSD 705.010) T/G 130.05
PROP. 41.0m SWALE @ 1.2% C/W SUBDRAIN
PROP. BUILDING OVERHANG
PROP. 11-STOREY RESIDENTIAL BUILDING FFE=131.45 P1=127.79 P2=124.74 P2=121.69
#1396 EX. 1 STOREY BRICK BUILDING
450mmø NYLOPLAST INSPECTION PORT C/W SUMP INSERT T/G=130.90 (CONTRACTOR TO PROVIDE SHOP DRAWINGS)
LIMIT OF UNDERGROUND
PROP. CONCRETE RAMP (TO BE HEATED)
PROP. RETAINING WALL (DESIGN BY OTHERS) (C/W RAILING)
PROP. RETAINING WALL (DESIGN BY OTHERS) (C/W RAILING)
PROP. RETAINING WALL TO TIE INTO THE UNDERGROUND (DESIGN BY OTHERS)
PROP. SILT FENCE
PROP. PAD MOUNTED TRANSFORMER
CONCRETE BARRIER CURB (AS PER OPSD 600.110)
PROP. DEPRESSED CURB & GUTTER AS PER OPSD 600.040
MAINTAIN EX. GRADES AT PROPERTY LINE
EX. CONCRETE CURB (TO BE REMOVED)
EX. ASPHALT AREA (TO BE REMOVED)
EX. CHAIN LINK FENCE (TO BE REMOVED)
EX. LANDSCAPED AREA
EX. CONCRETE CURB
EX. CONCRETE WALKWAY
EX. ASPHALT
EX. ASPHALT PARKING
EX. BRICK
EX. CONCRETE
EX. CONCRETE DOCK
EX. ROOF OVERHANG
EX. CHAIN LINK FENCE
EX. BRICK SIDEWALK
EX. CURB CUT
EX. BUS SHELTER
EX. STOP LIGHT
EX. SIGN
EX. TREE
EX. HYDRANT
EX. WV
EX. APPROX. CENTRE LINE OF ROAD
EX. STMMH T/G=130.66 W INV. 127.57 E INV. 127.54
EX. SANMH T/G=130.49 SE INV. 127.56
EX. 2 STOREY BRICK TOWNHOMES F.F.E=150.82
EX. FRAME SHED
EX. FRAME GARAGE F.F.E=130.22
#1380 EX. 2 STOREY BRICK TOWNHOMES
EX. CB T/G=130.80
EX. CB T/G=130.25 E. INV. 129.43 (TO BE REMOVED)
EX. CB T/G=130.27
EX. CB (NOT SURVEYED) T/G=129.31 S.INV. 128.78
EX. CB T/G=129.88
EX. CB T/G=129.68
EX. CB T/G=129.45
EX. CB T/G 130.40
EX. CB T/G 130.56
EX. SANMH T/G=130.49 SE INV. 127.56
EX. STMMH T/G=130.66 W INV. 127.57 E INV. 127.54
MECH. & ELEC.
#1396 EX. 1 STOREY BRICK BUILDING
1.25%
1.5%
1.3%
0.9%
2.0%
1.0%
0.8%
2.3%
3.3%
6.0%
15.0%
15.4%
1.0%
0.9%
1.2%
(131.45)
(131.10)
(131.30)
(131.20)
(131.35)
(131.25)
(131.00)
(130.92)
(128.17)
(127.70)
(131.40)TW (130.00)BW
(131.40)TW (128.17)BW
(131.35)TW (131.35)BW
(131.50)TW (130.30)BW
(131.30)TW (130.30)BW
(130.40)TW (130.40)BW
131.07EX.
131.24EX.
130.74EX. (130.79)
131.04EX.
131.05EX.
131.08EX.
131.09EX.
130.86EX.
130.70EX.
130.30EX.
130.27EX.
130.31EX.
129.96EX.
129.89EX.
130.74EX.
130.95EX.
130.55SW
130.03EX.
130.52EX.
130.36EX.
130.34EX.
130.29EX.
130.28EX.
130.22EX.

BENCH MARK NOTE:

CITY OF BURLINGTON BENCHMARK NO.397

BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION "B" ON THE WEST SIDE GUELPH LINE OPPOSITE PALMER DRIVE. PLAQUE IS LOCATED ,.25M SOUTH WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.

ELEVATION = 131.500M (DATUM CGVD 1928:1978)

NO.	DATE	BY	REVISIONS

NOTES TO CONTRACTOR:

1. CONTRACTORS AND SUBCONTRACTORS SHALL NOT SCALE FROM THIS DRAWING.
2. ANY INCONSISTENCIES AND OMISSIONS FOUND ON THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION BEFORE COMMENCING THE WORK.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND ELEVATIONS AND REPORT ALL FINDINGS TO THE ENGINEER. ONCE CONSTRUCTION HAS COMMENCED, THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS.
4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	YM	CHK'D	SN	DATE MAR. 8, 22
DRAWN	YM	CHK'D	SN	

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP

NOTES TO CONTRACTOR:

1. INSPECTION
   CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.
2. CONFIRMATION OF EXISTING INVERTS
   72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS
Tel. (905) 631-6978
Website: www.sla.on.ca
email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENTS

INFINITY DEVELOPMENT INC.
101-2275 UPPER MIDDLE ROAD,
OAKVILLE, ON L6H 0C3

PROJECT NAME

1396 GUELPH LINE
BURLINGTON, ON

TITLE

PRELIMINARY GRADING AND EROSION CONTROL PLAN

PROJECT No.	DRAWING No.
22024	C101

S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg

SAWCUT, REMOVE & RESTORE EX. ASPHALT, CONCRETE & LANDSCAPED AREAS TO EXISTING CONDITION OR BETTER (TYP.) (AS PER CITY OF BURLINGTON STANDARD S-114, S114A & S114B OR S-115 & S-115A IF CONCRETE ROAD BASE IS PRESENT)

PROP. ASPHALT LAP JOINT (TYP.)

CONNECT PROP. 30.0m-250mmø STM @ 1.0% TO EX. 750mmø STM
EX. INV=128.09±
PROP. INV=129.32

EX. 75mmø HYDRO (UNDERGROUND)
EX. 100mmø BELL (UNDERGROUND)
EX. GAS MAIN
EX. CONCRETE CURB
EX. 400mmø WTM
EX.CB T/G 130.80

PROP. DEPRESSED CURB & GUTTER AS PER OPSD 600.040

GUELPH LINE

EX. 350mmø CI WTM (ABANDONED)
EX. 86.9m-750mmø STM @ 0.9%
PROX. CENTRE LINE OF ROAD

PROP. MH1
T/G 131.30
NE.INV.=129.62
S.INV.=129.65

PROP. 4.5m-250mmø STM @ 1.0%
INV. 129.70

CONNECT PROP. 150mmø FIRE WTM TO EX. 400mmø WTM
(TAP BY HALTON REGION FORCES ONLY)

ABANDON EX. WATER SERVICE AS PER CITY OF BURLINGTON STANDARDS

PROP. CAST-IN-PLACE STORMWATER STORAGE TANK C/W ACCESS LID, PUMP & 140mmø OUTLET (DESIGN BY OTHERS)
TOTAL VOLUME=161m³
100-YEAR REQ'D VOLUME=117m³
TOP OF TANK=130.35
140mmø OUTLET INVERT=129.70
BOTTOM OF TANK=127.79

PROP. 100mmø DOM. WTM
EX. PARKING LOT
EX. HYDRANT
EX. XW
EX. CONCRETE WALKWAY
MECH. & ELEC.
EX. BELL MANHOLE T/G=131.00
EX. LS
EX. BELL (UNDERGROUND)
EX. WTM (APPROX. LOCATION)
EX. 75mmø HYDRO (UNDERGROUND)
EX. 100mmø BELL (UNDERGROUND)
EX. GAS MAIN
EX. 400mmø WTM
EX. 200mmø SAN.
EX. STMMH T/G=130.66 W INV. 127.57 E INV. 127.54
EX. SANMH T/G=130.49 SE INV. 127.56
CONNECT PROP. 12.0m-200mmø SAN @ 1.0% TO EX. SAN MH INCLUDING RE-BENCHING
PROP. INV=127.62
EX. 65.7m 825mmø STM @ 0.9%
EX. 300mmø WTM
EX. BUS SHELTER
EX. STOP LIGHT
EX. CABLE TV BOX
EX. SIGN
EX. CURB CUT
EX. 400mmø WTM
EX.CB T/G 130.40
EX. VC T/G 130.56

PROP. SILT SACK (TYP)

PROP. AD1
(NYLOPLAST)
T/G 130.95

PROP. BUILDING OVERHANG

PROP. AD2
(NYLOPLAST)
T/G 131.95

EX. ASPHALT
EX. ASPHALT PARKING
EX. CONCRETE WALKWAY
EX. LANDSCAPED AREA
CONCRETE BARRIER CURB (AS PER OPSD 600.110)

450mmø NYLOPLAST INSPECTION PORT C/W SUMP INSERT
T/G=130.90
SW INV. 127.75
NE INV. 127.74
(CONTRACTOR TO PROVIDE SHOP DRAWINGS)

PROP. 1.5m- 200mmø SAN @ 1.0% INV=127.77

LIMIT OF UNDERGROUND

EX. CONCRETE CURB (TO BE REMOVED)
EX. ASPHALT AREA (TO BE REMOVED)
EX. CONCRETE
F.F.E
EX. 0.3ø DT
EX. 0.4ø DT
EX. 0.1ø DT
EX. 0.2ø DT
EX. 0.5ø DT
EX. 0.6ø DT
EX. 0.2ø CT
EX. BOARD FENCE

PROP. 11-STOREY RESIDENTIAL BUILDING
FFE=131.45
P1=127.79
P2=124.74
P2=121.69

#1396
EX. 1 STOREY BRICK BUILDING

PROP. AD7
(NYLOPLAST)
T/G 131.20

PROP. CB1
(OPSD 705.010)
T/G 130.05
E.INV.=128.55

EX.CB T/G=130.25
E. INV. 129.43
(TO BE REMOVED)

PROP. 1.0m- 250mmø STM @ 1.0% INV=128.54
(TO CONNECT TO INTERNAL MECHANICAL SYSTEM AND BE PUMPED TO THE 250mmø STORM SERVICE, BYPASSING THE STORAGE TANK)

EX. SIDEWALK
EX. BRICK

PROP. AD3
(NYLOPLAST)
T/G 130.95

EX. CONCRETE CURB
EX. CHAIN LINK FENCE (TO BE REMOVED)
EX. CONCRETE DOCK
EX. ROOF OVERHANG
EX. CONCRETE CURB
EX.CB T/G=130.27
EX. CHAIN LINK FENCE (TO BE REMOVED)

PROP. AD6
(NYLOPLAST)
T/G 131.20

EX. PAD MOUNTED TRANSFORMER (TO BE REMOVED)
EX. ASPHALT
EX. CB T/G=129.68
EX. CB (NOT SURVEYED) T/G=128.31 S.INV. 128.78
#1380
EX. 2 STOREY BRICK TOWNHOMES

PROP. AD5
(NYLOPLAST)
T/G 131.30

MECH. & ELEC.
EX. CB T/G=129.88

PROP. BUILDING OVERHANG

PROP. AD4
(NYLOPLAST)
T/G 131.00

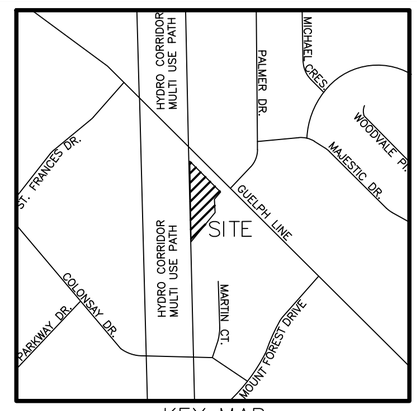
EX. CHAIN LINK FENCE
EX. TREE
PROP. CONCRETE RAMP (TO BE HEATED)
PROP. RETAINING WALL (DESIGN BY OTHERS) (C/W RAILING)

EX. 2 STOREY BRICK TOWNHOMES F.F.E=150.82

EX. RESIDENTIAL LANDS

EX. ASPHALT
PROP. RETAINING WALL (DESIGN BY OTHERS) (C/W RAILING)
PROP. RETAINING WALL TO TIE INTO THE UNDERGROUND (DESIGN BY OTHERS)
LIMIT OF UNDERGROUND
EX. EDGE BUSH
PROP. SILT FENCE
EX. CONCRETE CURB
EX. 0.25ø DT
EX. FRAME SHED
EX. FRAME GARAGE F.F.E=130.22
EX. CB T/G=129.45

EX. HYDRO CORRIDOR



KEY MAP
N.T.S.

LEGEND:

- EXISTING CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED GATE VALVE
- PROPOSED WATER METER
- PROPOSED BACKFLOW PREVENTOR
- SEWER CROSSING
- PROPOSED SEWER INSULATION
- PROPOSED ROAD RESTORATION

BENCH MARK NOTE:
CITY OF BURLINGTON BENCHMARK NO.397

BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION "B" ON THE WEST SIDE GUELPH LINE OPPOSITE PALMER DRIVE. PLAQUE IS LOCATED ,.25M SOUTH WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.

ELEVATION = 131.500M (DATUM CGVD 1928:1978)

NO.	DATE	BY	REVISIONS

NOTES TO CONTRACTOR:

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4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
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DESIGN	YM	CHK'D	SN	DATE MAR. 8, 22
DRAWN	YM	CHK'D	SN	

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP

NOTES TO CONTRACTOR:

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CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.

2. CONFIRMATION OF EXISTING INVERTS
72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

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3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENTS

INFINITY DEVELOPMENT INC.
101-2275 UPPER MIDDLE ROAD,
OAKVILLE, ON L6H 0C3

PROJECT NAME

1396 GUELPH LINE
BURLINGTON, ON

TITLE

PRELIMINARY SERVICING PLAN

PROJECT No. 22024

DRAWING No. C102

S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg
Plotted: Tuesday, March 8, 2022 5:01:32 PM By: Scott Nelson

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GENERAL NOTES:

1. CONSTRUCTION OF SEWERS, AND RELATED APPURTENANCES SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT STANDARD DRAWINGS OF THE CITY OF BURLINGTON, THE REGIONAL MUNICIPALITY OF HALTON AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). THE TOWN AND THE REGION'S DRAWINGS SHALL TAKE PRECEDENCE OVER THE OPSD DRAWINGS.
2. ONTARIO PROVINCIAL STANDARD DRAWINGS TO BE READ IN CONJUNCTION WITH THE REGION OF HALTON REVISIONS.
3. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL OBTAIN ALL PERMITS FOR CONSTRUCTION.
5. FOR ALL SEWERS AND WATERMAIN IN FILL SECTIONS, THE COMPACTION SHALL BE VERIFIED PRIOR TO LAYING OF PIPE.
6. NO SUBSTITUTIONS WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE REGIONAL ENGINEER, CITY OF BURLINGTON OR THE ENGINEER.
7. ALL EXCAVATIONS TO BE BACKFILLED WITH SELECT NATIVE MATERIAL, APPROVED BY THE ENGINEER, TO 95% SPD.
8. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING SILT CONTROL DEVICES AS SHOWN ON THE DRAWINGS AND AS DIRECTED BT THE ENGINEER.
9. TREE PROTECTION PROCEDURES TO BE IMPLEMENTED IN ACCORDANCE WITH CITY OF BURLINGTON STANDARDS.
10. THESE PLANS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SEALED BY THE ENGINEER AND INDICATED ISSUED FOR CONSTRUCTION ON THE DRAWING.
11. THIS/THESE PLAN(S) IS/ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF S. LLEWELLYN AND ASSOCIATES LIMITED.
12. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THE APPROVED SET OF CONSTRUCTION DRAWINGS ARE FURNISHED AS THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER AND HIS AGENTS DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND /OR SUFFICIENCY. THE CONTRACTOR SHALL ASSUME LIABILITY FOR ANY DAMAGE TO EXISTING WORKS.
13. SITE PLAN INFORMATION TAKEN FROM PLANS PREPARED BY ZEDD ARCHITECTURE.
14. THIS/THESE PLAN(S) TO BE READ IN CONJUNCTION WITH THE FUNCTIONAL SERVICING REPORT (FSR) PREPARED BY S. LLEWELLYN AND ASSOCIATES LIMITED.
15. THIS PLAN TO BE USED FOR SERVICING AND GRADING ONLY, FOR BUILDING LOCATION REFER TO TO THE SITE PLAN.
16. MUNICIPAL APPROVAL OF THESE DRAWINGS IS FOR MATERIAL AND COMPLIANCE WITH CITY OF BURLINGTON AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION OF THE WORKS BY THE CITY OF BURLINGTON STAFF DOES NOT CERTIFIY THE LINE AND GRADE OF THE WORKS NOR RELIEVE THE CONTRACTOR OF CERTIFICATION OF ALL WORKS BY THE OWNER'S ENGINEER.
17. ALTERNATE MATERIALS MAY BE ACCEPTABLE PROVIDED WRITTEN APPROVAL HAS FIRST BEEN OBTAINED FROM THE CITY OF BURLINGTON AND THE THE ENGINEER.
18. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:
    - ROAD CUT PERMITS
    - SEWER PERMITS
    - APPROACH APPROVAL PERMITS
    - RELOCATION OF SERVICES
    - COMMITTEE OF ADJUSTMENT
    - ENCROACHMENT AGREEMENTS
20. PRIOR TO CONSTRUCTION THE CONTRACTOR MUST:
    i. CHECK AND VERIFIY ALL DIMENSIONS AND EXISTING ELEVATIONS WHICH INCLUDE BUT ARE NOT LIMITED TO THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS, EXISTING INVERTS AND REPORT FINDING IN WRITING TO THE ENGINEER.
    ii. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.
    iii. VERIFY ALL FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS WHICH MY APPEAR ON THESE PLANS COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.
    iv. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.
    v. NOTIFY THE ENGINEER OF THE PROPOSED CONSTRUCTION SCHEDULE FOR COORDINATION OF NECESSARY INSPECTIONS.
21. **THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE ENGINEER 48 HOURS PRIOR TO THE COMMENCING SITE WORKS TO ARRANGE FOR INSPECTION. THE ENGINEER SHALL DETERMINE THE EXTENT OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF THE UNDERGROUND SERVICE INSTALLATION AS MANDATED BY THE ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO MAKE SUITABLE ARRANGEMENTS FOR INSPECTION WILL LEAD TO POST CONSTRUCTION TESTING AND INSPECTION AS DETERMINED BY THE ENGINEER, THE COSTS OF WHICH INCLUDING ANY DELAYS IN CONSTRUCTION SHALL BE BOURNE BY THE CONTRACTOR. FULL PAYMENT FOR UN-INSPECTED WORKS MAY BE WITHHELD UNTIL THE COMPLETION OF THE POST CONSTRUCTION INSPECTION AND TESTING TO THE SATISFACTION OF THE ENGINEER.**
22. INSPECTION BY THE OWNER'S ENGINEER IS FOR CERTIFICATION AND GENERAL CONFORMANCE PURPOSES AND DOES NOT CERTIFY LINE AND GRADE OR IMPLY AN ASSURANCE OF QUALITY CONTROL. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THE INSTALLATION OF THE WORKS TO PROPER LINE, GRADE AND QUALITY TO CURRENT INDUSTRY STANDARDS.
23. ANY UTILITY RELOCATIONS AND RESTORATIONS DUE TO THE DEVELOPMENT TO BE UNDERTAKEN AT THE EXPENSE OF THE OWNER/DEVELOPER AND SHALL BE COORDINATED BY THE CONTRACTOR.
24. ALL RESTORATIONS AND RECONSTRUCTIONS SHALL BE TO COMPLETED TO MATCH EXISTING CONDITIONS OR BETTER AND ARE TO BE PERFORMED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF BURLINGTON.
25. SERVICING CONTRACTOR TO MAINTAIN A "CONFINED TRENCH CONDITION" IN ALL SEWER AND WATERMAIN INSTALLATION TRENCHES.
26. THE SITE SERVICING CONTRACTOR SHALL TERMINATE ALL SERVICES 1.0m FROM THE BUILDING FACE.
27. NO BLASTING WILL BE PERMITTED.

ROADWORKS:

1. APPROVED FILL, FREE OF DELETERIOUS AND ORGANIC MATERIAL AND BOULDERS SHALL BE COMPACTED TO A DRY DENSITY NOT LESS THAN 95% THAN THE STANDARD PROCTOR DENSITY. AFTER COMPACTION, SOIL DENSITY TESTS SHALL BE CONDUCTED TO ENSURE ADEQUATE COMPACTION AND STABILITY OF THE FILL AND TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER.
2. SUBGRADE TO BE PROOF ROLLED PRIOR TO PLACEMENT OF SUB BASE. UNSUITABLE MATERIAL TO BE REMOVED AND REPLACED WITH SELECT FILL OR GRANULAR "B" AND COMPACTED TO 98% SPD.
3. ASPHALTIC CONCRETE TO BE COMPACTED TO 97% MARSHALL DENSITY.
4. PAVEMENT STRUCTURE FOR INTERNAL ROADS SHALL CONSIST OF COMPACTED THICKNESSES OF: 40mm HL3 SURFACE ASPHALT 60mm HL8 BASE BINDER ASPHALT 150mm GRANULAR "A" BASE COURSE 250mm GRANULAR "B" SUB-BASE COURSE
5. BOULEVARDS TO BE SODDED WITH #1 NURSERY SOD ON A MINIMUM 150mm OF SELECT TOPSOIL.
6. MANHOLE FRAMES AND COVERS AND WATER VALVE BOXES SHALL BE SET FLUSH WITH BASE COURSE ASPHALT AND ADJUSTED TO FINAL GRADE AFTER INSTALLATION OF SURFACE ASPHALT AS PER CITY OF BURLINGTON STANDARD DRAWINGS S-130.
7. TRAFFIC CONTROL SHALL BE MAINTAINED AT ALL TIMES FOR WORKS ON EXISTING ROADWAYS TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING. THE EXPENSE FOR THE ERECTION OF SIGNS, DELINEATORS AND OTHER TRAFFIC CONTROL DEVICES SHALL BE BORNE BY THE CONTRACTOR.
8. STANDARD PARKING SPACES SHALL BE 2.6mx5.6m.

GRADING NOTES

1. ALONG ADJOINING PROPERTIES GRADE TO MEET EXISTING OR PROPOSED ELEVATIONS WITH SODDED SLOPES (MIN. 3H TO 1V) AND/OR RETAINING WALLS AS SPECIFIED.
2. ALL RETAINING WALLS, WALKWAYS, CURBS, ETC., SHALL BE PLACED A MIN. OF 0.3m OFF THE PROPERTY LINE. ALL WALLS 1.0m OR HIGHER SHALL BE DESIGNED BY A P.ENG.
3. SHOULD A RETAINING WALL BE REQUIRED, THE TOP OF WALL ELEVATIONS SHALL BE SET 150mm ABOVE THE PROPOSED SIDE YARD SWALES.
4. RETAINING WALLS 0.6m IN HEIGHT OR GREATER REQUIRE CONSTRUCTION OF A FENCE OR GUARD RAIL AT THE TOP OF THE REAR OF THE WALL. GUARDS FOR RETAINING WALLS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF EXTERIOR GUARDS AS CONTAINED IN THE ONTARIO BUILDING CODE.
5. TOP OF FOUNDATION WALLS FOR BUILDINGS SHALL BE 150mm (MIN) ABOVE FINISHED GRADE.
6. DRIVEWAY SLOPES SHALL NOT BE LESS THAN 2% AND NOT MORE THAN 7.0%. REVERSED SLOPED DRIVEWAYS IN NEW DEVELOPMENTS ARE NOT PERMITTED.
7. IF GRADING IS REQUIRED ON LANDS ADJACENT TO THE DEVELOPMENT WHICH ARE NOT OWNED BY THE DEVELOPER, THEN THE DEVELOPER MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER TO ALLOW THE DEVELOPER TO GRADE ON THE ADJACENT LANDS, OTHERWISE RETAINING WALLS MUST BE USED.
8. THE WRITTEN PERMISSION REQUIRED FROM THE ADJACENT LANDOWNER SHALL BE OBTAINED PRIOR TO ENTERING THE LANDS. SHOULD PERMISSION NOT BE OBTAINED OR IS WITHDRAWN PRIOR TO COMMENCING THE WORK, THEN THE DEVELOPER SHALL LIMIT HIS ACTIVITIES TO THE LIMITS OF THE DEVELOPMENT SITE.
9. DRIVEWAY AND DRIVEWAY APPROACHES SHALL BE LOCATED SUCH THAT HYDRO VAULTS AND OTHER STREET FURNITURE ARE A MIN. OF 1.2m FROM THE DRIVEWAY ENTRANCE CURB RADII.
10. ANY CHANGES IN GRADES AND CATCH BASINS REQUIRE THE APPROVAL OF THE CITY'S MANAGER OF DEVELOPMENT ENGINEERING.
11. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAXIMUM GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES.

SILTATION AND EROSION CONTROL

1. SILTATION CONTROL BARRIERS SHALL BE PLACED AS DETAILED.
2. ALL SILTATION CONTROL MEASURES SHALL BE CLEANED AND MAINTAINED AFTER EACH RAINFALL AS DIRECTED AND TO THE SATISFACTION OF THE CITY OF BURLINGTON AND/OR THE HALTON CONSERVATION AUTHORITY.
3. ADDITIONAL SILT CONTROL LOCATIONS MAY BE REQUIRED AS DETERMINED BY THE ENGINEER, THE CITY OF BURLINGTON AND/OR THE HALTON CONSERVATION AUTHORITY.

SANITARY SEWERS:

1. SANITARY SEWERS SHALL BE PVC. PVC PIPE IS TO BE BELL AND SPIGOT AND COMPLY TO ASTM D-3034 WITH MINIMUM SDR 35.
2. MINIMUM BEDDING REQUIREMENTS FOR ALL SANITARY SEWER MAINS AND RELATED CONNECTIONS IN A SINGLE TRENCH SHALL BE CLASS B GRANULAR BEDDING AS PER OPSD 802.010 UNLESS OTHERWISE NOTED.
3. SANITARY SEWER MANHOLES FRAME AND COVER AS PER OPSD 401.010.
4. TAPPING AT EXISTING SANITARY SEWERS SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGION OF HALTON REQUIREMENTS.
5. ALL SEWERS TO BE VIDEO INSPECTED.
6. ALL SEWERS TO BE FLUSHED PRIOR TO VIDEO INSPECTION.
7. ALL PVC SEWERS ARE TO BE TESTED FOR DEFLECTION (MANDREL PASSAGE) AFTER INSTALLATION. SANITARY SEWERS SHALL ALSO BE TESTED FOR LEAKAGE (LOW AIR PRESSURE). PRIOR TO ASSUMPTION BY THE CITY, PIPE DEFLECTION TESTING SHALL BE REPEATED.

STORM SEWERS:

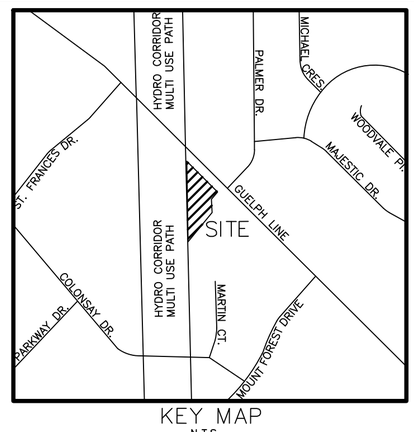
1. 300mm-450mm STORM SEWERS SHALL BE PVC, BELL AND SPIGOT AND SHALL COMPLY TO ASTM D-3034 WITH MINIMUM SDR 35.
2. MINIMUM BEDDING REQUIREMENTS FOR ALL SINGLE STORM SEWER MAINS AND ALL RELATED CONNECTIONS SHALL BE HIGH PERFORMANCE CLEAR STONE (HL-8 GRADED) AS PER CITY OF BURLINGTON STANDARD DRAWINGS S-188.
3. STORM SEWER MANHOLES SHALL BE IN ACCORDANCE WITH OPSD 701.010. AND 703.010. FRAME AND COVER AS PER OPSD 401.01 TYPE A. FRAMES TO BE STAMPED "DANGER" AND "STORM".
4. CATCHBASINS SHALL BE IN ACCORDANCE WITH OPSD 705.010. CATCHBASIN MANHOLES SHALL BE IN ACCORDANCE WITH OPSD 701.010 AND 701.030 UNLESS OTHERWISE SPECIFIED. CATCHBASINS TO LOCATED WITHIN LANDSCAPED AREAS TO BE SUMPLESS. FRAME AND COVER FOR CATCHBASINS AND CATCHBASIN MANHOLES SHALL BE AS PER OPSD 400.100 (ROADS) AND PER CITY OF BURLINGTON STANDARD DRAWING S-176 (REAR YARDS).
5. DOUBLE CATCH BASINS SHALL BE IN ACCORDANCE WITH OPSD 705.020 WITH 250mm DIA. LEAD. FRAMES AND COVERS TO BE OPSD 400.11 (ROADS) AND CITY OF BURLINGTON STD. S-176 (REAR YARDS). LEADS TO BE PVC SDR 35.
6. CATCH BASIN AND MANHOLE TOPS SHALL BE INITIALLY SET TO BASE COURSE ASPHALT ELEVATION AND ADJUSTED TO GRADE PRIOR TO PLACEMENT OF TOP LIFT OF ASPHALT.
7. ALL TRENCH EXCAVATIONS ARE TO BE BACKFILLED WITH SELECT NATIVE MATERIAL PLACED IN MAXIMUM 200mm LIFT THICKNESSES WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95% SPD, UNLESS OTHERWISE SPECIFIED.
8. INVERTS OF ALL SWALES TO BE SODDED TO A MINIMUM WIDTH OF 3.0m. ALL OTHER DISTURBED AREAS TO BE TOPSOILED AND SEEDED. SOD SHALL BE #1 NURSERY LAID ON A MINIMUM OF 150mm OF TOPSOIL.
9. ALL SEWERS TO BE VIDEO INSPECTED.
10. ALL SEWERS TO BE FLUSHED PRIOR TO VIDEO INSPECTION.
11. ALL PVC SEWERS (SANITARY AND STORM) ARE TO BE TESTED FOR DEFLECTION (MANDREL PASSAGE) AFTER INSTALLATION. PRIOR TO ASSUMPTION BY THE CITY, PIPE DEFLECTION TESTING SHALL BE REPEATED.

RESTORATIONS:

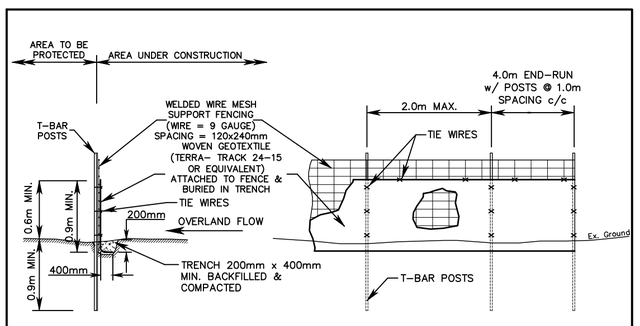
1. ALL TRENCH EXCAVATIONS WITHIN EXISTING ROAD ALLOWANCES SHALL BE AS BACKFILLED AS PER CITY OF BURLINGTON STANDARD DRAWING S-114 AND S-114A, OR S-115 AND S-115A WHERE CONCRETE ROAD BASE IS PRESENT.
2. EXISTING PRIVATE FENCING IS TO BE MAINTAINED THROUGHOUT CONSTRUCTION. WHERE REMOVAL OR RELOCATION OF FENCING IS NECESSARY IT SHALL BE RESTORED OR REPLACED TO ORIGINAL CONDITIONS OR BETTER UNDER THE DIRECTION OF THE ENGINEER.
3. DAMAGED CURB, GUTTER AND SIDEWALK TO BE REPLACED WITH 28 MPa CONCRETE TO EXISTING CONDITIONS OR BETTER.
4. PAVEMENT SURFACE ON EXISTING PLAINS ROAD EAST TO BE REPAIRED BY CONTRACTOR AT THEIR EXPENSE IF DAMAGED BY CONSTRUCTION TRAFFIC.

WATERMAINS:

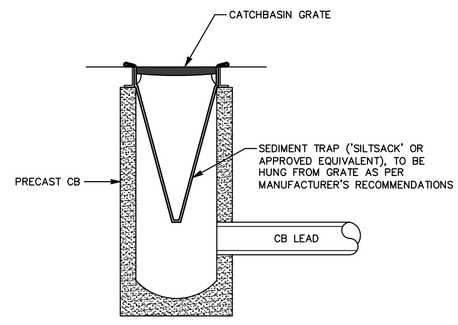
1. FLEXIBLE WATERMAIN PIPE UP TO 300mm DIAMETER TO BE P.V.C. DR-18 AND CONFORM TO A.W.W.A. C-900 WITH MECHANICAL JOINTS AS PER A.W.W.A. C-110, AND TO BE INSTALLED WITH A 10 GAUGE TRACER WIRE.
2. FLEXIBLE PIPE BEDDING TO BE OPSD 802.010 WITH COMPACTED GRANULAR B MATERIAL.
3. MINIMUM COVER TO BE 1.7m TO TOP OF PIPE.
4. DEFLECTION AT JOINTS NOT TO EXCEED 2.5 DEGREES AND SHALL BE EQUAL AT ALL JOINTS.
5. GATE VALVES AND BOXES FOR 150mm DIAMETER WATERMAINS AS PER A.W.W.A. STANDARD C-500 AND ARE TO OPEN TO THE LEFT (COUNTER CLOCKWISE).
6. HYDRANTS SHALL MEET THE REQUIREMENTS OF A.W.W.A. STANDARD C-502 AND SHALL BE SET IN ACCORDANCE WITH REGION OF HALTON, AND CITY OF BURLINGTON BUILDING DEPARTMENT STANDARDS, COMPLETE WITH STEAMER CONNECTIONS. THE 100mm STEAMER PORT SHALL FACE THE FIRE ROUTE AND SHALL BE UNOBSTRUCTED BY ANY PROPOSED LANDSCAPING.
7. ALL FITTINGS TO HAVE MECHANICAL RESTRAINTS THAT MEET UNI-B-13-92.
8. ALL TEMPORARY AND PERMANENT WATERMAIN PLUGS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH OPSD 1103.01.
9. TAPPING AT EXISTING WATERMAINS SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGION OF HALTON REQUIREMENTS.
10. ALL WATER CUSTOMERS SUPPLIED BY A WATERMAIN TO BE SHUT DOWN SHALL BE NOTIFIED BY THE CONTRACTOR AT LEAST 48 HOURS IN ADVANCE OF THE SHUT DOWN AS PER REGION OF HALTON SPECIFICATIONS. NOTIFICATION SHALL TAKE PLACE UNDER THE ENGINEER'S DIRECTION.
11. MINIMUM HORIZONTAL SEPERATION BETWEEN WATERMAINS (INCLUDING PRIVATE SERVICES) AND STORM AND SANITARY SEWERS SHALL BE 2.5m. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 500mm BETWEEN ALL OTHER UTILITIES WHEN CROSSING.



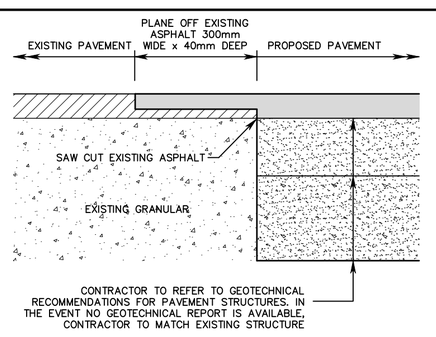
KEY MAP
N.T.S.



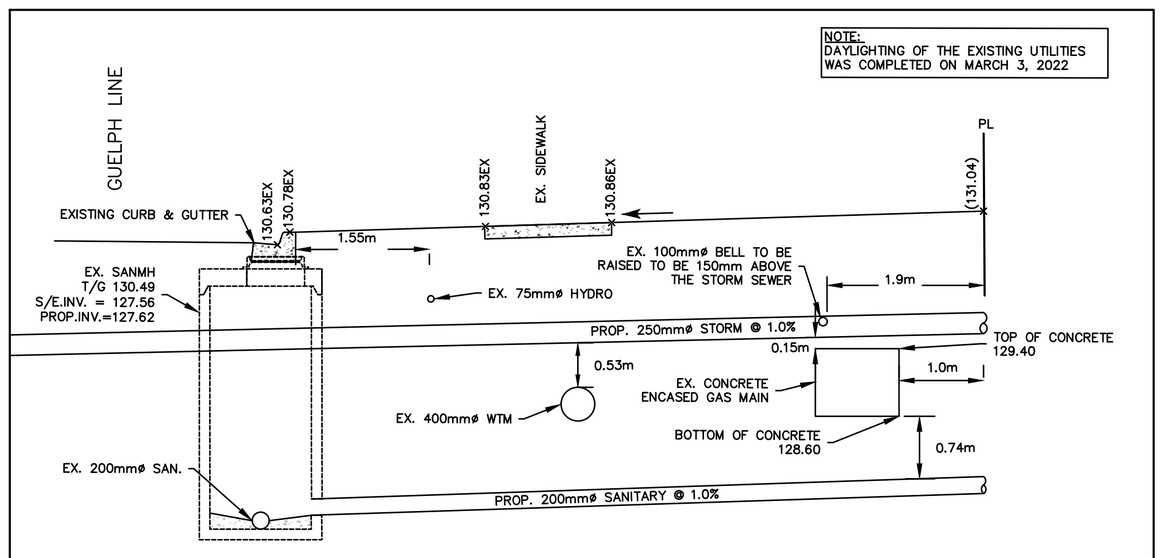
DETAIL 2 — HEAVY-DUTY SILT FENCE (PER OPSD 219.130)
SCALE: N.T.S.



DETAIL 3 — CATCH BASIN SEDIMENT TRAP
SCALE: N.T.S.



DETAIL 4 — ASPHALT LAP JOINT
SCALE: N.T.S.



DETAIL 1 — SECTION A-A
SCALE: 1:50

DETAIL 5 — STORMWATER STORAGE VAULT (DESIGN BY OTHERS)
SCALE: N.T.S.

BENCH MARK NOTE:
CITY OF BURLINGTON BENCHMARK NO.397

BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION "B" ON THE WEST SIDE GUELPH LINE OPPOSITE PALMER DRIVE. PLAQUE IS LOCATED ,.25M SOUTH WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.

ELEVATION = 131.500M (DATUM CGVD 1928:1978)

NO.	DATE	BY	REVISIONS

NOTES TO CONTRACTOR:

1. CONTRACTORS AND SUBCONTRACTORS SHALL NOT SCALE FROM THIS DRAWING.
2. ANY INCONSISTENCIES AND OMISSIONS FOUND ON THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION BEFORE COMMENCING THE WORK.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND ELEVATIONS AND REPORT ALL FINDINGS TO THE ENGINEER. ONCE CONSTRUCTION HAS COMMENCED, THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS.
4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	YM	CHK'D	SN	DATE MAR. 8, 22
DRAWN	YM	CHK'D	SN	

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS
Tel. (905) 631-6978
Website: www.sla.on.ca
email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENTS

INFINITY DEVELOPMENT INC.
101-2275 UPPER MIDDLE ROAD,
OAKVILLE, ON L6H 0C3

PROJECT NAME

1396 GUELPH LINE
BURLINGTON, ON

TITLE

PRELIMINARY NOTES & DETAILS

PROJECT No.	DRAWING No.
22024	C103

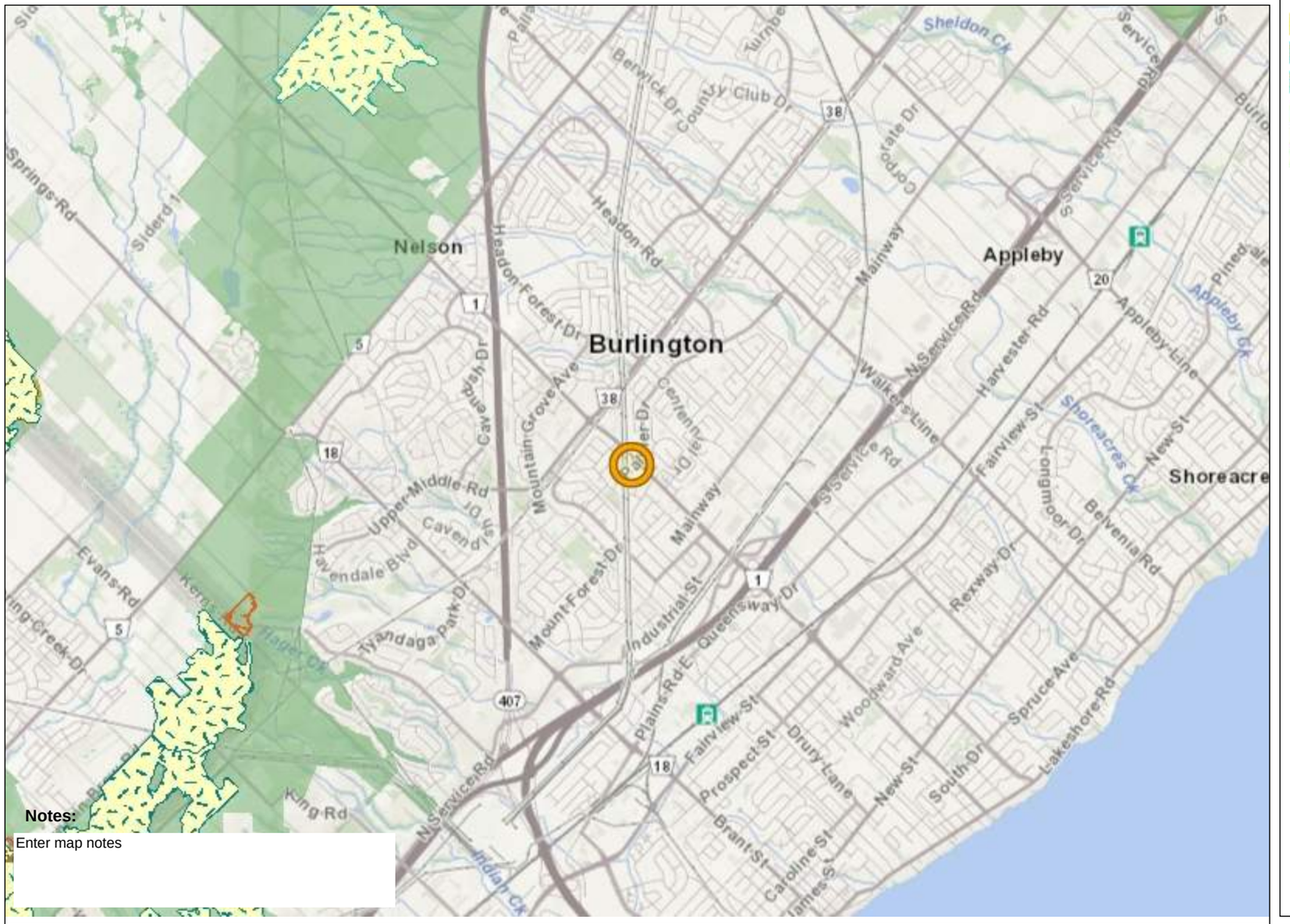
Ontario

Ministry of Natural Resources and Forestry

Make-a-Map: Natural Heritage Areas

Natural Heritage Map

Map created:3/9/2022



Notes:

Enter map notes

Legend

ANSI

- Earth Science Provincially Significant/sciences de la terre d'importance provinciale
- Earth Science Regionally Significant/sciences de la terre d'importance régionale
- Life Science Provincially Significant/sciences de la vie d'importance provinciale
- Life Science Regionally Significant/sciences de la vie d'importance régionale
- Conservation Reserve
- Provincial Park
- Natural Heritage System

2.7 0 1.33 2.7 Kilometres

Absence of a feature in the map does not mean they do not exist in this area.

This map should not be relied on as a precise indicator of routes or locations, nor as a guide to navigation. The Ontario Ministry of Natural Resources and Forestry(OMNRF) shall not be liable in any way for the use of, or reliance upon, this map or any information on this map.

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APPENDIX B – LOG OF BOREHOLES

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		131.11			
0	0	2" ASPHALT GRANULAR MATERIAL		130.60/ 0.51		SS-1	56
2	1	FILL: Dark grey to black clayey silt, trace gravel & organics, moist, stiff		130.20/ 0.91		SS-2	11
4		SANDY SILT TILL: Grey, trace clay & gravel, moist, compact			22-8059-1	SS-3	24
6	2	SILT TO CLAYEY SILT TILL: Reddish brown, trace sand, pieces of shale/cobbles, slightly moist to dry, hard to very stiff		129.13/ 1.98		SS-4	31
8					22-8059-2	SS-5	42
10	3						
12	4						
14					22-8059-3	SS-6	23
16	5						
18				125.32/ 5.79			
20	6	WEATHERED SHALE: Red with grey seams/layers, slightly moist to dry, hard				SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

13.7

12.5

10.8

PIEZOMETER OR WELL CONSTRUCTION

Concrete

1.39m

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: dry; on March 9, 2022: 1.39m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH1(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey seams/layers, slightly moist to dry, hard					
				120.36/ 10.75			
34		Refusal to auger at 10.75m				SS-10	100+
36	11	End of Borehole at 10.75m					
38							
40	12						
42							
44	13						
46							
48	14						
50							
52	15						
54							
56	16						
58							
60	17						
62							
64	18						
	19						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

2" Slotted Pipe

Silica Sand

10.67m bgs

Groundwater Depth (m): on completion: dry; on March 9, 2022: 1.39m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		131.27			
0	0	1½" ASPHALT		130.93/ 0.34		SS-1	31
2		GRANULAR FILL: Grey gravelly sand, moist, dense					
4	1	SANDY SILT TILL: Grey to brown, trace clay, trace gravel, moist, compact Signs of oxidation @ 1.52m				SS-2	24
6	2					SS-3	25
8		SILT TO CLAYEY SILT TILL: Reddish brown, trace sand, pieces of shale/cobbles, slightly moist to dry, hard		129.14/ 2.13		SS-4	38
10	3					SS-5	59
12	4						
14							
16	5					SS-6	32
18							
20	6	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		125.17/ 6.10		SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

1.05m

2" blank PVC

Bentonite Pellets

2" Slotted Pipe

Silica Sand

Groundwater Depth (m): on completion: 5.18m; on March 9, 2022: 1.05m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH2(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard Grey shale at the bottom		120.91/ 10.36			
34		Refusal to auger at 10.36m					
36	11	End of Borehole at 10.36m					
38							
40	12						
42							
44	13						
46							
48	14						
50							
52	15						
54							
56	16						
58							
60	17						
62							
64	18						
	19						

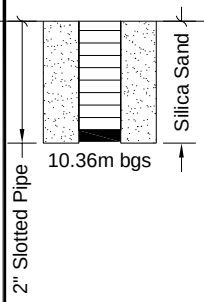
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 9, 2022: 1.05m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

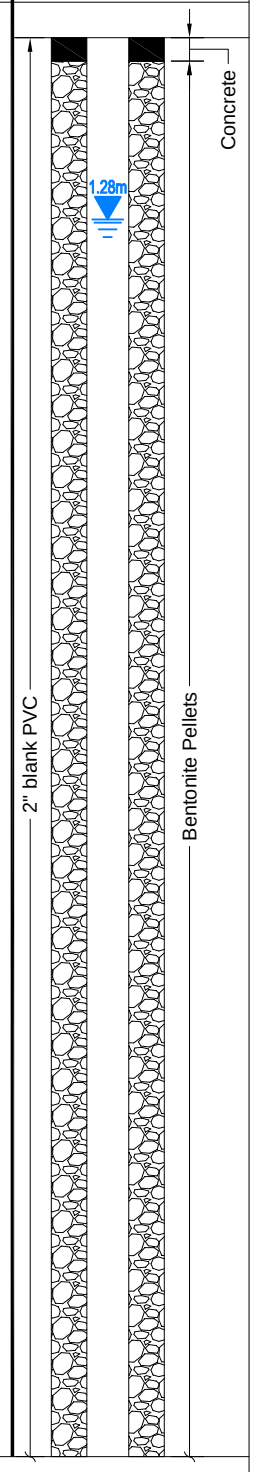
DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.96			
0	0	1½" ASPHALT				SS-1	37
2		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		130.50/ 0.46			
4	1	FILL: Dark grey clayey silt, trace gravel, brick, organics & rootlets, moist, loose				SS-2	8
6	2	CLAYEY SILT TILL: Grey, trace gravel, moist, firm to stiff		129.28/ 1.68	22-8059-4	SS-3	8
8		SILTY SAND: Light brown, trace gravel, wet, compact		128.52/ 2.44		SS-4	11
10	3	SANDY TO CLAYEY SILT TILL: Reddish brown, with pieces of shale, moist, compact to very dense (very stiff to hard)		127.91/ 3.05	22-8059-5	SS-5	26
12	4						
14							
16	5				22-8059-6	SS-6	29
18		Mixed with weathered red shale @ 5.33m				SS-7	100+
20	6	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.86/ 6.10		SS-8	100+
22	7						
24							
26	8					SS-9	100+
28							
30	9					SS-10	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40



Groundwater Depth (m): on completion: dry; on March 2, 2022: 12.64m; on March 9, 2022: 1.28m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH3(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	SAMPLES Type NO.	"N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-11	100+
38							
40	12					SS-12	100+
42	13						
44							
46	14					SS-13	100+
48							
50	15	Augered to 15.24m		115.59/ 15.37		SS-14	100+
		End of Borehole at 15.37m					
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

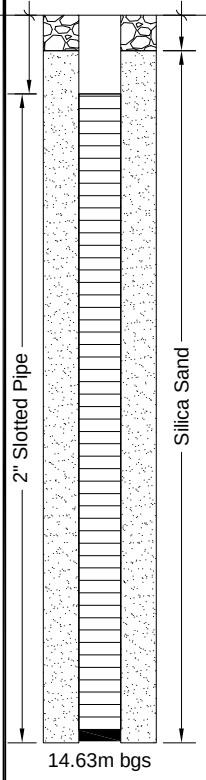
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: dry; on March 2, 2022: 12.64m; on March 9, 2022: 1.28m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.64			
0	0	2" ASPHALT				SS-1	20
2	1	FILL: Granular fill, gravelly sand, moist Dark brown to black, brown stones, fill material mixed of asphalt, wooden pieces				SS-2	4
4				129.12/ 1.52			
6	2	FILL: Dark brown clayey silt, moist, firm				SS-3	8
8		SANDY SILT TILL: Grey, trace gravel, moist, dense		128.35/ 2.29		SS-4	40
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard		127.59/ 3.05		SS-5	44
12	4						
14							
16	5					SS-6	47
18							
20	6	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.54/ 6.10		SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

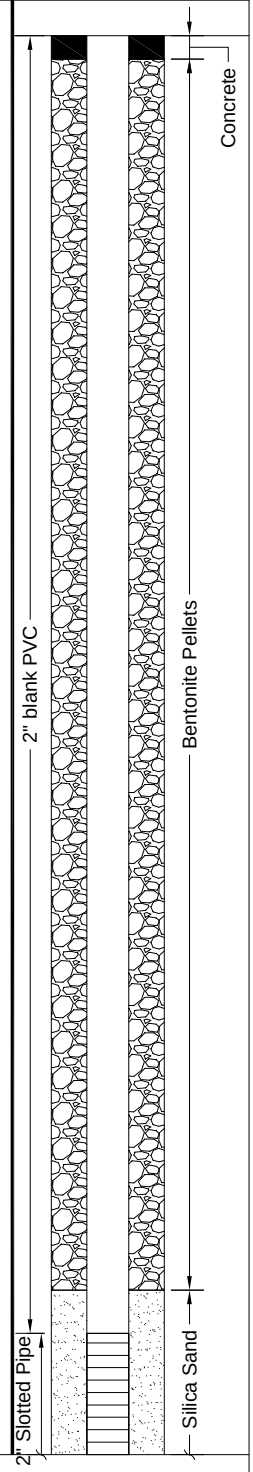
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 2, 2022: 11.17m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH4(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-10	100+
38							
40	12					SS-11	100+
42	13						
44							
46	14					SS-12	100+
48							
50	15	Augered to 15.24m		115.40/ 15.24			
		End of Borehole at 15.24m				SS-13	100+
52	16						
54							
56	17						
58							
60	18						
62	19						
64							

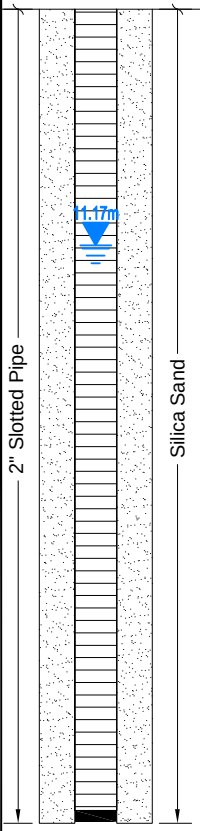
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: 5.18m; on March 2, 2022: 11.17m

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 1 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		129.92			
0	0	1½" ASPHALT		129.62/ 0.30		SS-1	15
2		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		129.31/ 0.61			
4	1	FILL: Brown sandy silt, trace clay & gravel, moist, compact				SS-2	25
6	2	SANDY SILT TILL: Grey, trace gravel, moist, compact				SS-3	29
8						SS-4	28
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard to very stiff		126.87/ 3.05		SS-5	38
12	4						
14							
16	5			124.74/ 5.18		SS-6	27
18		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
20	6					SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9					SS-9	100+
32	10						

PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION

Concrete

2" blank PVC

Bentonite Pellets

Groundwater Depth (m): on completion: dry

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH5(MW) SHEET. 2 of 2

PROJECT NO.: FE-P 22-11966/67

PROJECT NAME: Geotechnical & Hydrogeological Investigations

LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 2, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	SAMPLES: LAB ID	SAMPLES: Type NO.	SAMPLES: "N" VALUE
32	10	WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard					
34							
36	11					SS-10	100+
38							
40	12					SS-11	100+
42	13						
44				116.12/ 13.80			
46	14	Refusal to auger at 13.80m End of Borehole at 13.80m				SS-12	100+
48							
50	15						
52	16						
54							
56	17						
58							
60	18						
62							
64	19						

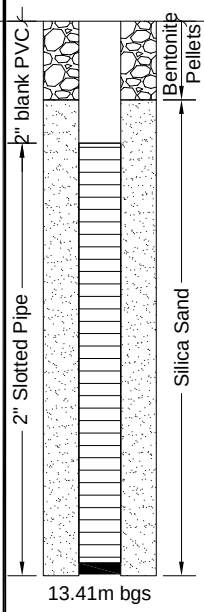
PENETRATION TESTING (SPT) ▲ 20 40 60 80

SHEAR STRENGTH (Kpa) ✚ 40 80 120 160

VAPOUR READING (ppm) □ 20 40 60 80

MOISTURE CONTENT (%) ● 10 20 30 40

PIEZOMETER OR WELL CONSTRUCTION



Groundwater Depth (m): on completion: dry

DRAWN: DC LOGGED: BS CHECKED: CW

FISHER ENGINEERING

LOG OF BOREHOLE

NO. BH6(MW) SHEET. 1 of 1

PROJECT NO.: FE-P 22-11966/67

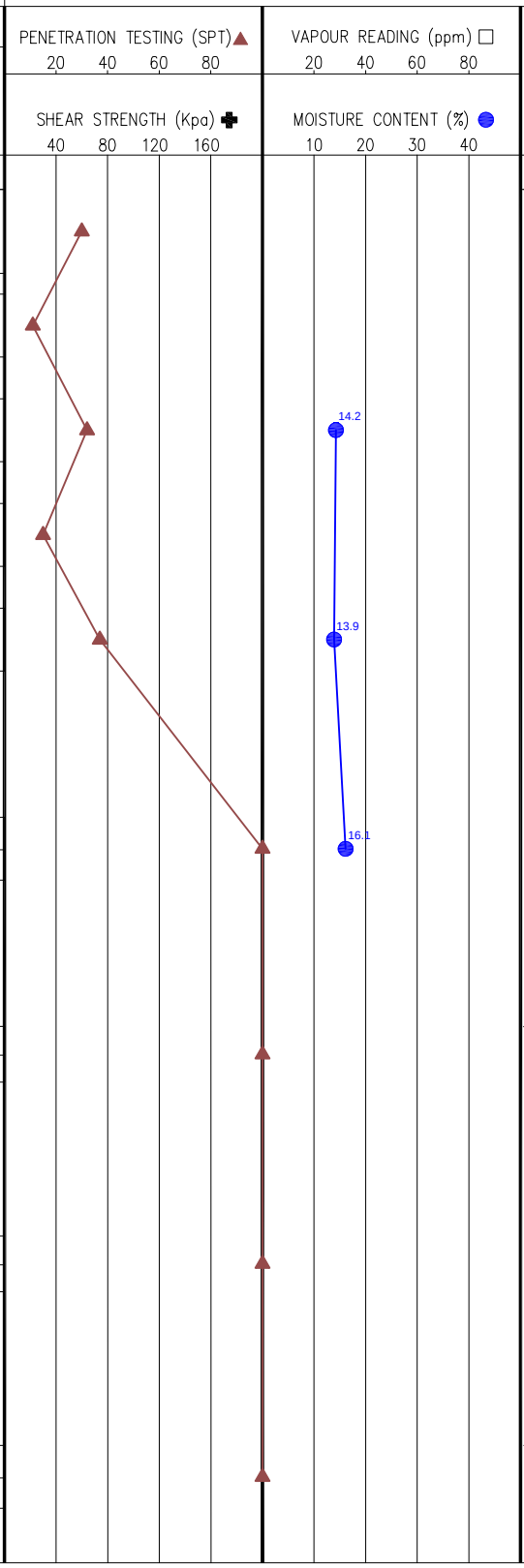
PROJECT NAME: Geotechnical & Hydrogeological Investigations

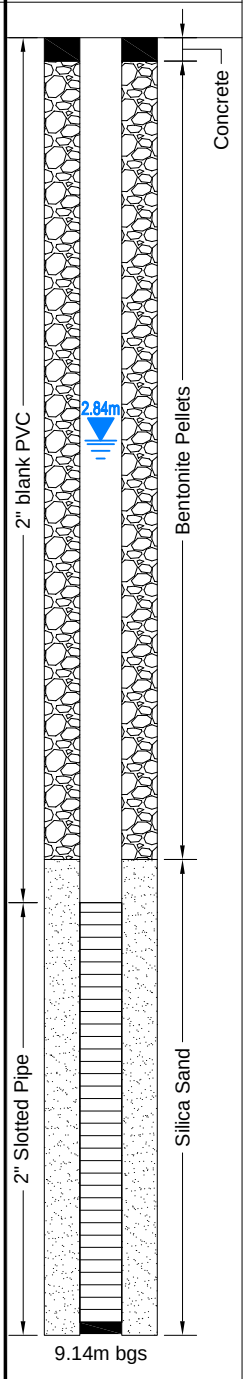
LOCATION: 1396 Guelph Line, Burlington

DRILLING METHOD: Truck D-50, Solid Stem

DRILLING DATE: March 1, 2022

DEPTH (feet)	DEPTH (metres)	DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	LAB ID	Type NO.	"N" VALUE
		GROUND SURFACE (m asl)		130.12			
0	0	3" ASPHALT					
		GRANULAR MATERIAL: Sand & gravel, brown, moist, very dense		129.76/ 0.36		SS-1	30
2	1	FILL: Black sandy silt, trace clay, gravel, topsoil & organics, moist, compact		129.21/ 0.91		SS-2	11
4		FILL: Grey silty sand, trace gravel & rootlet, moist, loose		128.75/ 1.37			
6	2	SANDY SILT TILL: Grey, trace gravel, moist, compact to dense			22-8059-7	SS-3	32
8						SS-4	15
10	3	CLAYEY SILT TILL: Reddish brown, some sand, moist to dry, hard		126.77/ 3.35	22-8059-8	SS-5	37
12	4						
14							
16	5	Wet @ 4.57m			22-8059-9	SS-6	100+
18		WEATHERED SHALE: Red with grey layers/seams, slightly moist to dry, hard		124.63/ 5.49			
20	6					SS-7	100+
22	7						
24							
26	8					SS-8	100+
28							
30	9	End of Borehole at 9.25m		120.87/ 9.25		SS-9	100+
32	10						





Groundwater Depth (m): on completion: 4.57m; on March 2, 2022: 2.84m

DRAWN: DC LOGGED: BS CHECKED: CW

APPENDIX C – MOISTURE CONTENT AND GRAIN SIZE DISTRIBUTION ANALYSES

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Client: Infinity Development Group
Address: 101-2275 Upper Middle Road
Oakville, ON
L6H 0C3
Tel.:
Email:
Attn.:

F.E. Job #: 22-8059
Project Name: Geotechnical
Project ID: FE-P 22-11966
Date Sampled: N/A
Date Received: 3-Mar-2022
Date Reported: 4-Mar-2022
Location: 1396 Guelph Line
Burlington, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
pH	Soil	2	4-Mar-22	4-Mar-22	pH-EC-SAR F-16	SW-846, 9045D
Chloride	Soil	2	N/A	4-Mar-22	Chloride F-20	SM 4500-Cl-E
Sulphate	Soil	2	4-Mar-22	4-Mar-22	Sulphate F-21	SM 4500-SO_4
Moisture Content	Soil	9	N/A	4-Mar-22	Support Procedures F-99	Carter (1993)
Grain Size	Soil	3	N/A	4-Mar-22	Grain Size F-28	ASTM D6913-04

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:

Roger Lin, Ph. D., C. Chem.
Laboratory Manager



Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (***Rush***)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				**Soil Standards** *
pH *(pH unit)*	8.60	6.59				(5-11) 5-9

* Surface soil pH value from 5 - 9, Sub-surface soil pH value from 5-11.

QA/QC Report

Parameter	**LCS**	**AR**	**Duplicate**	**AR**		
	Absolute Difference *(pH Unit)*					
pH *(pH unit)*	7.21	7.00-7.40	0.04	<0.3		

LEGEND:
LCS - Laboratory Control Sample
AR - Acceptable Range

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				
	Concentration (µg/g)					
Chloride in Soil	160.97	795.54				

< result obtained was below RL (Reporting Limit).

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**MS**	**AR**
	(µg/g)		**Recovery (%)**		**Recovery (%)**	
Chloride in Soil	<10	10	96	70-130	87	70-130

Parameter	**Duplicate**	**AR**				
	RPD (%)					
Chloride in Soil	8.7	0-20				

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
MS - Matrix Spike
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-4*** BH3 SS3 1.52-1.98m				
Sulphate *(mg/kg)*	25.5	122.4				

QA/QC Report

Parameter	**Blank**	**RL**	**LCS/Spike**	**AR**	**Duplicate**	**AR**
	(mg/kg)		**Recovery (%)**		**RPD (%)**	
Sulphate	<1	1	100	70-130	4	0-30

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

Parameter	***22-8059-1*** BH1 SS3 1.52-1.98m	***22-8059-2*** BH1 SS5 3.05-3.51m	***22-8059-3*** BH1 SS6 4.57-5.03m	***22-8059-4*** BH3 SS3 1.52-1.98m	***22-8059-5*** BH3 SS5 3.05-3.51m	***22-8059-6*** BH3 SS6 4.57-5.03m
Geo Moisture Content (%)	13.7	12.5	10.8	20.1	13.5	10.2

Parameter	***22-8059-7*** BH6 SS3 1.52-1.98m	***22-8059-8*** BH6 SS5 3.05-3.51m	***22-8059-9*** BH6 SS6 4.57-5.03m			
Geo Moisture Content (%)	14.2	13.9	16.1			

QA/QC Report

Parameter	**Blank**	**RL**	**LCS**	**AR**	**Duplicate**	**AR**
			Recovery (%)		**RPD (%)**	
Geo Moisture Content (%)	<0.1	0.1	100	70-130	14.5	0-20

LEGEND:

RL - Reporting Limit
LCS - Laboratory Control Sample
AR - Acceptable Range
RPD - Relative Percent Difference

Results related only to the items tested

Certificate of Analysis

Analysis Requested:	pH, Sulphate, Chloride, Moisture Content, Grain Size
Sample Description:	9 Soil Sample(s) (Rush)

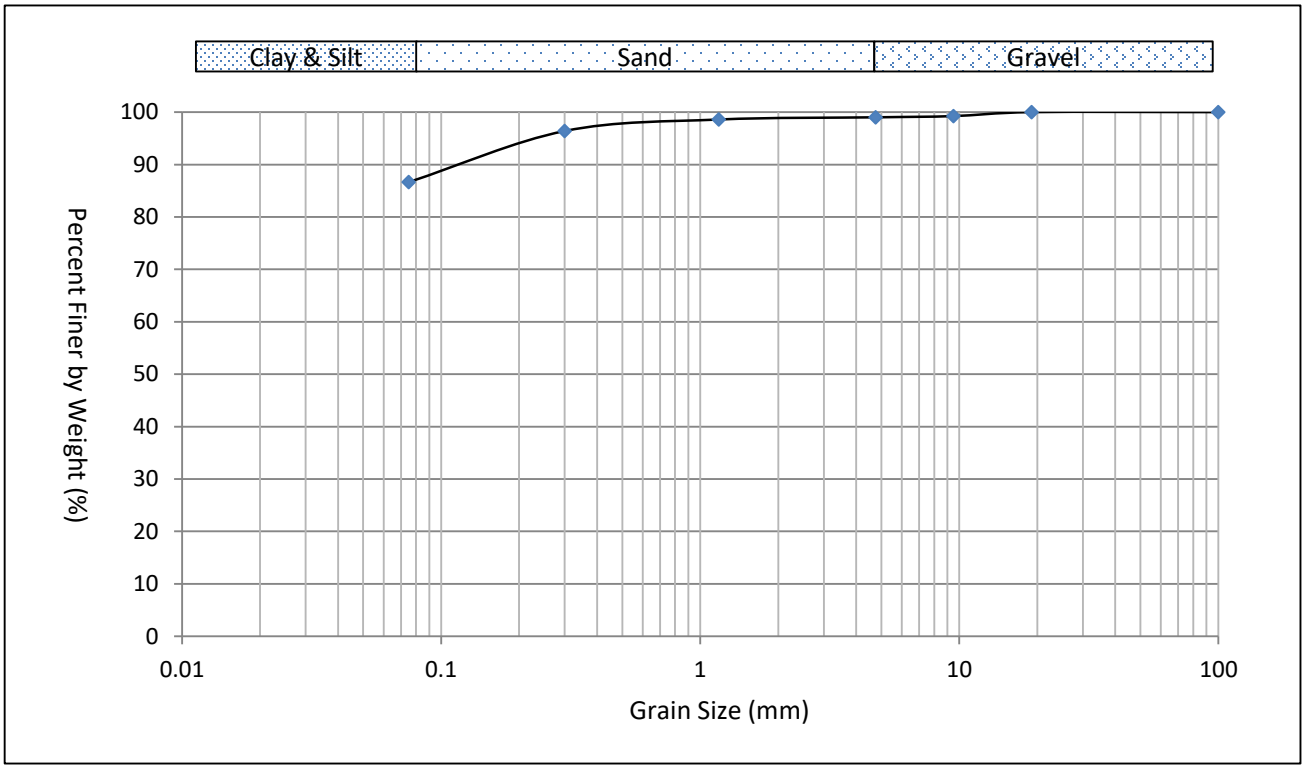
Parameter	***22-8059-4*** BH3 SS3 1.52-1.98m	***22-8059-5*** BH3 SS5 3.05-3.51m	***22-8059-6*** BH3 SS6 4.57-5.03m			
Grain Size (%)						
>19mm	0.0	0.0	0.0			
9.5mm-19mm	0.8	0.0	0.0			
4.75mm-9.5mm	0.2	4.3	4.6			
1.18m-4.75mmm	0.4	6.8	10.7			
300um-1.18mm	2.2	5.5	8.5			
75um-300um	9.8	10.2	8.5			
<75um	86.7	73.2	67.7			
Clay & Silt	**87**	**73**	**68**			
Sand	**12**	**23**	**28**			
Gravel	**1**	**4**	**5**			

Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m

Clay & Silt: 87% Sand: 12% Gravel: 1%

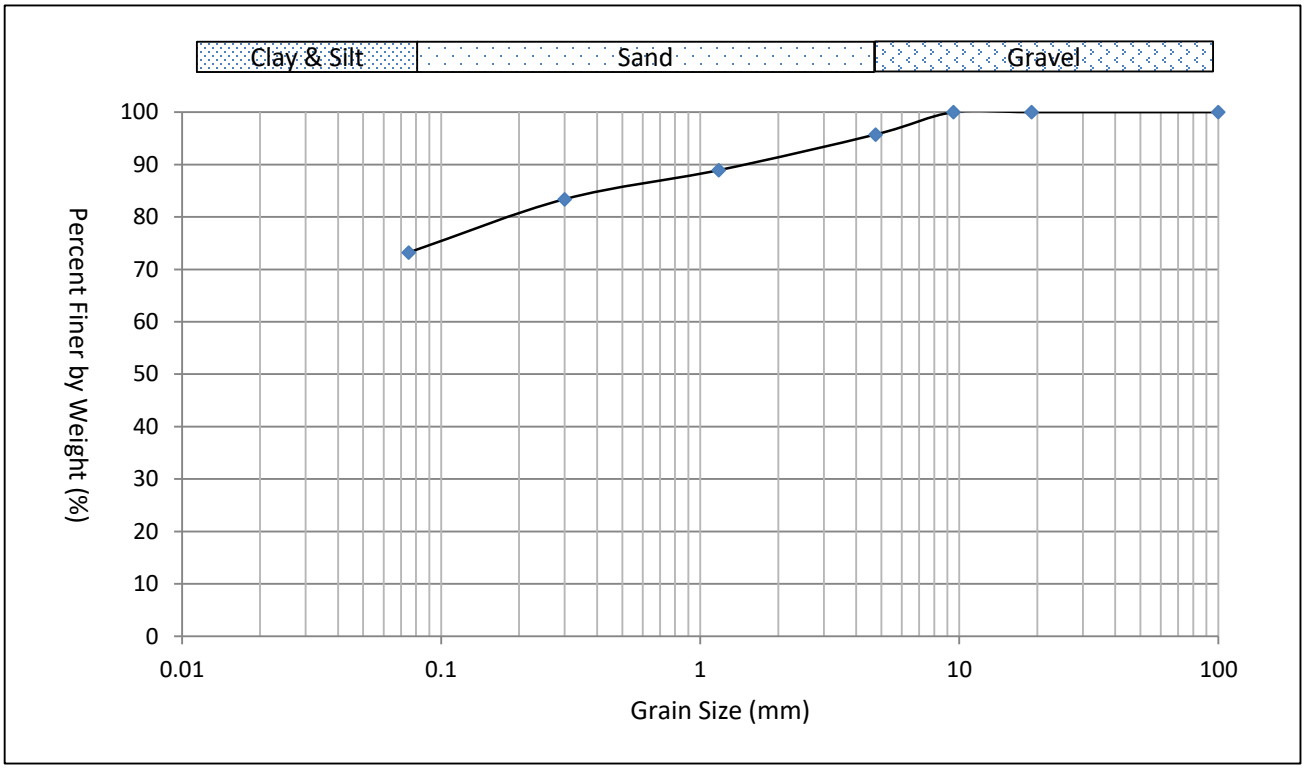


Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-5 BH3 SS5 3.05-3.51m

Clay & Silt: 73% Sand: 23% Gravel: 4%

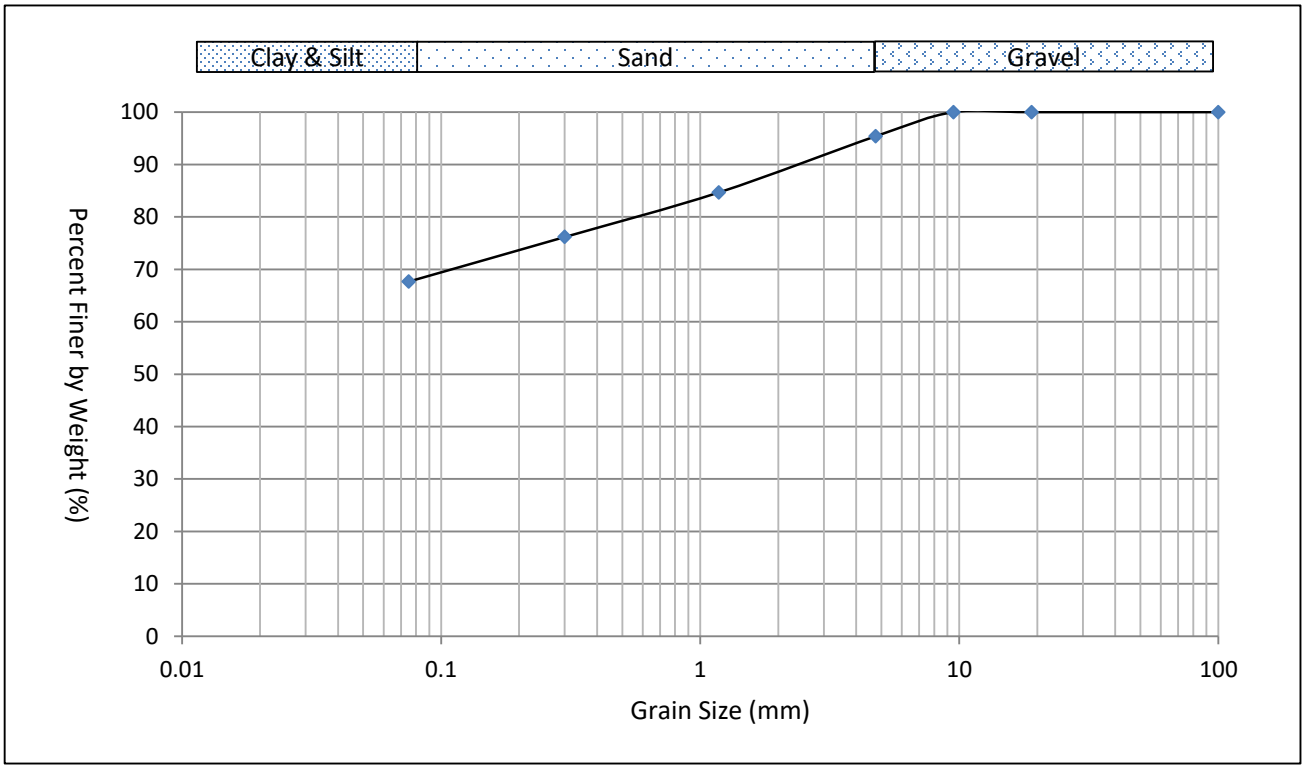


Results related only to the items tested

Grain Size Distribution

Sample ID: 22-8059-6 BH3 SS6 4.57-5.03m

Clay & Silt: 68% Sand: 28% Gravel: 5%



Results related only to the items tested

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Client:	Infinity Development Group	***F.E. Job #:***	22-8059B
Address:	101-2275 Upper Middle Road	***Project Name:***	Geotechnical
	Oakville, ON	***Project ID:***	FE-P 22-11966
	L6H 0C3	***Date Sampled:***	N/A
Tel.:		***Date Received:***	3-Mar-2022
Email:		***Date Reported:***	10-Mar-2022
Attn.:		***Location:***	1396 Guelph Line
			Burlington, ON

Certificate of Analysis

Analyses	Matrix	Quantity	Date Extracted	Date Analyzed	Lab SOP	Method Reference
Hydrometer	Soil	1	N/A	9-Mar-22	Hydrometer SOP	ASTM D7928-17

Fisher Environmental Laboratories is accredited by CALA (the Canadian Association for Laboratory Accreditation Inc.) for specific parameters as required by Ontario Regulation 153/04. All analytical testing has been performed in accordance with ISO 17025 and the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act published by Ontario Ministry of the Environment.

Authorized by:



Roger Lin, Ph. D., C. Chem.
Laboratory Manager

Client: Infinity Development Group ***F.E. Job #:*** 22-8059B

Certificate of Analysis

Analysis Requested:	Hydrometer
Sample Description:	1 Soil Sample(s)

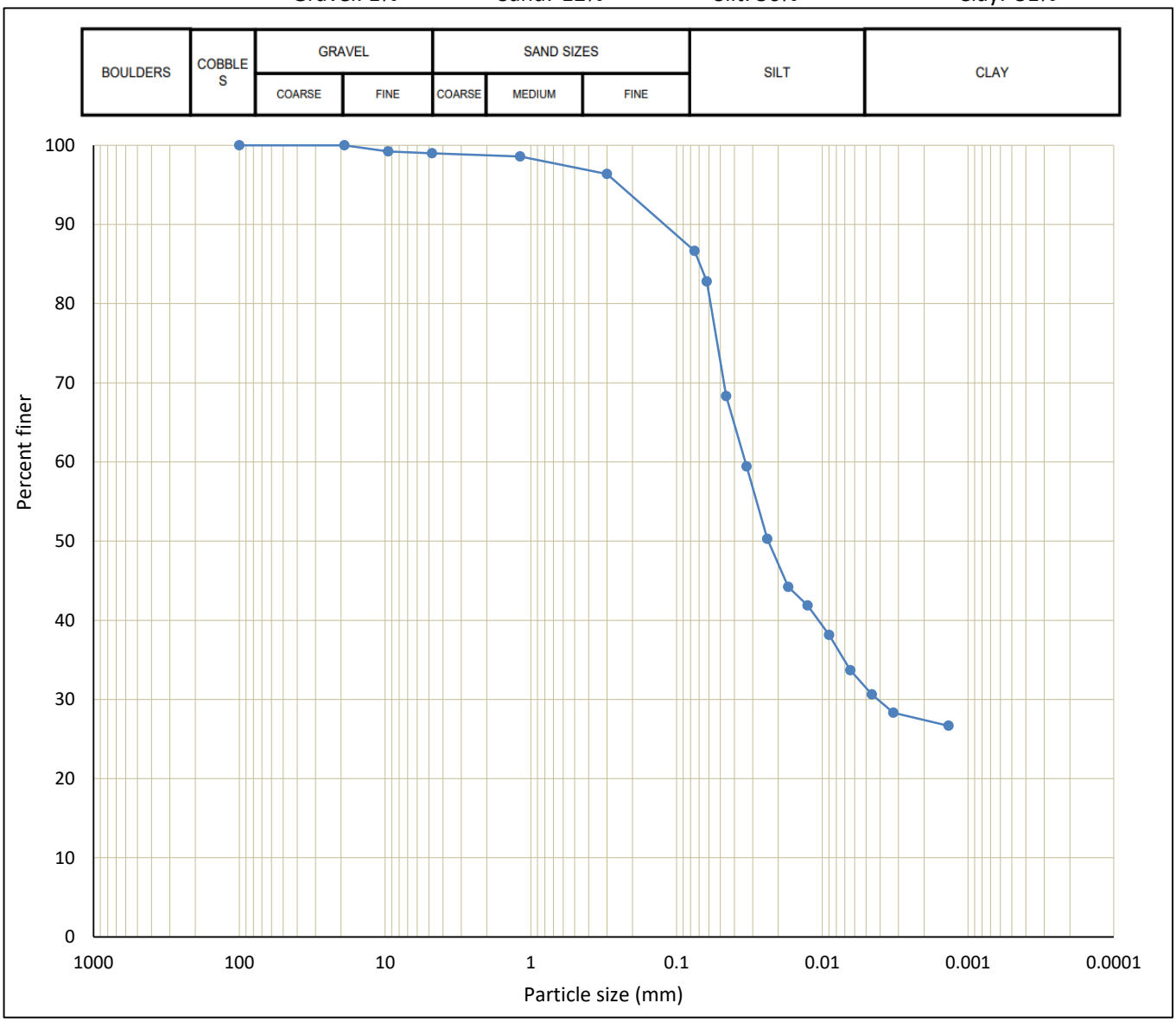
Parameter	***22-8059-4*** BH3 SS3 1.52-1.98m					
Grain Size (%)						
>19mm	0.0					
9.5mm-19mm	0.8					
4.75mm-9.5mm	0.2					
1.18mm-4.75mm	0.4					
300um-1.18mm	2.2					
75um-300um	9.8					
5um-75um	56					
2um-5um	4					
<2um	27					
Clay	**31**					
Silt	**56**					
Sand	**12**					
Gravel	**1**					

Client: Infinity Development Group ***F.E. Job #:*** 22-8059B

Grain Size Distribution

Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m

Gravel: 1% Sand: 12% Silt: 56% Clay: 31%



Sample ID: 22-8059-4 BH3 SS3 1.52-1.98m		
Diameter	***Weight (%)***	***Grain Size***
>4.75mm	1.0	Gravel
1.18mm-4.75mm	0.4	Coarse Sand
300um-1.18mm	2.2	Medium Sand
75um-300um	9.8	Fine Sand
5um-75um	56	Silt
2um-5um	4	Clay
<2um	27	

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www.fisherenvironmental.com
laboratory@fisherenvironmental.com

LAB JOB #: 8059

CHAIN OF CUSTODY 2588

Page ____ of ____

CLIENT INFORMATION
Company Name:
Contact: Clive 416-605-9722
Address: Rajindra 647-784-2727

Phone:
Fax: Fax results? Y/N
Email: Email results? Y/N

PROJECT INFORMATION
Project Name: 1396 Guelph Line
Project ID: 22-11966
Sampled By:

TURNAROUND TIME (TAT) REQUIRED

STD - Standard (5-7 working days) ✓		Working Time: Monday-Friday 9:00am-5:00pm
SR - Semi Rush (48 hours)	50%	Surcharges apply; Sample received after 2pm will be considered received the next business day
R - Rush (24 hours)	75%	
SD - Same Day - 100%	100%	

BILLING INFORMATION
Purchase Order #:
Verbal Authorization:
Credit Card (type):
Credit Card #:
Expiry Date:

LAB SAMPLE ID	CLIENT'S SAMPLE ID AND DESCRIPTION	SAMPLING DATE/TIME	SAMPLE MATRIX	CONTAINER # & TYPE	TAT (Above)	ANALYSIS REQUESTED (Check or Specify) Metals	PHCs	VOCs	PAHs	PCBs	Asbestos	Moist	Grain	NOTES
1	BH1 SS3 5-6.5'											✓		+ (CL, SO4, PH)
2	SS5 10-11.5'											✓		
3	SS6 15-16.5'											✓		
4	BH3 SS3 5-6.5'											✓	✓	+ (CL, SO4 + PH)
5	SS5 10-11.5'											✓	✓	
6	SS6 15-16.5'											✓	✓	
7	BH6 SS3 5-6.5'											✓		
8	SS5 10-11.5'											✓		
9	SS6 15-16.5'											✓		

Relinquished by: (Signature & Print) Behnam Sayad Pour
Date & Time: March 3, 22
Method of Shipment:

Client's Comments:

Received by: (Signature & Print) Bo
Date & Time: Mar 3. 22

Arrival Temperature (°C): 4°C
Laboratory Remarks:

Regulatory Requirements

Reg. 153
Table ____
☐ Residential / Parkland
☐ Industrial / Commercial
☐ Agricultural
Soil Texture
☐ Coarse ☐ Med/Fine

Sewer Use
☐ Sanitary
☐ Storm
Region ____

Reg. 558
☐ TCLP

Revision: 2.2

APPENDIX D – SEWER BYLAW RESULTS

FISHER ENVIRONMENTAL
ATTN: CLIVE
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2

Date Received: 03-MAR-22
Report Date: 09-MAR-22 15:05 (MT)
Version: FINAL

Client Phone: 905-475-7755

Certificate of Analysis

Lab Work Order #: L2689805

Project P.O. #: NOT SUBMITTED
Job Reference:
C of C Numbers: 20-893644
Legal Site Desc:

Emily Hansen
Account Manager

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ANALYTICAL REPORT

Summary of Guideline Exceedances

ALS ID	Client ID	Grouping	Analyte	Result	Guideline Limit	Unit
Guideline						
Ontario Halton Santitary Sewer By-law No. 02-03 (MAR, 2003) - Halton Sanitary Sewer By-Law No. 02-03						
(No parameter exceedances)						
Ontario Halton Santitary Sewer By-law No. 02-03 (MAR, 2003) - Halton Storm Sewer By-Law No, 02-03						
(No parameter exceedances)						

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Physical Tests - WATER

			Lab ID	L2689805-1
			Sample Date	03-MAR-22
			Sample ID	1396 GUELPH LINE BURLINGTON MW6
Analyte	**Unit**	**Guide Limits #1**	**#2**	
pH	pH units	6.00-10.0	6.5-8.5	7.34
Total Suspended Solids	mg/L	350	-	5.6

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Anions and Nutrients - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2689805-1 Sample Date: 03-MAR-22 Sample ID: 1396 GUELPH LINE BURLINGTON MW6
Fluoride (F)	mg/L	10	-	<0.40 DLDS
Total Kjeldahl Nitrogen	mg/L	100	-	1.41
Phosphorus, Total	mg/L	10.0	-	0.0104
Sulfate (SO4)	mg/L	1500	-	394 DLDS

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Cyanides - WATER

			Lab ID	L2689805-1
			Sample Date	03-MAR-22
			Sample ID	1396 GUELPH LINE BURLINGTON MW6
		Guide Limits		
Analyte	Unit	#1	#2	
Cyanide, Total	mg/L	2	-	<0.0020

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Bacteriological Tests - WATER

			Lab ID	L2689805-1
			Sample Date	03-MAR-22
			Sample ID	1396 GUELPH LINE BURLINGTON MW6
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
E. Coli	CFU/100mL	-	200	0

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Total Metals - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2689805-1 Sample Date: 03-MAR-22 Sample ID: 1396 GUELPH LINE BURLINGTON MW6
Aluminum (Al)-Total	mg/L	50	-	0.711 DLHC
Antimony (Sb)-Total	mg/L	5	-	<0.0010 DLHC
Arsenic (As)-Total	mg/L	1	-	0.0028 DLHC
Beryllium (Be)-Total	mg/L	5	-	<0.0010 DLHC
Cadmium (Cd)-Total	mg/L	1	-	0.000083 DLHC
Chromium (Cr)-Total	mg/L	3	-	<0.0050 DLHC
Cobalt (Co)-Total	mg/L	5	-	0.0015 DLHC
Copper (Cu)-Total	mg/L	3	-	<0.0050 DLHC
Iron (Fe)-Total	mg/L	50	-	0.46 DLHC
Lead (Pb)-Total	mg/L	3	-	<0.00050 DLHC
Manganese (Mn)-Total	mg/L	5	-	0.810 DLHC
Mercury (Hg)-Total	mg/L	0.05	-	<0.0000050
Molybdenum (Mo)-Total	mg/L	5	-	0.0163 DLHC
Nickel (Ni)-Total	mg/L	3	-	0.0237 DLHC
Selenium (Se)-Total	mg/L	5	-	<0.00050 DLHC
Silver (Ag)-Total	mg/L	5	-	<0.00050 DLHC
Tin (Sn)-Total	mg/L	5	-	0.0018 DLHC
Titanium (Ti)-Total	mg/L	5	-	<0.030 DLUI
Zinc (Zn)-Total	mg/L	3	-	<0.030 DLHC

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Aggregate Organics - WATER

Analyte	Unit	Guide Limits #1	Guide Limits #2	Lab ID: L2689805-1 Sample Date: 03-MAR-22 Sample ID: 1396 GUELPH LINE BURLINGTON MW6
BOD Carbonaceous	mg/L	300	-	3.2
Oil and Grease, Total	mg/L	-	-	<5.0
Animal/Veg Oil & Grease	mg/L	150	-	<5.0
Mineral Oil and Grease	mg/L	15	-	<2.5
Phenols (4AAP)	mg/L	1.0	-	0.0041

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Volatile Organic Compounds - WATER

			Lab ID	L2689805-1
			Sample Date	03-MAR-22
			Sample ID	1396 GUELPH LINE BURLINGTON MW6
		Guide Limits		
Analyte	Unit	#1	#2	
Benzene	ug/L	10	-	<0.50
Chloroform	ug/L	40	-	<1.0
1,4-Dichlorobenzene	ug/L	80	-	<0.50
Dichloromethane	ug/L	2000	-	<2.0
Ethylbenzene	ug/L	160	-	<0.50
Tetrachloroethylene	ug/L	1000	-	<0.50
Toluene	ug/L	16	-	1.66
Trichloroethylene	ug/L	400	-	<0.50
Surrogate: 4-Bromofluorobenzene	%	-	-	82.2
Surrogate: 1,4-Difluorobenzene	%	-	-	99.5

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

ANALYTICAL REPORT

Polycyclic Aromatic Hydrocarbons - WATER

			Lab ID	L2689805-1
			Sample Date	03-MAR-22
			Sample ID	1396 GUELPH LINE BURLINGTON MW6
		Guide Limits		
Analyte	**Unit**	**#1**	**#2**	
Naphthalene	ug/L	140	-	1.62
Surrogate: d8-Naphthalene	%	-	-	107.9

Guide Limit #1: Halton Sanitary Sewer By-Law No. 02-03
Guide Limit #2: Halton Storm Sewer By-Law No, 02-03

Detection Limit for result exceeds Guideline Limit. Assessment against Guideline Limit cannot be made.
Analytical result for this parameter exceeds Guide Limits listed. See Summary of Guideline Exceedances.

* Please refer to the Reference Information section for an explanation of any qualifiers noted.

Reference Information

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DLDS	Detection Limit Raised: Dilution required due to high Dissolved Solids / Electrical Conductivity.
DLUI	Detection Limit Raised: Unknown Interference generated an apparent false positive test result.
DLHC	Detection Limit Raised: Dilution required due to high concentration of test analyte(s).

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
BOD-C-WT	Water	BOD Carbonaceous	APHA 5210 B (CBOD)

This analysis is carried out using procedures adapted from APHA Method 5210B - "Biochemical Oxygen Demand (BOD)". All forms of biochemical oxygen demand (BOD) are determined by diluting and incubating a sample for a specified time period, and measuring the oxygen depletion using a dissolved oxygen meter. Dissolved BOD (SOLUBLE) is determined by filtering the sample through a glass fibre filter prior to dilution. Carbonaceous BOD (CBOD) is determined by adding a nitrification inhibitor to the diluted sample prior to incubation.

CN-TOT-WT	Water	Cyanide, Total	ISO 14403-2

Total cyanide is determined by the combination of UV digestion and distillation. Cyanide is converted to cyanogen chloride by reacting with chloramine-T, the cyanogen chloride then reacts with a combination of barbituric acid and isonicotinic acid to form a highly colored complex.

When using this method, high levels of thiocyanate in samples can cause false positives at ~1-2% of the thiocyanate concentration. For samples with detectable cyanide analyzed by this method, ALS recommends analysis for thiocyanate to check for this potential interference

EC-SCREEN-WT	Water	Conductivity Screen (Internal Use Only)	APHA 2510

Qualitative analysis of conductivity where required during preparation of other tests - e.g. TDS, metals, etc.

EC-WW-MF-WT	Water	E. Coli	SM 9222D

A 100 mL volume of sample is filtered through a membrane, the membrane is placed on mFC-BCIG agar and incubated at 44.5 –0 .2 °C for 24 – 2 h. Method ID: WT-TM-1200

F-IC-N-WT	Water	Fluoride in Water by IC	EPA 300.1 (mod)

Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.

HG-T-CVAA-WT	Water	Total Mercury in Water by CVAAS	EPA 1631E (mod)

Water samples undergo a cold-oxidation using bromine monochloride prior to reduction with stannous chloride, and analyzed by CVAAS.

MET-T-CCMS-WT	Water	Total Metals in Water by CRC ICPMS	EPA 200.2/6020A (mod)

Water samples are digested with nitric and hydrochloric acids, and analyzed by CRC ICPMS.

Method Limitation (re: Sulfur): Sulfide and volatile sulfur species may not be recovered by this method.

Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011).

OGG-SPEC-CALC-WT	Water	Speciated Oil and Grease A/V Calc	CALCULATION

Sample is extracted with hexane, sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then determined gravimetrically.

OGG-SPEC-WT	Water	Speciated Oil and Grease-Gravimetric	APHA 5520 B

The procedure involves an extraction of the entire water sample with hexane. Sample speciation into mineral and animal/vegetable fractions is achieved via silica gel separation and is then

Reference Information

Methods Listed (if applicable):

ALS Test Code	Matrix	Test Description	Method Reference**
		determined gravimetrically.	
P-T-COL-WT	Water	Total P in Water by Colour	APHA 4500-P PHOSPHORUS
		This analysis is carried out using procedures adapted from APHA Method 4500-P "Phosphorus". Total Phosphorus is deteremined colourimetrically after persulphate digestion of the sample.	
PAH-NAPHTHALENE-WT	Water	Polyaromatic Hydrocarbons (PAHs)	SW846 8270
		Sample is extracted at neutral pH using separate aliquots of dichloromethane with a modified separatory funnel technique, extracts are then concentrated and analyzed by GC/MSD.	
PH-WT	Water	pH	APHA 4500 H-Electrode
		Water samples are analyzed directly by a calibrated pH meter.	
		Analysis conducted in accordance with the Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act (July 1, 2011). Holdtime for samples under this regulation is 28 days	
PHENOLS-4AAP-WT	Water	Phenol (4AAP)	EPA 9066
		An automated method is used to distill the sample. The distillate is then buffered to pH 9.4 which reacts with 4AAP and potassium ferricyanide to form a red complex which is measured colorimetrically.	
SO4-IC-N-WT	Water	Sulfate in Water by IC	EPA 300.1 (mod)
		Inorganic anions are analyzed by Ion Chromatography with conductivity and/or UV detection.	
SOLIDS-TSS-WT	Water	Suspended solids	APHA 2540 D-Gravimetric
		A well-mixed sample is filtered through a weighed standard glass fibre filter and the residue retained is dried in an oven at 104–1°C for a minimum of four hours or until a constant weight is achieved.	
TKN-F-WT	Water	TKN in Water by Fluorescence	J. ENVIRON. MONIT., 2005,7,37-42,RSC
		Total Kjeldahl Nitrogen is determined using block digestion followed by Flow-injection analysis with fluorescence detection	
VOC-ROU-HS-WT	Water	Volatile Organic Compounds	SW846 8260
		Aqueous samples are analyzed by headspace-GC/MS.	

**ALS test methods may incorporate modifications from specified reference methods to improve performance.

Chain of Custody Numbers:

20-893644

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
WT	ALS ENVIRONMENTAL - WATERLOO, ONTARIO, CANADA

Reference Information

GLOSSARY OF REPORT TERMS

Surrogates are compounds that are similar in behaviour to target analyte(s), but that do not normally occur in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery. In reports that display the D.L. column, laboratory objectives for surrogates are listed there.
mg/kg - milligrams per kilogram based on dry weight of sample
mg/kg wwt - milligrams per kilogram based on wet weight of sample
mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight
mg/L - unit of concentration based on volume, parts per million.
< - Less than.
D.L. - The reporting limit.
N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.
UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.
Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.

Application of guidelines is provided "as is" without warranty of any kind, either expressed or implied, including, but not limited to, fitness for a particular purpose, or non-infringement. ALS assumes no responsibility for errors or omissions in the information. Guideline limits are not adjusted for the hardness, pH or temperature of the sample (the most conservative values are used). Measurement uncertainty is not applied to test results prior to comparison with specified criteria values.

Quality Control Report

Workorder: L2689805 Report Date: 09-MAR-22

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2

Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
BOD-C-WT	**Water**							
Batch R5735981								
WG3702180-2 DUP		**L2689805-1**						
BOD Carbonaceous		3.2	<3.0	RPD-NA	mg/L	N/A	30	03-MAR-22
WG3702180-3 LCS								
BOD Carbonaceous			97.5		%		85-115	03-MAR-22
WG3702180-1 MB								
BOD Carbonaceous			<2.0		mg/L		2	03-MAR-22
CN-TOT-WT	**Water**							
Batch R5733125								
WG3702332-8 DUP		**WG3702332-10**						
Cyanide, Total		<0.0020	<0.0020	RPD-NA	mg/L	N/A	20	03-MAR-22
WG3702332-7 LCS								
Cyanide, Total			104.9		%		80-120	03-MAR-22
WG3702332-6 MB								
Cyanide, Total			<0.0020		mg/L		0.002	03-MAR-22
WG3702332-9 MS		**WG3702332-10**						
Cyanide, Total			98.4		%		70-130	03-MAR-22
EC-WW-MF-WT	**Water**							
Batch R5733258								
WG3702171-3 DUP		**L2689643-1**						
E. Coli		3	2		CFU/100mL	40	65	03-MAR-22
WG3702171-1 MB								
E. Coli			0		CFU/100mL		1	03-MAR-22
F-IC-N-WT	**Water**							
Batch R5734456								
WG3702569-9 DUP		**WG3702569-8**						
Fluoride (F)		0.058	0.059		mg/L	0.6	20	04-MAR-22
WG3702569-7 LCS								
Fluoride (F)			101.2		%		90-110	04-MAR-22
WG3702569-6 MB								
Fluoride (F)			<0.020		mg/L		0.02	04-MAR-22
WG3702569-10 MS		**WG3702569-8**						
Fluoride (F)			98.4		%		75-125	04-MAR-22
HG-T-CVAA-WT	**Water**							
Batch R5733076								
WG3702480-3 DUP		**WG3702480-5**						
Mercury (Hg)-Total		<0.0000050	<0.000005(	RPD-NA	mg/L	N/A	20	04-MAR-22
WG3702480-2 LCS								

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
HG-T-CVAA-WT	**Water**							
Batch R5733076								
WG3702480-2 LCS								
Mercury (Hg)-Total			94.9		%		80-120	04-MAR-22
WG3702480-1 MB								
Mercury (Hg)-Total			<0.000005(		mg/L		0.000005	04-MAR-22
WG3702480-4 MS		**WG3702480-6**						
Mercury (Hg)-Total			95.4		%		70-130	04-MAR-22
MET-T-CCMS-WT	**Water**							
Batch R5732369								
WG3702279-4 DUP		**WG3702279-3**						
Aluminum (Al)-Total		0.711	0.716		mg/L	0.7	20	03-MAR-22
Antimony (Sb)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	03-MAR-22
Arsenic (As)-Total		0.0028	0.0027		mg/L	1.5	20	03-MAR-22
Beryllium (Be)-Total		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	03-MAR-22
Cadmium (Cd)-Total		0.000083	0.000090		mg/L	7.5	20	03-MAR-22
Chromium (Cr)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	03-MAR-22
Cobalt (Co)-Total		0.0015	0.0015		mg/L	4.3	20	03-MAR-22
Copper (Cu)-Total		<0.0050	<0.0050	RPD-NA	mg/L	N/A	20	03-MAR-22
Iron (Fe)-Total		0.46	0.48		mg/L	2.8	20	03-MAR-22
Lead (Pb)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	03-MAR-22
Manganese (Mn)-Total		0.810	0.820		mg/L	1.3	20	03-MAR-22
Molybdenum (Mo)-Total		0.0163	0.0168		mg/L	3.0	20	03-MAR-22
Nickel (Ni)-Total		0.0237	0.0236		mg/L	0.5	20	03-MAR-22
Selenium (Se)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	03-MAR-22
Silver (Ag)-Total		<0.00050	<0.00050	RPD-NA	mg/L	N/A	20	03-MAR-22
Tin (Sn)-Total		0.0018	0.0018		mg/L	0.5	20	03-MAR-22
Titanium (Ti)-Total		0.0206	0.0191		mg/L	7.6	20	03-MAR-22
Zinc (Zn)-Total		<0.030	<0.030	RPD-NA	mg/L	N/A	20	03-MAR-22
WG3702279-2 LCS								
Aluminum (Al)-Total			101.7		%		80-120	03-MAR-22
Antimony (Sb)-Total			104.4		%		80-120	03-MAR-22
Arsenic (As)-Total			101.8		%		80-120	03-MAR-22
Beryllium (Be)-Total			95.4		%		80-120	03-MAR-22
Cadmium (Cd)-Total			100.7		%		80-120	03-MAR-22
Chromium (Cr)-Total			97.2		%		80-120	03-MAR-22
Cobalt (Co)-Total			91.9		%		80-120	03-MAR-22

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5732369								
WG3702279-2 LCS								
Copper (Cu)-Total			94.0		%		80-120	03-MAR-22
Iron (Fe)-Total			96.5		%		80-120	03-MAR-22
Lead (Pb)-Total			101.8		%		80-120	03-MAR-22
Manganese (Mn)-Total			99.3		%		80-120	03-MAR-22
Molybdenum (Mo)-Total			95.8		%		80-120	03-MAR-22
Nickel (Ni)-Total			96.2		%		80-120	03-MAR-22
Selenium (Se)-Total			97.1		%		80-120	03-MAR-22
Silver (Ag)-Total			91.4		%		80-120	03-MAR-22
Tin (Sn)-Total			97.3		%		80-120	03-MAR-22
Titanium (Ti)-Total			94.8		%		80-120	03-MAR-22
Zinc (Zn)-Total			98.7		%		80-120	03-MAR-22
WG3702279-1 MB								
Aluminum (Al)-Total			<0.0050		mg/L		0.005	03-MAR-22
Antimony (Sb)-Total			<0.00010		mg/L		0.0001	03-MAR-22
Arsenic (As)-Total			<0.00010		mg/L		0.0001	03-MAR-22
Beryllium (Be)-Total			<0.00010		mg/L		0.0001	03-MAR-22
Cadmium (Cd)-Total			<0.000005(		mg/L		0.000005	03-MAR-22
Chromium (Cr)-Total			<0.00050		mg/L		0.0005	03-MAR-22
Cobalt (Co)-Total			<0.00010		mg/L		0.0001	03-MAR-22
Copper (Cu)-Total			<0.00050		mg/L		0.0005	03-MAR-22
Iron (Fe)-Total			<0.010		mg/L		0.01	03-MAR-22
Lead (Pb)-Total			<0.000050		mg/L		0.00005	03-MAR-22
Manganese (Mn)-Total			<0.00050		mg/L		0.0005	03-MAR-22
Molybdenum (Mo)-Total			<0.000050		mg/L		0.00005	03-MAR-22
Nickel (Ni)-Total			<0.00050		mg/L		0.0005	03-MAR-22
Selenium (Se)-Total			<0.000050		mg/L		0.00005	03-MAR-22
Silver (Ag)-Total			<0.000050		mg/L		0.00005	03-MAR-22
Tin (Sn)-Total			<0.00010		mg/L		0.0001	03-MAR-22
Titanium (Ti)-Total			<0.00030		mg/L		0.0003	03-MAR-22
Zinc (Zn)-Total			<0.0030		mg/L		0.003	03-MAR-22
WG3702279-5 MS		**WG3702279-3**						
Aluminum (Al)-Total			N/A	MS-B	%		-	03-MAR-22
Antimony (Sb)-Total			102.6		%		70-130	03-MAR-22
Arsenic (As)-Total			96.2		%		70-130	03-MAR-22

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
MET-T-CCMS-WT	**Water**							
Batch R5732369								
WG3702279-5 MS		**WG3702279-3**						
Beryllium (Be)-Total			88.4		%		70-130	03-MAR-22
Cadmium (Cd)-Total			86.4		%		70-130	03-MAR-22
Chromium (Cr)-Total			94.4		%		70-130	03-MAR-22
Cobalt (Co)-Total			83.9		%		70-130	03-MAR-22
Copper (Cu)-Total			78.4		%		70-130	03-MAR-22
Iron (Fe)-Total			N/A	MS-B	%		-	03-MAR-22
Lead (Pb)-Total			91.2		%		70-130	03-MAR-22
Manganese (Mn)-Total			N/A	MS-B	%		-	03-MAR-22
Molybdenum (Mo)-Total			N/A	MS-B	%		-	03-MAR-22
Nickel (Ni)-Total			77.5		%		70-130	03-MAR-22
Selenium (Se)-Total			90.8		%		70-130	03-MAR-22
Silver (Ag)-Total			86.7		%		70-130	03-MAR-22
Tin (Sn)-Total			97.1		%		70-130	03-MAR-22
Titanium (Ti)-Total			N/A	MS-B	%		-	03-MAR-22
Zinc (Zn)-Total			93.3		%		70-130	03-MAR-22
OGG-SPEC-WT	**Water**							
Batch R5734376								
WG3702163-2 LCS								
Oil and Grease, Total			92.5		%		70-130	03-MAR-22
Mineral Oil and Grease			86.1		%		70-130	03-MAR-22
WG3702163-1 MB								
Oil and Grease, Total			<5.0		mg/L		5	03-MAR-22
Mineral Oil and Grease			<2.5		mg/L		2.5	03-MAR-22
P-T-COL-WT	**Water**							
Batch R5733080								
WG3702170-3 DUP		**L2689250-1**						
Phosphorus, Total		0.0954	0.0953		mg/L	0.1	20	04-MAR-22
WG3702170-2 LCS								
Phosphorus, Total			96.4		%		80-120	04-MAR-22
WG3702170-1 MB								
Phosphorus, Total			<0.0030		mg/L		0.003	04-MAR-22
WG3702170-4 MS		**L2689250-1**						
Phosphorus, Total			93.4		%		70-130	04-MAR-22
PAH-NAPHTHALENE-WT	**Water**							

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
PAH-NAPHTHALENE-WT	**Water**							
Batch R5734498								
WG3702165-2 LCS								
Naphthalene			106.2		%		50-130	07-MAR-22
WG3702165-1 MB								
Naphthalene			<0.020		ug/L		0.02	07-MAR-22
Surrogate: d8-Naphthalene			107.0		%		60-140	07-MAR-22
PH-WT	**Water**							
Batch R5732658								
WG3702231-4 DUP		**WG3702231-3**						
pH		8.00	8.00	J	pH units	0.00	0.2	03-MAR-22
WG3702231-2 LCS								
pH			7.09		pH units		6.9-7.1	03-MAR-22
PHENOLS-4AAP-WT	**Water**							
Batch R5733474								
WG3702488-3 DUP		**L2689987-1**						
Phenols (4AAP)		<0.0010	<0.0010	RPD-NA	mg/L	N/A	20	04-MAR-22
WG3702488-2 LCS								
Phenols (4AAP)			101.4		%		85-115	04-MAR-22
WG3702488-1 MB								
Phenols (4AAP)			<0.0010		mg/L		0.001	04-MAR-22
WG3702488-4 MS		**L2689987-1**						
Phenols (4AAP)			102.2		%		75-125	04-MAR-22
SO4-IC-N-WT	**Water**							
Batch R5734456								
WG3702569-9 DUP		**WG3702569-8**						
Sulfate (SO4)		17.6	17.6		mg/L	0.1	20	04-MAR-22
WG3702569-7 LCS								
Sulfate (SO4)			100.7		%		90-110	04-MAR-22
WG3702569-6 MB								
Sulfate (SO4)			<0.30		mg/L		0.3	04-MAR-22
WG3702569-10 MS		**WG3702569-8**						
Sulfate (SO4)			99.5		%		75-125	04-MAR-22
SOLIDS-TSS-WT	**Water**							
Batch R5734106								
WG3702622-3 DUP		**L2689370-1**						
Total Suspended Solids		35.2	36.0		mg/L	2.2	20	05-MAR-22
WG3702622-2 LCS								
Total Suspended Solids			99.7		%		85-115	05-MAR-22

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
SOLIDS-TSS-WT	**Water**							
Batch R5734106								
WG3702622-1 MB								
Total Suspended Solids			<3.0		mg/L		3	05-MAR-22
TKN-F-WT	**Water**							
Batch R5735496								
WG3702520-3 DUP		**L2690054-2**						
Total Kjeldahl Nitrogen		7.57	7.37		mg/L	2.8	20	07-MAR-22
WG3702520-2 LCS								
Total Kjeldahl Nitrogen			91.8		%		75-125	07-MAR-22
WG3702520-1 MB								
Total Kjeldahl Nitrogen			<0.050		mg/L		0.05	07-MAR-22
WG3702520-4 MS		**L2690054-2**						
Total Kjeldahl Nitrogen			N/A	MS-B	%		-	07-MAR-22
VOC-ROU-HS-WT	**Water**							
Batch R5732417								
WG3701919-4 DUP		**WG3701919-3**						
1,4-Dichlorobenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	04-MAR-22
Benzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	04-MAR-22
Chloroform		<1.0	<1.0	RPD-NA	ug/L	N/A	30	04-MAR-22
Dichloromethane		<2.0	<2.0	RPD-NA	ug/L	N/A	30	04-MAR-22
Ethylbenzene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	04-MAR-22
Tetrachloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	04-MAR-22
Toluene		<0.40	<0.40	RPD-NA	ug/L	N/A	30	04-MAR-22
Trichloroethylene		<0.50	<0.50	RPD-NA	ug/L	N/A	30	04-MAR-22
WG3701919-1 LCS								
1,4-Dichlorobenzene			86.5		%		70-130	03-MAR-22
Benzene			97.2		%		70-130	03-MAR-22
Chloroform			97.5		%		70-130	03-MAR-22
Dichloromethane			98.6		%		70-130	03-MAR-22
Ethylbenzene			90.2		%		70-130	03-MAR-22
Tetrachloroethylene			79.8		%		70-130	03-MAR-22
Toluene			94.1		%		70-130	03-MAR-22
Trichloroethylene			90.1		%		70-130	03-MAR-22
WG3701919-2 MB								
1,4-Dichlorobenzene			<0.50		ug/L		0.5	04-MAR-22
Benzene			<0.50		ug/L		0.5	04-MAR-22

Quality Control Report

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Test	Matrix	Reference	Result	Qualifier	Units	RPD	Limit	Analyzed
VOC-ROU-HS-WT	**Water**							
Batch R5732417								
WG3701919-2 MB								
Chloroform			<1.0		ug/L		1	04-MAR-22
Dichloromethane			<2.0		ug/L		2	04-MAR-22
Ethylbenzene			<0.50		ug/L		0.5	04-MAR-22
Tetrachloroethylene			<0.50		ug/L		0.5	04-MAR-22
Toluene			<0.40		ug/L		0.4	04-MAR-22
Trichloroethylene			<0.50		ug/L		0.5	04-MAR-22
Surrogate: 1,4-Difluorobenzene			100.0		%		70-130	04-MAR-22
Surrogate: 4-Bromofluorobenzene			84.6		%		70-130	04-MAR-22

Quality Control Report

Workorder: L2689805 Report Date: 09-MAR-22

Client: FISHER ENVIRONMENTAL
15-400 ESNA PARK DRIVE
MARKHAM ON L3R 3K2
Contact: CLIVE

Legend:

Limit	ALS Control Limit (Data Quality Objectives)
DUP	Duplicate
RPD	Relative Percent Difference
N/A	Not Available
LCS	Laboratory Control Sample
SRM	Standard Reference Material
MS	Matrix Spike
MSD	Matrix Spike Duplicate
ADE	Average Desorption Efficiency
MB	Method Blank
IRM	Internal Reference Material
CRM	Certified Reference Material
CCV	Continuing Calibration Verification
CVS	Calibration Verification Standard
LCSD	Laboratory Control Sample Duplicate

Sample Parameter Qualifier Definitions:

Qualifier	Description
J	Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.
RPD-NA	Relative Percent Difference Not Available due to result(s) being less than detection limit.

Hold Time Exceedances:

All test results reported with this submission were conducted within ALS recommended hold times.

ALS recommended hold times may vary by province. They are assigned to meet known provincial and/or federal government requirements. In the absence of regulatory hold times, ALS establishes recommendations based on guidelines published by the US EPA, APHA Standard Methods, or Environment Canada (where available). For more information, please contact ALS.

The ALS Quality Control Report is provided to ALS clients upon request. ALS includes comprehensive QC checks with every analysis to ensure our high standards of quality are met. Each QC result has a known or expected target value, which is compared against pre-determined data quality objectives to provide confidence in the accuracy of associated test results.

Please note that this report may contain QC results from anonymous Sample Duplicates and Matrix Spikes that do not originate from this Work Order.

Chain of Custody (COC) / Analy

Canada Toll Free: 1 800

L2689805-COFC

nber: 20-893644

Page of

www.alsglobal.com

Report To	Contact and company name below will appear on the final report
Company:	Fisher Environmental
Contact:	CWE
Phone:	416-605-9722
Company address below will appear on the final report	
Street:	15-400 Esna Park Dr.
City/Province:	Markham, ON
Postal Code:	L3R 3K2
Invoice To	Same as Report To ☐ YES ☐ NO
	Copy of Invoice with Report ☐ YES ☐ NO
Company:	Fisher Environmental
Contact:	CWE

Reports / Recipients

Select Report Format: ☒ PDF ☐ EXCEL ☐ EDD (DIGITAL)

Merge QC/QCI Reports with COA ☐ YES ☐ NO ☐ N/A

☐ Compare Results to Criteria on Report - provide details below if box checked

Select Distribution: ☒ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax CWE@FE

Email 2

Email 3

Invoice Recipients

Select Invoice Distribution: ☐ EMAIL ☐ MAIL ☐ FAX

Email 1 or Fax

Email 2

Turnaround Time (TAT) Requested

☐ Routine [R] if received by 3pm M-F - no surcharges apply

☐ 4 day [P4] if received by 3pm M-F - 20% rush surcharge minimum

☐ 3 day [P3] if received by 3pm M-F - 25% rush surcharge minimum

☒ 2 day [P2] if received by 3pm M-F - 50% rush surcharge minimum

☐ 1 day [E] if received by 3pm M-F - 100% rush surcharge minimum

☐ Same day [E2] if received by 10am M-S - 200% rush surcharge. Additional fees may apply to rush requests on weekends, statutory holidays and non-routine tests

AFFIX ALS BARCODE LABEL HERE (ALS use only)

Date and Time Required for all E&P TATs:

For all tests with rush TATs requested, please contact your AM to confirm availability.

Project Information		Oil and Gas Required Fields (client use)	
ALS Account # / Quote #:		AFE/Cost Center:	PO#
Job #:		Major/Minor Code:	Routing Code:
PO / AFE:		Requisitioner:	
LSD:		Location:	
ALS Lab Work Order # (ALS use only):	L2689805	ALS Contact:	Sampler:

Analysis Request

Indicate Filtered (F), Preserved (P) or Filtered and Preserved (F/P) below

ALS Sample # (ALS use only)	Sample Identification and/or Coordinates (This description will appear on the report)	Date (dd-mmm-yy)	Time (hh:mm)	Sample Type	NUMBER OF CONTAINERS	Halton Sewer discharge bylaws MW6 (Unfiltered)	-RUSH WORK-	SAMPLES ON HOLD	EXTENDED STORAGE REQUIRED	SUSPECTED HAZARD (see notes)
	1396 Guelph Line Burlington Halton Sewer discharge bylaws MW6 (Unfiltered) -RUSH WORK-	02/03/22		Water						

Drinking Water (DW) Samples[1] (client use)	Notes / Specify Limits for result evaluation by selecting from drop-down below (Excel COC only)
Are samples taken from a Regulated DW System? ☐ YES ☒ NO	
Are samples for human consumption/ use? ☐ YES ☒ NO	

SAMPLE RECEIPT DETAILS (ALS use only)

Cooling Method: ☐ NONE ☐ ICE ☒ ICE PACKS ☐ FROZEN ☐ COOLING INITIATED

Submission Comments identified on Sample Receipt Notification: ☐ YES ☐ NO

Cooler Custody Seals Intact: ☐ YES ☐ N/A Sample Custody Seals Intact: ☐ YES ☐ N/A

INITIAL COOLER TEMPERATURES °C	FINAL COOLER TEMPERATURES °C
	6.1

SHIPMENT RELEASE (client use)			INITIAL SHIPMENT RECEPTION (ALS use only)			FINAL SHIPMENT RECEPTION (ALS use only)		
Released by: Nramali	Date: 02/03/22	Time:	Received by:	Date:	Time:	Received by:	Date: 03/03/22	Time: 1050

REFER TO BACK PAGE FOR ALS LOCATIONS AND SAMPLING INFORMATION

WHITE - LABORATORY COPY YELLOW - CLIENT COPY

AUG 2020 FRONT

Failure to complete all portions of this form may delay analysis. Please fill in this form LEGIBLY. By the use of this form the user acknowledges and agrees with the Terms and Conditions as specified on the back page of the white - report copy.

1. If any water samples are taken from a Regulated Drinking Water (DW) System, please submit using an Authorized DW COC form.

APPENDIX E – HYDRAULIC CONDUCTIVITY ANALYSES

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Test Date: *3/2/2022*
Tested By: *CAW*
Well No. *MW3*

Equilibrium Water level (from top of pipe) HE	*1264*	*cm*
Initial Water level (from top of pipe) Ho	*1440*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*5*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*176.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*2.00E-05*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

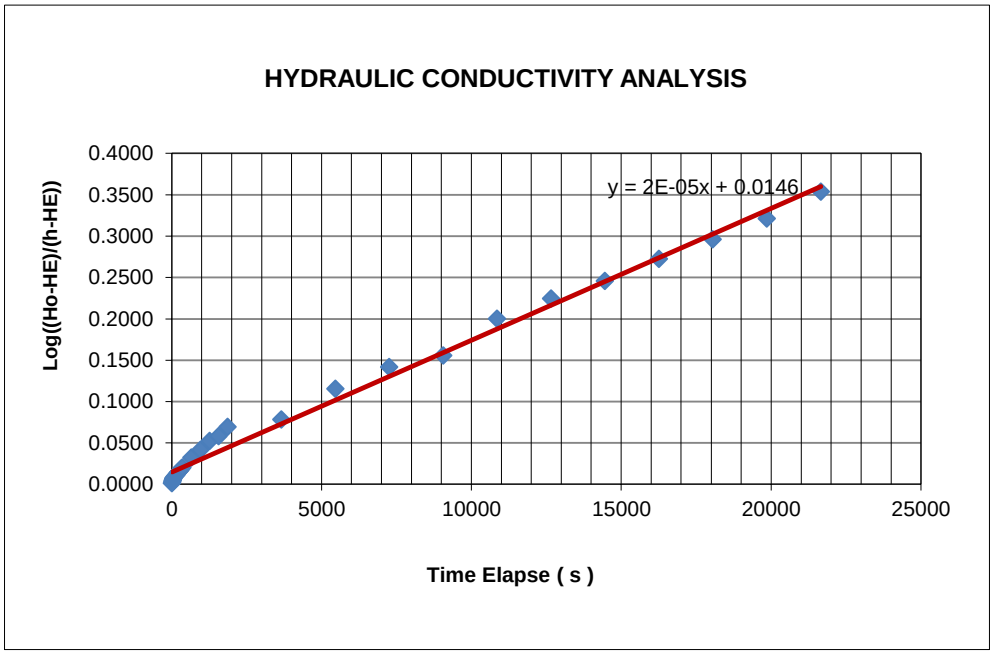
0.0000303	**cm/s**
3.03E-07	**m/s**
0.026	**m/day**

Time		HT (Water Drop)		G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	14.400			
10	10	14.395	1439.50	1.0028	0.0012
10	20	14.390	1439.00	1.0057	0.0025
10	30	14.385	1438.50	1.0086	0.0037
10	40	14.380	1438.00	1.0115	0.0050
10	50	14.375	1437.50	1.0144	0.0062
10	60	14.370	1437.00	1.0173	0.0075
30	90	14.365	1436.50	1.0203	0.0087
30	120	14.360	1436.00	1.0233	0.0100
30	150	14.355	1435.50	1.0262	0.0112
30	180	14.350	1435.00	1.0292	0.0125
30	210	14.345	1434.50	1.0323	0.0138
30	240	14.340	1434.00	1.0353	0.0151
30	270	14.335	1433.50	1.0383	0.0163
30	300	14.330	1433.00	1.0414	0.0176
30	330	14.325	1432.50	1.0445	0.0189
30	360	14.320	1432.00	1.0476	0.0202
300	660	14.275	1427.50	1.0765	0.0320
300	960	14.240	1424.00	1.1000	0.0414
300	1260	14.200	1420.00	1.1282	0.0524
300	1560	14.180	1418.00	1.1429	0.0580
300	1860	14.140	1414.00	1.1733	0.0694
1800	3660	14.110	1411.000	1.197	0.078
1800	5460	13.990	1399.000	1.304	0.115
1800	7260	13.910	1391.000	1.386	0.142
1800	9060	13.870	1387.000	1.431	0.156
1800	10860	13.750	1375.000	1.586	0.200
1800	12660	13.690	1369.000	1.676	0.224
1800	14460	13.640	1364.000	1.760	0.246
1800	16260	13.580	1358.000	1.872	0.272
1800	18060	13.530	1353.000	1.978	0.296
1800	19860	13.480	1348.000	2.095	0.321
1800	21660	13.420	1342.000	2.256	0.353

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Test Date: *3/2/2022*
Tested By: *CAW*
Well No. *MW3*



FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Test Date: *3/2/2022*
Tested By: *CAW*
Well No. *MW4*

Equilibrium Water level (from top of pipe) HE	*1117*	*cm*
Initial Water level (from top of pipe) Ho	*1335*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*5*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*218.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*7.00E-06*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

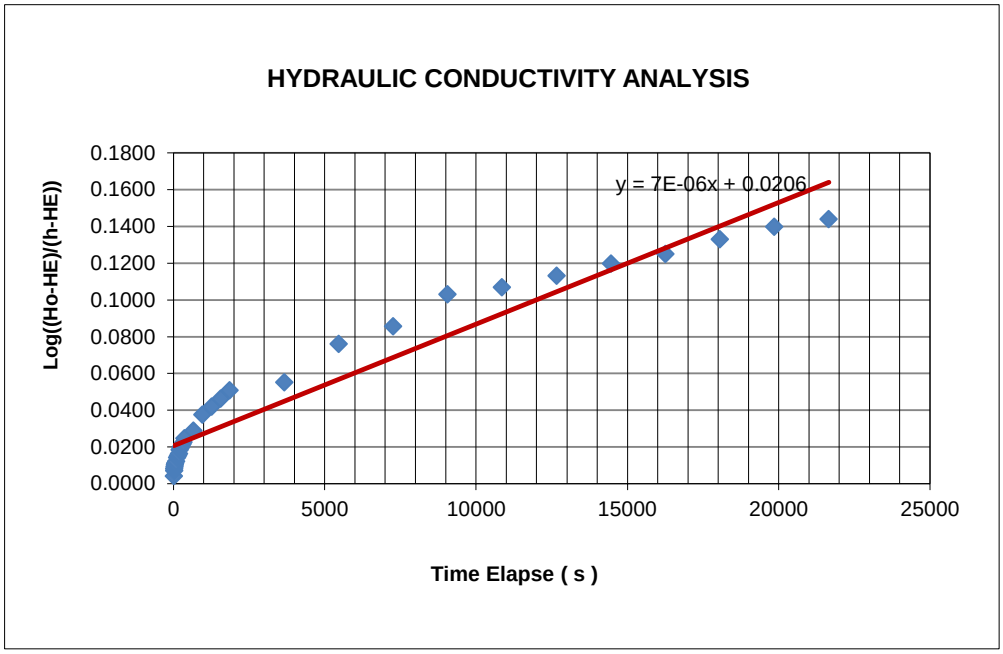
0.0000106	**cm/s**
1.06E-07	**m/s**
0.009	**m/day**

Time		HT (Water Drop)		G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	13.350			
10	10	13.330	1333.00	1.0093	0.0040
10	20	13.315	1331.50	1.0163	0.0070
10	30	13.310	1331.00	1.0187	0.0080
10	40	13.305	1330.50	1.0211	0.0091
10	50	13.300	1330.00	1.0235	0.0101
10	60	13.295	1329.50	1.0259	0.0111
30	90	13.290	1329.00	1.0283	0.0121
30	120	13.280	1328.00	1.0332	0.0142
30	150	13.275	1327.50	1.0356	0.0152
30	180	13.270	1327.00	1.0381	0.0162
30	210	13.260	1326.00	1.0431	0.0183
30	240	13.255	1325.50	1.0456	0.0194
30	270	13.250	1325.00	1.0481	0.0204
30	300	13.245	1324.50	1.0506	0.0214
30	330	13.240	1324.00	1.0531	0.0225
30	360	13.230	1323.00	1.0583	0.0246
300	660	13.210	1321.00	1.0686	0.0288
300	960	13.170	1317.00	1.0900	0.0374
300	1260	13.150	1315.00	1.1010	0.0418
300	1560	13.130	1313.00	1.1122	0.0462
300	1860	13.110	1311.00	1.1237	0.0507
1800	3660	13.090	1309.00	1.1354	0.0552
1800	5460	13.000	1300.00	1.1913	0.0760
1800	7260	12.960	1296.00	1.2179	0.0856
1800	9060	12.890	1289.00	1.2674	0.1029
1800	10860	12.875	1287.50	1.2786	0.1067
1800	12660	12.850	1285.00	1.2976	0.1131
1800	14460	12.825	1282.50	1.3172	0.1197
1800	16260	12.805	1280.50	1.3333	0.1249
1800	18060	12.775	1277.50	1.3583	0.1330
1800	19860	12.750	1275.00	1.3797	0.1398
1800	21660	12.735	1273.50	1.3930	0.1439

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Test Date: *3/2/2022*
Tested By: *CAW*
Well No. *MW4*



FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Test Date: *3/2/2022*
Tested By: *CAW*
Well No. *MW6*

Equilibrium Water level (from top of pipe) HE	*284*	*cm*
Initial Water level (from top of pipe) Ho	*894*	*cm*
Monitoring well inner diameter d	*0.05*	*m*
Initial Time offset To	*5*	*second*
Reverse of Luthin's reference system Ru = Ho - HE	*610.00*	*cm*
Slope of Log((ho-he)/(ht-he)) / T	*2.00E-05*	
G = Ru / (HT - HE)		

Hydraulic conductivity computed k =

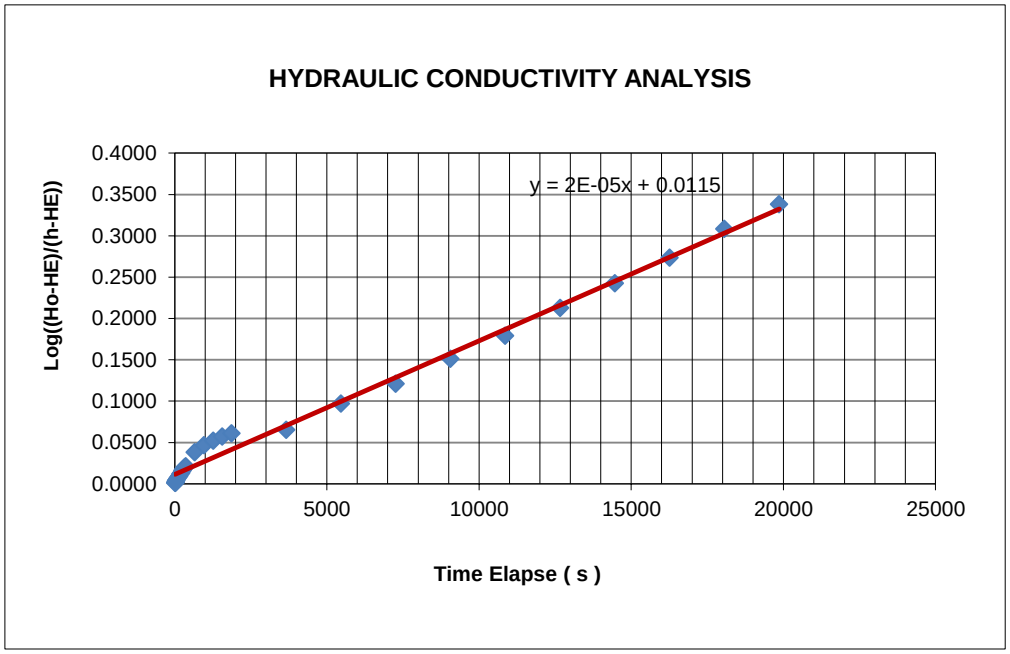
0.0000303	**cm/s**
3.03E-07	**m/s**
0.026	**m/day**

Time		HT (Water Drop)		G	LOG (G)
(Interval s)	(Elapsed s)	(m)	(cm)		
	0	8.940			
10	10	8.930	893.00	1.0016	0.0007
10	20	8.920	892.00	1.0033	0.0014
10	30	8.910	891.00	1.0049	0.0021
10	40	8.900	890.00	1.0066	0.0029
10	50	8.890	889.00	1.0083	0.0036
10	60	8.880	888.00	1.0099	0.0043
30	90	8.850	885.00	1.0150	0.0065
30	120	8.830	883.00	1.0184	0.0079
30	150	8.810	881.00	1.0218	0.0094
30	180	8.780	878.00	1.0269	0.0115
30	210	8.760	876.00	1.0304	0.0130
30	240	8.730	873.00	1.0357	0.0152
30	270	8.710	871.00	1.0392	0.0167
30	300	8.690	869.00	1.0427	0.0182
30	330	8.670	867.00	1.0463	0.0197
30	360	8.650	865.00	1.0499	0.0212
300	660	8.430	843.00	1.0912	0.0379
300	960	8.320	832.00	1.1131	0.0465
300	1260	8.250	825.00	1.1275	0.0521
300	1560	8.190	819.00	1.1402	0.0570
300	1860	8.140	814.00	1.1509	0.0611
1800	3660	8.090	809.00	1.1619	0.0652
1800	5460	7.720	772.00	1.2500	0.0969
1800	7260	7.460	746.00	1.3203	0.1207
1800	9060	7.150	715.00	1.4153	0.1509
1800	10860	6.880	688.00	1.5099	0.1789
1800	12660	6.580	658.00	1.6310	0.2125
1800	14460	6.330	633.00	1.7479	0.2425
1800	16260	6.090	609.00	1.8769	0.2734
1800	18060	5.840	584.00	2.0333	0.3082
1800	19860	5.640	564.00	2.1786	0.3382

FISHER ENGINEERING

HYDRAULIC CONDUCTIVITY ANALYSIS

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Test Date: *3/2/2022*
Tested By: *CAW*
Well No. *MW6*



APPENDIX F – CONSTRUCTION DEWATERING AND PERMANENT DRAINAGE

Construction Dewatering Calculation

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Date: *3/9/2022*

Dupuit Forcheimer for Radial Flow to a Closely Welled System or Excavation

Construction Units	P3 TOS (m asl)	FFE (m asl)	Average Footing Elevation (m asl)	Required Dewatering Elevation (m asl)	Static water level		Well base elevation	H (m)	h_w (m)	H-h_w (m)	R_0 (m)		r_w	ab (m^2)	K (m/s)	H^2-h_w^2	lnR_0	lnr_w	Q, (m^3/s)	Q, (m^3/day)
					BGS (m)	Elevation (m asl)	(m)				Model	Adjusted								
Building with 3 UG levels	121.70	131.45	120.50	119.50	2.77	127.35	119.20	8.15	0.3	7.85	7.64	40.18	32.54	3326	2.37E-07	66.33	3.69	3.48	2.34E-04	20.23

Dupuit Forcheimer Equation

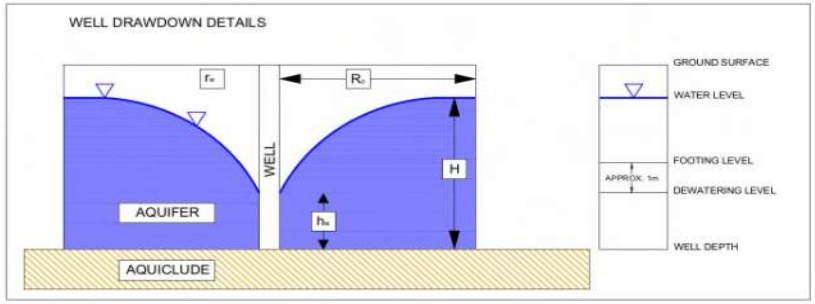
$$Q = \frac{\pi K(H^2 - h_w{}^2)}{lnR_0 - lnr_w}$$

Equivalent radius of well, r_w

$$r_w = \sqrt{\frac{ab}{\pi}}$$

Radius of influence in m, calculated from Sichardt's equation

$$R_0 = 2000(H - h_w)\sqrt{k}$$



Where:

r_w = equivalent radius of the well in m,
H = hydraulic head of the original water table (total saturated aquifer thickness) in m,
h_w = hydraulic head at maximum dewatering (proposed drawdown) in m,
R_0 = radius of influence in m, calculated from Sichardt's equation, and
K = hydraulic conductivity, in m/s
a = length of excavation area in m
b = width of excavation area in m

Permanent Drainage Rates

Location: *1396 Guelph Line, Burlington*
Project: *FE-P-22-11967H*
Date: *3/9/2022*

Dupuit Forcheimer for Radial Flow to a Closely Welled System or Excavation

Construction Units	P3 TOS (m asl)	FFE (m asl)	Lowest Footing Elevation (m asl)	Required Dewatering Elevation (m asl)	Static water level		Well base elevation	H (m)	h_w (m)	H-h_w (m)	R_0 (m)		r_w	ab (m^2)	K (m/s)	H^2-h_w^2	lnR_0	lnr_w	Q, (m^3/s)	Q, (m^3/day)
					BGS (m)	Elevation (m asl)	(m)				Model	Adjusted								
Building with 3 UG levels	121.70	131.45	120.50	121.40	1.70	128.42	121.15	7.27	0.3	7.02	6.84	39.37	32.54	3326	2.37E-07	52.79	3.67	3.48	2.06E-04	17.81
						129.12														
														83.15						

Dupuit Forcheimer Equation

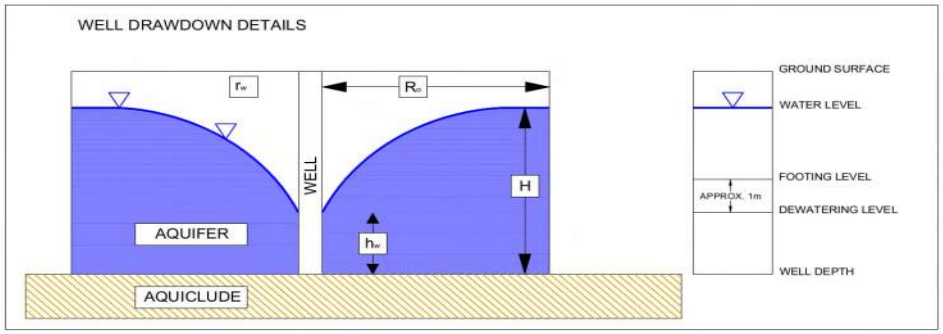
$$Q = \frac{\pi K(H^2 - h_w{}^2)}{lnR_0 - lnr_w}$$

Equivalent radius of well, r_w

$$r_w = \sqrt{\frac{ab}{\pi}}$$

Radius of influence in m, calculated from Sichardt's equation

$$R_0 = 2000(H - h_w)\sqrt{k}$$

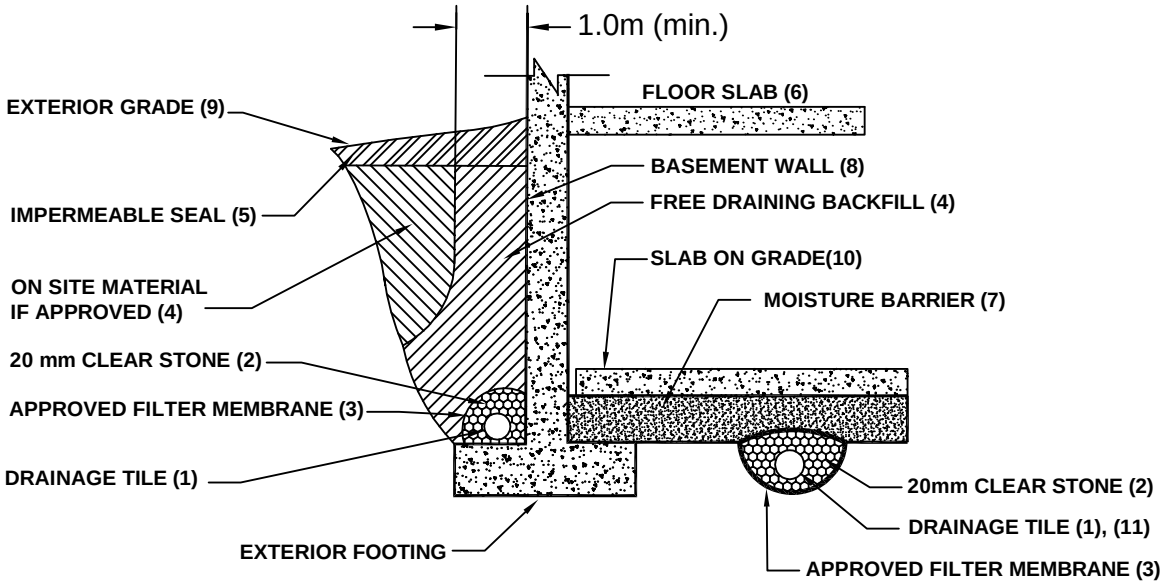


Where:

r_w = equivalent radius of the well in m,
H = hydraulic head of the original water table (total saturated aquifer thickness) in m,
h_w = hydraulic head at maximum dewatering (proposed drawdown) in m,
R_0 = radius of influence in m, calculated from Sichardt's equation, and
K = hydraulic conductivity, in m/s
a = length of excavation area in m
b = width of excavation area in m

APPENDIX G – BACKFILL AND DRAINAGE DESIGN

FISHER ENGINEERING



NOTES:

(1) DRAINAGE TILE TO CONSIST OF 100mm (4") DIAMETER WEEPING TILE OR EQUIVALENT PERFORATED PIPE LEADING TO A POSITIVE SUMP OR OUTLET.

(2) 20mm (3/4") CLEAR STONE - 150mm (6") TOP AND SIDE OF DRAIN. IF DRAIN IS NOT ON FOOTING, PLACE 100mm (4") OF STONE BELOW DRAIN.

(3) WRAP THE CLEAR STONE WITH AN APPROVED FILTER MEMBRANE (TERRAFIX 279R OR EQUIVALENT).

(4) FREE DRAINING BACKFILL - OPSS GRANULAR B OR EQUIVALENT COMPACTED TO THE SPECIFIED DENSITY. DO NOT USE HEAVY COMPACTION EQUIPMENT WITHIN 1.8m (6') OF WALL.

(5) IMPERMEABLE BACKFILL SEAL - COMPACTED CLAY, CLAYEY SILT OR EQUIVALENT. IF ORIGINAL SOIL IS FREE-DRAINING, SEAL MAY BE OMITTED. MAXIMUM THICKNESS OF SEAL TO BE 0.5m.

(6) DO NOT BACKFILL UNTIL WALL IS SUPPORTED BY BASEMENT AND FLOOR SLABS OR ADEQUATE BRACING.

(7) MOISTURE BARRIER TO BE AT LEAST 200mm (8") OF COMPACTED CLEAR 20mm (3/4") STONE OR EQUIVALENT FREE DRAINING MATERIAL. A VAPOUR BARRIER MAY BE REQUIRED FOR SPECIALTY FLOORS.

(8) BASEMENT WALL TO BE DAMP PROOFED.

(9) EXTERIOR GRADE TO SLOPE AWAY FROM BUILDING.

(10) SLAB ON GRADE SHOULD NOT BE STRUCTURALLY CONNECTED TO THE WALL OR FOOTING

(11) UNDERFLOOR DRAIN INVERT TO BE AT LEAST 300mm (12") BELOW UNDERSIDE OF FLOOR SLAB. DRAINAGE TILE PLACED IN PARALLEL ROWS 6 TO 8m (20-25') CENTERS ONE WAY. PLACE DRAIN ON 100mm (4") CLEAR STONE WITH 150mm (6") OF CLEAR STONE ON TOP AND SIDES. ENCLOSE STONE WITH FILTER FABRIC AS NOTED IN (3)

(12) THE ENTIRE SUBGRADE TO BE SEALED WITH APPROVED FILER FABRIC (TERRAFIX 270R OR EQUIVALENT) IF NON-COHESIVE(SANDY) SOILS BELOW GROUND WATER TABLE ENCOUNTERED.

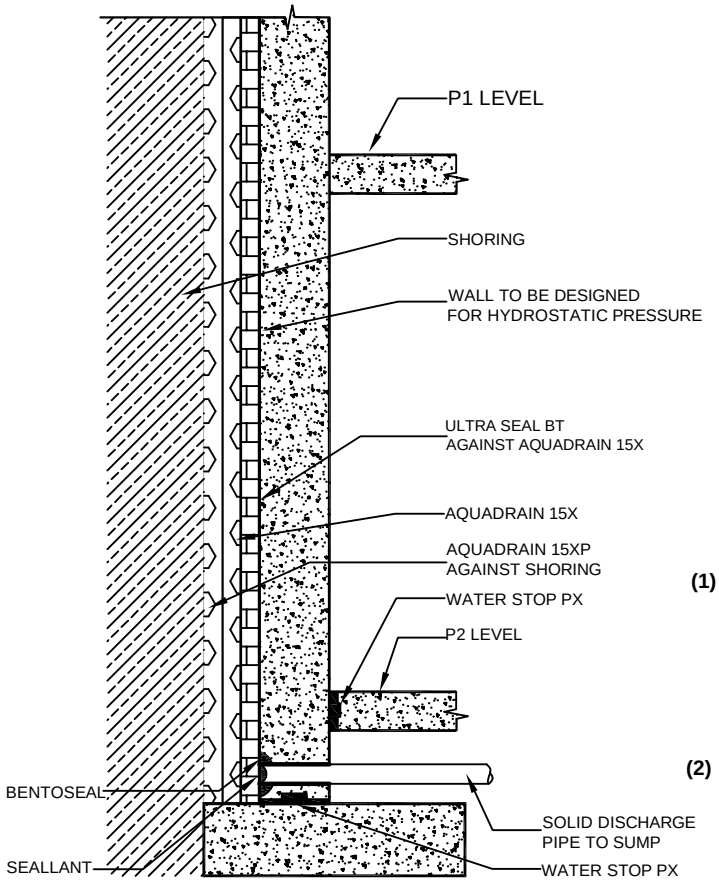
(13) DO NOT CONNECT THE UNDERFLOOR DRAINS TO PERIMETER DRAINS.

(14) REVIEW THE GEOTECHNICAL REPORT FOR SPECIFIC DETAILS.

DRAINAGE AND BACKFILL RECOMMENDATIONS

BASEMENT WITH UNDERFLOOR DRAINAGE

(NOT TO SCALE)



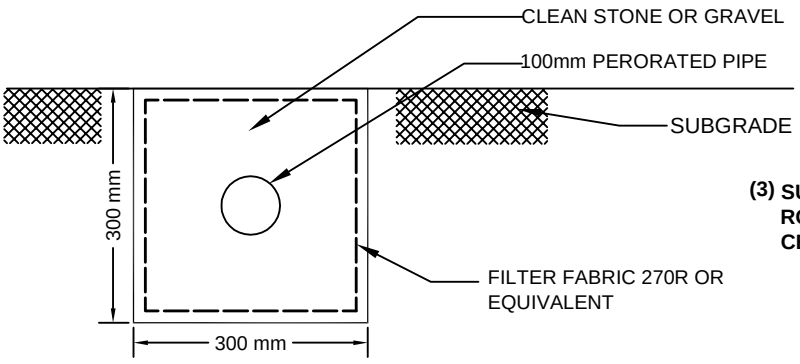
NOTES:

(1) ALL PERMANENT DRAINAGE PIPES MUST HAVE GEOTEXTILE FILTER SLEEVE TO PREVENT LONG TERM SILTING. TO FURTHER MINIMIZE SILTATION OF THE DRAINAGE SYSTEM, ALL DRAINAGE PIPE CONNECTION MUST BE SOLID PVC ELBOWS AND Ts. NO "BUTT" END CONNECTIONS SHOULD BE PERMITTED.

(2) PERIMETER COLLECTION PIPE TO BE SOLID PIPE,

SUGGESTED EXTERIOR DRAINAGE AGAINST SHORING

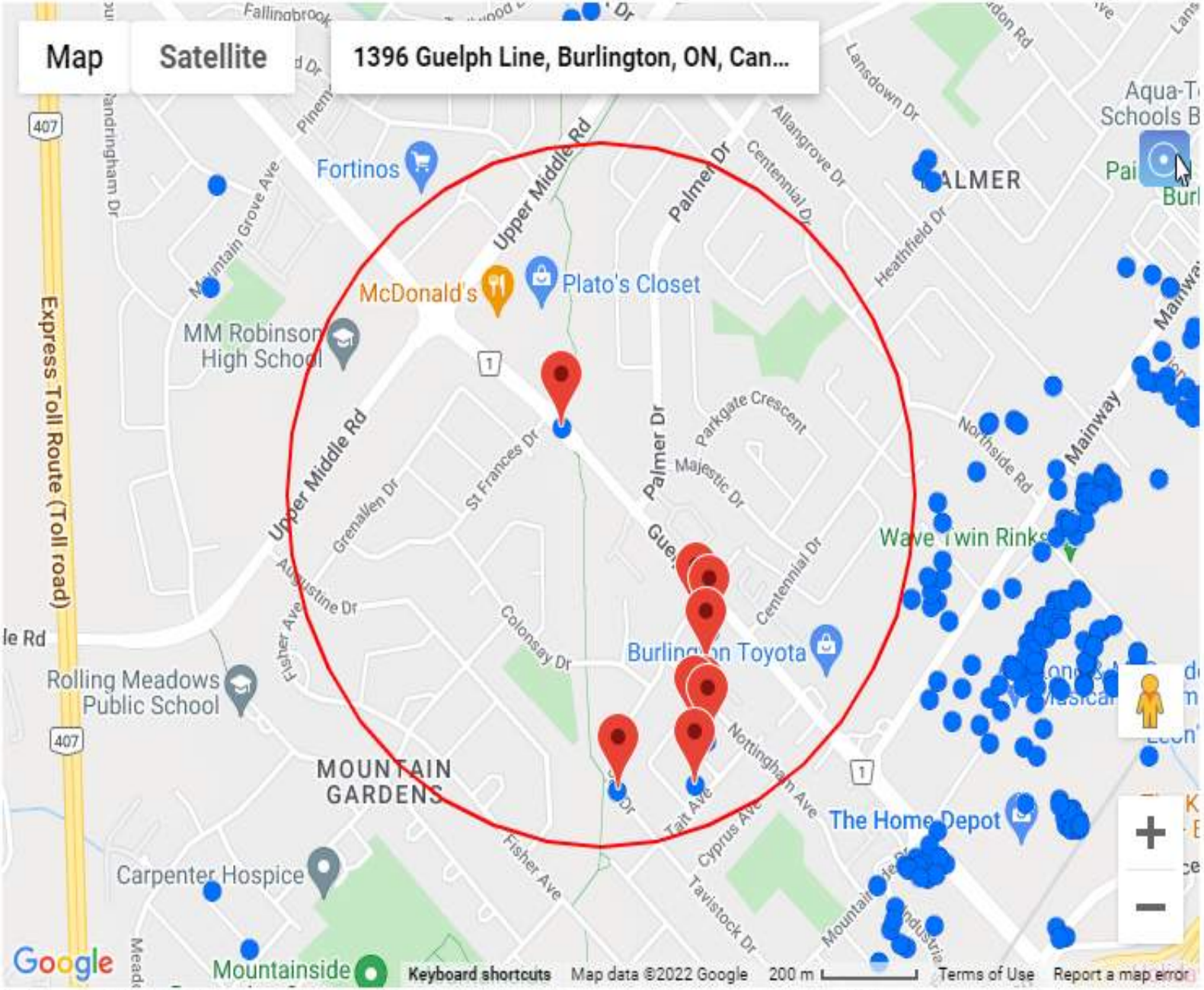
(NOT TO SCALE)



(3) SUBGRADE DRAIN TO BE PLACED IN PARALLEL ROWS 6-8 m (20'-25'), FROM CENTERLINE TO CENTERLINE.

DETAIL OF SUBGRADE DRAIN

(NOT TO SCALE)



Latitude:43.36814, Longitude:-79.82797 (UTM Zone:17, Easting:594959, Northing:4802364)

FISHER ENGINEERING
400 Esna Park Dr., #15
Markham, Ontario
L3R 3K2
Tel: 905 475-7755
Fax: 905 475-7718

NORTH

LEGEND

SITE BOUNDARY

PROJECT NAME AND ADDRESS

HYDROGEOLOGICAL INVESTIGATION

1396 Guelph Line
BURLINGTON, ONTARIO

FIGURE 1:
WELLS WITHIN 500M RADIUS

SHEET NO.
H1

PROJECT NO.
FE-P22-11967H

DATE
MARCH 2022

SCALE
AS SHOWN

APPENDIX F

ENGINEERING PLANS

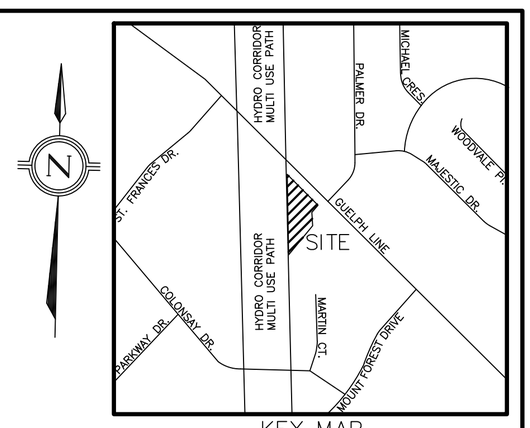
S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg

EX. HYDRO CORRIDOR

EX. RESIDENTIAL LANDS

LEGEND:

- EXISTING GROUND ELEVATION
- PROPOSED GROUND ELEVATION
- PROPOSED ELEVATION TO MATCH EXISTING
- PROPOSED DIRECTION OF SHEET FLOW
- EXISTING CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED GATE VALVE
- EXISTING DIRECTION OF DRAINAGE
- PROPOSED EMERGENCY OVERLAND FLOW ROUTE
- PROPOSED DRAINAGE BREAK LINE
- PROPOSED SILTATION CONTROL FENCE
- PROPOSED CATCHBASIN SILT SACK
- PROPOSED SWALE
- PROPOSED SWALE WITH SUBDRAIN



KEY MAP
N.T.S.

EX. APPROX. CENTRE LINE OF ROAD

EX. CONCRETE CURB

PROP. DEPRESSED CURB & GUTTER AS PER OPSD 600.040

EX.CB T/G 130.80

PROP. MH1 (HYDROSTORM HS6) T/G 131.30

131.07EX.

131.24EX.

130.74EX. (130.79)

131.04EX.

(130.95)

(131.05)

2.0%

EX. ASPHALT PARKING

1.25%

MECH. & ELEC.

PROP. SILT SACK (TYP)

EX. CONCRETE WALKWAY

EX. HYDRANT

EX. CONCRETE WALKWAY

131.08EX.

131.05EX.

EX. SANMH T/G=130.49 SE INV. 127.56

EX. STMMH T/G=130.66 W INV. 127.57 E INV. 127.54

PROP. AD1 (NYLOPLAST C/W FLEXSTORM FILTER) T/G 130.95

MS(08"DIA.)

EX. ASPHALT

(131.10)

1.5%

EX. ASPHALT PARKING

3.5%

(131.45)

PROP. BUILDING OVERHANG

131.09EX.

PROP. AD2 (NYLOPLAST C/W FLEXSTORM FILTER) T/G 131.95

EX. CONCRETE WALKWAY

EX. BRICK

EX. BRICK

(131.45)

130.86EX.

130.70EX.

EX. BUS SHELTER

EX. STOP LIGHT

EX. SIGN

EX.CB T/G 130.40

450mmø NYLOPLAST INSPECTION PORT C/W SUMP INSERT T/G=130.90 (CONTRACTOR TO PROVIDE SHOP DRAWINGS)

EX. 0.3ø DT

EX. 0.4ø DT

EX. 0.1ø DT

EX. 0.2ø DT

LIMIT OF UNDERGROUND

EX. LANDSCAPED AREA

CONCRETE BARRIER CURB (AS PER OPSD 600.110)

EX. CONCRETE CURB (TO BE REMOVED)

EX. CONCRETE

EX. ASPHALT AREA (TO BE REMOVED)

MECH. & ELEC.

(131.45)

PROP. 11-STOREY RESIDENTIAL BUILDING FFE=131.45 P1=127.79 P2=124.74 P2=121.69

#1396 EX. 1 STOREY BRICK BUILDING

(131.00)

15.4%

EX. CURB CUT

130.69EX.

EX. 0.2ø DT

PROP. CB1 (OPSD 705.010) T/G 130.05

2.0%

EX.CB T/G=130.25 E. INV. 129.43 (TO BE REMOVED)

130.03EX.

EX. ASPHALT

(131.10)

(131.35)

(131.20)

PROP. AD7 (NYLOPLAST) T/G 131.20

(131.30)

(131.25)

130.31EX.

(131.25)TW (131.25)BW

(131.30)TW (130.70)BW

130.22EX.

1.0%

EX. 0.5ø DT

EX. ASPHALT

PROP. AD3 (NYLOPLAST C/W FLEXSTORM FILTER) T/G 130.95

PROP. 41.0m SWALE @ 1.2% C/W SUBDRAIN

EX. CONCRETE CURB

EX. 0.3ø DT

EX. CONCRETE DOCK

EX. ROOF OVERHANG

EX. CONCRETE CURB

EX. CHAIN LINK FENCE (TO BE REMOVED)

EX.CB T/G=130.27

EX. PAD MOUNTED TRANSFORMER (TO BE REMOVED)

129.96EX.

EX. 0.4ø DT

EX. 0.6ø DT

EX. ASPHALT

EX. CB T/G=129.68

PROP. AD6 (NYLOPLAST) T/G 131.20

3.3%

EX. 0.2ø DT

129.89EX.

(131.40)TW (130.00)BW

EX. CB (NOT SURVEYED) T/G=129.31 S.INV. 128.78

#1380 EX. 2 STOREY BRICK TOWNHOMES

(131.40)TW (128.17)BW

2.3%

(128.17)

PROP. AD5 (NYLOPLAST) T/G 131.30

EX. CB T/G=129.88

EX. 0.4ø DT

EX. 0.3ø DT

15.0%

PROP. CONCRETE RAMP (TO BE HEATED)

EX. ASPHALT

EX. CONCRETE CURB

130.27EX.

PROP. BUILDING OVERHANG

PROP. AD4 (NYLOPLAST C/W FLEXSTORM FILTER) T/G 131.00

EX. CHAIN LINK FENCE

130.95EX.

(130.55)SW

EX. TREE

(131.35)TW (131.35)BW

(130.92)

6.0%

PROP. RETAINING WALL (DESIGN BY OTHERS) (C/W RAILING)

EX. 2 STOREY BRICK TOWNHOMES F.F.E=150.82

MAINTAIN EX. GRADES AT PROPERTY LINE

130.29EX.

EX. TREE

EX. ASPHALT

PROP. RETAINING WALL (DESIGN BY OTHERS) (C/W RAILING)

(131.50)TW (130.30)BW

PROP. RETAINING WALL TO TIE INTO THE UNDERGROUND (DESIGN BY OTHERS)

LIMIT OF UNDERGROUND

EX. EDGE BUSH

130.34EX.

EX. CONCRETE CURB

PROP. SILT FENCE

EX. 0.25ø DT

EX. 0.25ø DT

EX. 0.25ø DT

EX. 0.25ø DT

130.36EX.

EX. FRAME SHED

EX. FRAME GARAGE F.F.E=130.22

EX. CB T/G=129.45

NOTES TO CONTRACTOR:

1. INSPECTION
   CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.
2. CONFIRMATION OF EXISTING INVERTS
   72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

BENCH MARK NOTE:

CITY OF BURLINGTON BENCHMARK NO.397

BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION "B" ON THE WEST SIDE GUELPH LINE OPPOSITE PALMER DRIVE. PLAQUE IS LOCATED ,.25M SOUTH WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.

ELEVATION = 131.500M (DATUM CGVD 1928:1978)

NO.	DATE	BY	REVISIONS

NOTES TO CONTRACTOR:

1. CONTRACTORS AND SUBCONTRACTORS SHALL NOT SCALE FROM THIS DRAWING.
2. ANY INCONSISTENCIES AND OMISSIONS FOUND ON THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION BEFORE COMMENCING THE WORK.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND ELEVATIONS AND REPORT ALL FINDINGS TO THE ENGINEER. ONCE CONSTRUCTION HAS COMMENCED, THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS.
4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	YM	CHK'D	SN	DATE MAR. 10, 22
DRAWN	YM	CHK'D	SN	

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP: LICENSED PROFESSIONAL ENGINEER — S. J. NELSON — 100228748 — Mar.11/22 — PROVINCE OF ONTARIO

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS
Tel. (905) 631-6978
Website: www.sla.on.ca
email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENTS

INFINITY DEVELOPMENT GROUP

2275 UPPER MIDDLE ROAD, OAKVILLE, ON

PROJECT NAME

1396 GUELPH LINE
BURLINGTON, ON

TITLE

PRELIMINARY GRADING AND EROSION CONTROL PLAN

PROJECT No.	DRAWING No.
22024	C101

S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg
Plotted: Thursday, March 10, 2022 1:28:58 PM By: Scott Nelson

S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg

SAWCUT, REMOVE & RESTORE EX. ASPHALT, CONCRETE & LANDSCAPED AREAS TO EXISTING CONDITION OR BETTER (TYP.) (AS PER CITY OF BURLINGTON STANDARD S-114, S114A & S114B OR S-115 & S-115A IF CONCRETE ROAD BASE IS PRESENT)

PROP. ASPHALT LAP JOINT (TYP.)

CONNECT PROP. 30.0m-250mmø STM @ 1.0% TO EX. 750mmø STM
EX. INV=128.09±
PROP. INV=129.32

EX. 75mmø HYDRO (UNDERGROUND)
EX. CONCRETE CURB
EX. 100mmø BELL
EX. GAS MAIN
EX. 400mmø WTM
EX.CB T/G 130.80

PROP. DEPRESSED CURB & GUTTER AS PER OPSD 600.040

GUELPH LINE

EX. 350mmø CI WTM (ABANDONED)
EX. 86.9m-750mmø STM @ 0.9%

PROP. MH1
(HYDROSTORM HS6)
T/G 131.30
NE.INV.=129.62
S.INV.=129.65

PROP. 4.5m-250mmø STM @ 1.0%
INV. 129.70

CONNECT PROP. 150mmø FIRE WTM TO EX. 400mmø WTM
(TAP BY HALTON REGION FORCES ONLY)

PROX. CENTRE LINE OF ROAD

ABANDON EX. WATER SERVICE AS PER CITY OF BURLINGTON STANDARDS

PROP. CAST-IN-PLACE STORMWATER STORAGE TANK C/W ACCESS LID, PUMP & 140mmø OUTLET (DESIGN BY OTHERS)
TOTAL VOLUME=161m³
100-YEAR REQ'D VOLUME=117m³
TOP OF TANK=130.35
140mmø OUTLET INVERT=129.70
BOTTOM OF TANK=127.79

PROP. 100mmø DOM. WTM
EX. PARKING LOT
EX. CONCRETE WALKWAY
EX. HYDRANT
EX. MH
EX. LS
EX. BELL MANHOLE T/G=131.00
EX. BELL MANHOLE T/G=131.05
EX. BELL
EX. WTM (APPROX. LOCATION)
EX. 75mmø HYDRO (UNDERGROUND)
EX. 100mmø BELL
EX. GAS MAIN

MECH. & ELEC.

PROP. AD1
(NYLOPLAST C/W FLEXSTORM FILTER)
T/G 130.95

EX. ASPHALT
EX. ASPHALT PARKING

CONNECT PROP. 12.0m-200mmø SAN @ 1.0% TO EX. SAN MH INCLUDING RE-BENCHING
PROP. INV=127.62

EX. STMMH
T/G=130.66
W INV. 127.57
E INV. 127.54

EX. SANMH
T/G=130.49
SE INV. 127.56

EX. 400mmø WTM
EX. 200mmø SAN
EX. 65.7m 825mmø STM @ 0.9%

PROP. BUILDING OVERHANG

PROP. AD2
(NYLOPLAST C/W FLEXSTORM FILTER)
T/G 131.95

EX. CONCRETE WALKWAY

450mmø NYLOPLAST INSPECTION PORT C/W SUMP INSERT
T/G=130.90
SW INV. 127.75
NE INV. 127.74
(CONTRACTOR TO PROVIDE SHOP DRAWINGS)

EX. BF
F.F.E
EX. 0.3ø DT

EX.CB T/G 130.40
EX. BUS SHELTER
EX. CABLE TV BOX
EX. STOP LIGHT
EX. TF
EX. 300mmø WTM
EX. SIGN
EX. CURB CUT

PROP. 1.5m- 200mmø SAN @ 1.0% INV=127.77

LIMIT OF UNDERGROUND

EX. LANDSCAPED AREA (AS PER OPSD 600.110) CONRETE BARRIER CURB

EX. CONCRETE
F.F.E

MECH. & ELEC.

EX. 0.4ø DT
EX. 0.1ø DT
EX.VC T/G 130.56
EX. 400mmø WTM

PROP. 11-STOREY RESIDENTIAL BUILDING
FFE=131.45
P1=127.79
P2=124.74
P2=121.69

#1396
EX. 1 STOREY BRICK BUILDING

EX. CONCRETE CURB (TO BE REMOVED)

EX. ASPHALT AREA (TO BE REMOVED)

PROP. AD7
(NYLOPLAST)
T/G 131.20

EX. BOARD FENCE
EX. 0.2ø DT
EX. LS

PROP. CB1
(OPSD 705.010)
T/G 130.05
E.INV.=128.55

EX. ASPHALT
EX. SIDEWALK
EX. BRICK

EX.CB
T/G=130.25
E. INV. 129.43
(TO BE REMOVED)

PROP. 1.0m- 250mmø STM @ 1.0%
INV=128.54
(TO CONNECT TO INTERNAL MECHANICAL SYSTEM AND BE PUMPED TO THE 250mmø STORM SERVICE, BYPASSING THE STORAGE TANK)

EX. 0.5ø DT
EX. ASPHALT

PROP. AD3
(NYLOPLAST C/W FLEXSTORM FILTER)
T/G 130.95

EX. PAD MOUNTED TRANSFORMER (TO BE REMOVED)

EX. CONCRETE CURB
EX. 0.3ø DT
EX. CONCRETE DOCK
EX. ROOF OVERHANG
EX. CONCRETE CURB

EX. 0.4ø DT
EX. 0.5ø DT

PROP. AD6
(NYLOPLAST)
T/G 131.20

EX. CHAIN LINK FENCE (TO BE REMOVED)

EX.CB T/G=130.27

MECH. & ELEC.

EX. 0.4ø DT
EX. 0.2ø DT

EX. CB T/G=129.68

EX. ASPHALT

EX.CB (NOT SURVEYED) T/G=129.31 S.INV.=128.78

EX. 0.2ø CT

#1380
EX. 2 STOREY BRICK TOWNHOMES

EX. CHAIN LINK FENCE (TO BE REMOVED)

EX. CHAIN LINK FENCE

PROP. AD5
(NYLOPLAST)
T/G 131.30

MECH. & ELEC.

EX. CB T/G=129.88

EX. 0.4ø DT
EX. 0.3ø DT

PROP. CONCRETE RAMP (TO BE HEATED)

PROP. BUILDING OVERHANG

PROP. AD4
(NYLOPLAST C/W FLEXSTORM FILTER)
T/G 131.00

EX. CHAIN LINK FENCE

EX. ASPHALT

PROP. RETAINING WALL
(DESIGN BY OTHERS)
(C/W RAILING)

EX. CONCRETE CURB

EX. TREE

EX. 0.3ø DT

EX. 2 STOREY BRICK TOWNHOMES
F.F.E=150.82

EX. LS

EX. BOARD FENCE

EX. ASPHALT

PROP. RETAINING WALL
(DESIGN BY OTHERS)
(C/W RAILING)

PROP. RETAINING WALL TO TIE INTO THE UNDERGROUND
(DESIGN BY OTHERS)

LIMIT OF UNDERGROUND

EX. EDGE BUSH

EX. CONCRETE CURB

EX. 0.25ø DT
EX. 0.25ø DT
EX. 0.25ø DT
EX. 0.25ø DT

EX. FRAME SHED

EX. FRAME GARAGE
F.F.E=130.22

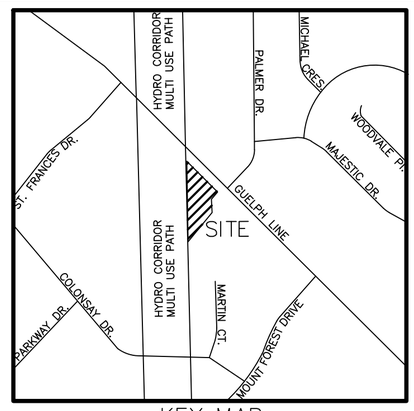
EX. CB
T/G=129.45

EX. HYDRO CORRIDOR

EX. RESIDENTIAL LANDS

N

KEY MAP
N.T.S.



LEGEND:

- EXISTING CATCHBASIN
- EXISTING STORM/SANITARY MANHOLE
- PROPOSED CATCHBASIN
- PROPOSED STORM/SANITARY MANHOLE
- PROPOSED GATE VALVE
- PROPOSED WATER METER
- PROPOSED BACKFLOW PREVENTOR
- SEWER CROSSING
- PROPOSED SEWER INSULATION
- PROPOSED ROAD RESTORATION

BENCH MARK NOTE:
CITY OF BURLINGTON BENCHMARK NO.397

BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION "B" ON THE WEST SIDE GUELPH LINE OPPOSITE PALMER DRIVE. PLAQUE IS LOCATED ,.25M SOUTH WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.

ELEVATION = 131.500M (DATUM CGVD 1928:1978)

NO.	DATE	BY	REVISIONS

NOTES TO CONTRACTOR:

1. CONTRACTORS AND SUBCONTRACTORS SHALL NOT SCALE FROM THIS DRAWING.
2. ANY INCONSISTENCIES AND OMISSIONS FOUND ON THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION BEFORE COMMENCING THE WORK.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND ELEVATIONS AND REPORT ALL FINDINGS TO THE ENGINEER. ONCE CONSTRUCTION HAS COMMENCED, THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS.
4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	YM	CHK'D	SN	DATE MAR. 10, 22
DRAWN	YM	CHK'D	SN	

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP: LICENSED PROFESSIONAL ENGINEER — Scott Nelson — S. J. NELSON — 100228748 — Mar.11/22 — PROVINCE OF ONTARIO

NOTES TO CONTRACTOR:

1. INSPECTION
CONTRACTOR IS RESPONSIBLE FOR CONTACTING ENGINEER 48 HRS PRIOR TO COMMENCING WORK TO ARRANGE FOR INSPECTION. ENGINEER TO DETERMINE DEGREE OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF UNDERGROUND SERVICE INSTALLATION AS MANDATED BY ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO NOTIFY ENGINEER WILL RESULT IN EXTENSIVE POST CONSTRUCTION INSPECTION AT CONTRACTORS EXPENSE.

2. CONFIRMATION OF EXISTING INVERTS
72 HOURS PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR IS TO LOCATE, EXPOSE AND VERIFY INVERTS OF EXISTING UTILITIES AND EXISTING SEWERS AT CONNECTION POINTS. SHOULD THE CONTRACTOR PROCEED WITHOUT COMPLETING THESE LOCATES, EXTRA COSTS RESULTING FROM DELAYS AND STANDBY TIME WILL NOT BE CONSIDERED.

S. LLEWELLYN & ASSOCIATES LIMITED
CONSULTING ENGINEERS
Tel. (905) 631-6978
Website: www.sla.on.ca
email: info@sla.on.ca
3228 South Service Road, Suite #105 East Wing, Burlington, Ont., L7N 3H8

CLIENTS
INFINITY DEVELOPMENT GROUP
2275 UPPER MIDDLE ROAD, OAKVILLE, ON

PROJECT NAME
1396 GUELPH LINE
BURLINGTON, ON

TITLE
PRELIMINARY SERVICING PLAN

PROJECT No.	DRAWING No.
22024	C102

S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg
Plotted: Thursday, March 10, 2022 1:29:02 PM By: Scott Nelson

S:\22024\WORKING\Current\22024-Grading and Servicing Plan.dwg

GENERAL NOTES:

1. CONSTRUCTION OF SEWERS, AND RELATED APPURTENANCES SHALL BE UNDERTAKEN IN ACCORDANCE WITH THE CURRENT STANDARD DRAWINGS OF THE CITY OF BURLINGTON, THE REGIONAL MUNICIPALITY OF HALTON AND THE ONTARIO PROVINCIAL STANDARD DRAWINGS (OPSD). THE TOWN AND THE REGION'S DRAWINGS SHALL TAKE PRECEDENCE OVER THE OPSD DRAWINGS.
2. ONTARIO PROVINCIAL STANDARD DRAWINGS TO BE READ IN CONJUNCTION WITH THE REGION OF HALTON REVISIONS.
3. RELOCATION OF EXISTING SERVICES AND/OR UTILITIES SHALL BE CONSTRUCTED AS SHOWN ON THE DRAWINGS OR AS DIRECTED BY THE ENGINEER.
4. THE CONTRACTOR SHALL OBTAIN ALL PERMITS FOR CONSTRUCTION.
5. FOR ALL SEWERS AND WATERMAIN IN FILL SECTIONS, THE COMPACTION SHALL BE VERIFIED PRIOR TO LAYING OF PIPE.
6. NO SUBSTITUTIONS WILL BE ALLOWED WITHOUT WRITTEN APPROVAL FROM THE REGIONAL ENGINEER, CITY OF BURLINGTON OR THE ENGINEER.
7. ALL EXCAVATIONS TO BE BACKFILLED WITH SELECT NATIVE MATERIAL, APPROVED BY THE ENGINEER, TO 95% SPD.
8. THE CONTRACTOR IS RESPONSIBLE FOR INSTALLING AND MAINTAINING SILT CONTROL DEVICES AS SHOWN ON THE DRAWINGS AND AS DIRECTED BT THE ENGINEER.
9. TREE PROTECTION PROCEDURES TO BE IMPLEMENTED IN ACCORDANCE WITH CITY OF BURLINGTON STANDARDS.
10. THESE PLANS ARE NOT TO BE USED FOR CONSTRUCTION UNTIL SEALED BY THE ENGINEER AND INDICATED ISSUED FOR CONSTRUCTION ON THE DRAWING.
11. THIS/THESE PLAN(S) IS/ARE NOT TO BE REPRODUCED IN WHOLE OR IN PART WITHOUT THE WRITTEN PERMISSION OF S. LLEWELLYN AND ASSOCIATES LIMITED.
12. INFORMATION REGARDING ANY EXISTING SERVICES AND/OR UTILITIES SHOWN ON THE APPROVED SET OF CONSTRUCTION DRAWINGS ARE FURNISHED AS THE BEST AVAILABLE INFORMATION. THE CONTRACTOR SHALL INTERPRET THIS INFORMATION AS HE SEES FIT WITH THE UNDERSTANDING THAT THE OWNER AND HIS AGENTS DISCLAIM ALL RESPONSIBILITY FOR ITS ACCURACY AND /OR SUFFICIENCY. THE CONTRACTOR SHALL ASSUME LIABILITY FOR ANY DAMAGE TO EXISTING WORKS.
13. SITE PLAN INFORMATION TAKEN FROM PLANS PREPARED BY ZEDD ARCHITECTURE.
14. THIS/THESE PLAN(S) TO BE READ IN CONJUNCTION WITH THE FUNCTIONAL SERVICING REPORT (FSR) PREPARED BY S. LLEWELLYN AND ASSOCIATES LIMITED.
15. THIS PLAN TO BE USED FOR SERVICING AND GRADING ONLY, FOR BUILDING LOCATION REFER TO TO THE SITE PLAN.
16. MUNICIPAL APPROVAL OF THESE DRAWINGS IS FOR MATERIAL AND COMPLIANCE WITH CITY OF BURLINGTON AND PROVINCIAL SPECIFICATIONS AND STANDARDS ONLY. APPROVAL AND INSPECTION OF THE WORKS BY THE CITY OF BURLINGTON STAFF DOES NOT CERTIFIY THE LINE AND GRADE OF THE WORKS NOR RELIEVE THE CONTRACTOR OF CERTIFICATION OF ALL WORKS BY THE OWNER'S ENGINEER.
17. ALTERNATE MATERIALS MAY BE ACCEPTABLE PROVIDED WRITTEN APPROVAL HAS FIRST BEEN OBTAINED FROM THE CITY OF BURLINGTON AND THE THE ENGINEER.
18. THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S BONDED CONTRACTOR FROM THE REQUIREMENTS TO OBTAIN THE VARIOUS PERMITS/APPROVALS NORMALLY REQUIRED TO COMPLETE A CONSTRUCTION PROJECT, SUCH AS, BUT NOT LIMITED TO THE FOLLOWING:
    - ROAD CUT PERMITS
    - SEWER PERMITS
    - APPROACH APPROVAL PERMITS
    - RELOCATION OF SERVICES
    - COMMITTEE OF ADJUSTMENT
    - ENCROACHMENT AGREEMENTS
20. PRIOR TO CONSTRUCTION THE CONTRACTOR MUST:
    i. CHECK AND VERIFIY ALL DIMENSIONS AND EXISTING ELEVATIONS WHICH INCLUDE BUT ARE NOT LIMITED TO THE BENCHMARK ELEVATIONS, EXISTING SERVICE CONNECTIONS, EXISTING INVERTS AND REPORT FINDING IN WRITING TO THE ENGINEER.
    ii. OBTAIN ALL UTILITY LOCATES AND REQUIRED PERMITS AND LICENSES.
    iii. VERIFY ALL FINISHED FLOOR ELEVATIONS AND BASEMENT FLOOR ELEVATIONS WHICH MY APPEAR ON THESE PLANS COMPLY WITH THE FINAL ARCHITECTURAL DRAWINGS.
    iv. CONFIRM ALL DRAWINGS USED FOR CONSTRUCTION ARE OF THE MOST RECENT REVISION.
    v. NOTIFY THE ENGINEER OF THE PROPOSED CONSTRUCTION SCHEDULE FOR COORDINATION OF NECESSARY INSPECTIONS.
21. **THE CONTRACTOR IS RESPONSIBLE FOR CONTACTING THE ENGINEER 48 HOURS PRIOR TO THE COMMENCING SITE WORKS TO ARRANGE FOR INSPECTION. THE ENGINEER SHALL DETERMINE THE EXTENT OF INSPECTION AND TESTING REQUIRED FOR CERTIFICATION OF THE UNDERGROUND SERVICE INSTALLATION AS MANDATED BY THE ONTARIO BUILDING CODE DIVISION C, PART 1, SECTION 1.2.2, GENERAL REVIEW. FAILURE TO MAKE SUITABLE ARRANGEMENTS FOR INSPECTION WILL LEAD TO POST CONSTRUCTION TESTING AND INSPECTION AS DETERMINED BY THE ENGINEER, THE COSTS OF WHICH INCLUDING ANY DELAYS IN CONSTRUCTION SHALL BE BOURNE BY THE CONTRACTOR. FULL PAYMENT FOR UN-INSPECTED WORKS MAY BE WITHHELD UNTIL THE COMPLETION OF THE POST CONSTRUCTION INSPECTION AND TESTING TO THE SATISFACTION OF THE ENGINEER.**
22. INSPECTION BY THE OWNER'S ENGINEER IS FOR CERTIFICATION AND GENERAL CONFORMANCE PURPOSES AND DOES NOT CERTIFY LINE AND GRADE OR IMPLY AN ASSURANCE OF QUALITY CONTROL. THE CONTRACTOR SHALL BE RESPONSIBLE TO ENSURE THE INSTALLATION OF THE WORKS TO PROPER LINE, GRADE AND QUALITY TO CURRENT INDUSTRY STANDARDS.
23. ANY UTILITY RELOCATIONS AND RESTORATIONS DUE TO THE DEVELOPMENT TO BE UNDERTAKEN AT THE EXPENSE OF THE OWNER/DEVELOPER AND SHALL BE COORDINATED BY THE CONTRACTOR.
24. ALL RESTORATIONS AND RECONSTRUCTIONS SHALL BE TO COMPLETED TO MATCH EXISTING CONDITIONS OR BETTER AND ARE TO BE PERFORMED TO THE SATISFACTION OF THE ENGINEER AND THE CITY OF BURLINGTON.
25. SERVICING CONTRACTOR TO MAINTAIN A "CONFINED TRENCH CONDITION" IN ALL SEWER AND WATERMAIN INSTALLATION TRENCHES.
26. THE SITE SERVICING CONTRACTOR SHALL TERMINATE ALL SERVICES 1.0m FROM THE BUILDING FACE.
27. NO BLASTING WILL BE PERMITTED.

ROADWORKS:

1. APPROVED FILL, FREE OF DELETERIOUS AND ORGANIC MATERIAL AND BOULDERS SHALL BE COMPACTED TO A DRY DENSITY NOT LESS THAN 95% THAN THE STANDARD PROCTOR DENSITY. AFTER COMPACTION, SOIL DENSITY TESTS SHALL BE CONDUCTED TO ENSURE ADEQUATE COMPACTION AND STABILITY OF THE FILL AND TEST RESULTS SHALL BE SUBMITTED TO THE ENGINEER.
2. SUBGRADE TO BE PROOF ROLLED PRIOR TO PLACEMENT OF SUB BASE. UNSUITABLE MATERIAL TO BE REMOVED AND REPLACED WITH SELECT FILL OR GRANULAR "B" AND COMPACTED TO 98% SPD.
3. ASPHALTIC CONCRETE TO BE COMPACTED TO 97% MARSHALL DENSITY.
4. PAVEMENT STRUCTURE FOR INTERNAL ROADS SHALL CONSIST OF COMPACTED THICKNESSES OF: 40mm HL3 SURFACE ASPHALT 60mm HL8 BASE BINDER ASPHALT 150mm GRANULAR "A" BASE COURSE 250mm GRANULAR "B" SUB-BASE COURSE
5. BOULEVARDS TO BE SODDED WITH #1 NURSERY SOD ON A MINIMUM 150mm OF SELECT TOPSOIL.
6. MANHOLE FRAMES AND COVERS AND WATER VALVE BOXES SHALL BE SET FLUSH WITH BASE COURSE ASPHALT AND ADJUSTED TO FINAL GRADE AFTER INSTALLATION OF SURFACE ASPHALT AS PER CITY OF BURLINGTON STANDARD DRAWINGS S-130.
7. TRAFFIC CONTROL SHALL BE MAINTAINED AT ALL TIMES FOR WORKS ON EXISTING ROADWAYS TO THE SATISFACTION OF THE DIRECTOR OF ENGINEERING. THE EXPENSE FOR THE ERECTION OF SIGNS, DELINEATORS AND OTHER TRAFFIC CONTROL DEVICES SHALL BE BORNE BY THE CONTRACTOR.
8. STANDARD PARKING SPACES SHALL BE 2.6mx5.6m.

SANITARY SEWERS:

1. SANITARY SEWERS SHALL BE PVC. PVC PIPE IS TO BE BELL AND SPIGOT AND COMPLY TO ASTM D-3034 WITH MINIMUM SDR 35.
2. MINIMUM BEDDING REQUIREMENTS FOR ALL SANITARY SEWER MAINS AND RELATED CONNECTIONS IN A SINGLE TRENCH SHALL BE CLASS B GRANULAR BEDDING AS PER OPSD 802.010 UNLESS OTHERWISE NOTED.
3. SANITARY SEWER MANHOLES FRAME AND COVER AS PER OPSD 401.010.
4. TAPPING AT EXISTING SANITARY SEWERS SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGION OF HALTON REQUIREMENTS.
5. ALL SEWERS TO BE VIDEO INSPECTED.
6. ALL SEWERS TO BE FLUSHED PRIOR TO VIDEO INSPECTION.
7. ALL PVC SEWERS ARE TO BE TESTED FOR DEFLECTION (MANDREL PASSAGE) AFTER INSTALLATION. SANITARY SEWERS SHALL ALSO BE TESTED FOR LEAKAGE (LOW AIR PRESSURE). PRIOR TO ASSUMPTION BY THE CITY, PIPE DEFLECTION TESTING SHALL BE REPEATED.

STORM SEWERS:

1. 300mm-450mm STORM SEWERS SHALL BE PVC, BELL AND SPIGOT AND SHALL COMPLY TO ASTM D-3034 WITH MINIMUM SDR 35.
2. MINIMUM BEDDING REQUIREMENTS FOR ALL SINGLE STORM SEWER MAINS AND ALL RELATED CONNECTIONS SHALL BE HIGH PERFORMANCE CLEAR STONE (HL-8 GRADED) AS PER CITY OF BURLINGTON STANDARD DRAWINGS S-188.
3. STORM SEWER MANHOLES SHALL BE IN ACCORDANCE WITH OPSD 701.010. AND 703.010. FRAME AND COVER AS PER OPSD 401.01 TYPE A. FRAMES TO BE STAMPED "DANGER" AND "STORM".
4. CATCHBASINS SHALL BE IN ACCORDANCE WITH OPSD 705.010. CATCHBASIN MANHOLES SHALL BE IN ACCORDANCE WITH OPSD 701.010 AND 701.030 UNLESS OTHERWISE SPECIFIED. CATCHBASINS TO LOCATED WITHIN LANDSCAPED AREAS TO BE SUMPLESS. FRAME AND COVER FOR CATCHBASINS AND CATCHBASIN MANHOLES SHALL BE AS PER OPSD 400.100 (ROADS) AND PER CITY OF BURLINGTON STANDARD DRAWING S-176 (REAR YARDS).
5. DOUBLE CATCH BASINS SHALL BE IN ACCORDANCE WITH OPSD 705.020 WITH 250mm DIA. LEAD. FRAMES AND COVERS TO BE OPSD 400.11 (ROADS) AND CITY OF BURLINGTON STD. S-176 (REAR YARDS). LEADS TO BE PVC SDR 35.
6. CATCH BASIN AND MANHOLE TOPS SHALL BE INITIALLY SET TO BASE COURSE ASPHALT ELEVATION AND ADJUSTED TO GRADE PRIOR TO PLACEMENT OF TOP LIFT OF ASPHALT.
7. ALL TRENCH EXCAVATIONS ARE TO BE BACKFILLED WITH SELECT NATIVE MATERIAL PLACED IN MAXIMUM 200mm LIFT THICKNESSES WITHIN 3% OF THE OPTIMUM MOISTURE CONTENT AND COMPACTED TO A MINIMUM OF 95% SPD, UNLESS OTHERWISE SPECIFIED.
8. INVERTS OF ALL SWALES TO BE SODDED TO A MINIMUM WIDTH OF 3.0m. ALL OTHER DISTURBED AREAS TO BE TOPSOILED AND SEEDED. SOD SHALL BE #1 NURSERY LAID ON A MINIMUM OF 150mm OF TOPSOIL.
9. ALL SEWERS TO BE VIDEO INSPECTED.
10. ALL SEWERS TO BE FLUSHED PRIOR TO VIDEO INSPECTION.
11. ALL PVC SEWERS (SANITARY AND STORM) ARE TO BE TESTED FOR DEFLECTION (MANDREL PASSAGE) AFTER INSTALLATION. PRIOR TO ASSUMPTION BY THE CITY, PIPE DEFLECTION TESTING SHALL BE REPEATED.

RESTORATIONS:

1. ALL TRENCH EXCAVATIONS WITHIN EXISTING ROAD ALLOWANCES SHALL BE AS BACKFILLED AS PER CITY OF BURLINGTON STANDARD DRAWING S-114 AND S-114A, OR S-115 AND S-115A WHERE CONCRETE ROAD BASE IS PRESENT.
2. EXISTING PRIVATE FENCING IS TO BE MAINTAINED THROUGHOUT CONSTRUCTION. WHERE REMOVAL OR RELOCATION OF FENCING IS NECESSARY IT SHALL BE RESTORED OR REPLACED TO ORIGINAL CONDITIONS OR BETTER UNDER THE DIRECTION OF THE ENGINEER.
3. DAMAGED CURB, GUTTER AND SIDEWALK TO BE REPLACED WITH 28 MPa CONCRETE TO EXISTING CONDITIONS OR BETTER.
4. PAVEMENT SURFACE ON EXISTING PLAINS ROAD EAST TO BE REPAIRED BY CONTRACTOR AT THEIR EXPENSE IF DAMAGED BY CONSTRUCTION TRAFFIC.

GRADING NOTES

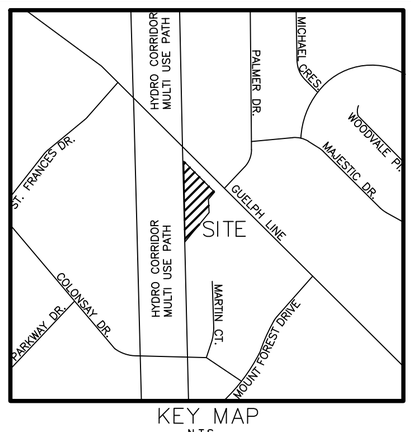
1. ALONG ADJOINING PROPERTIES GRADE TO MEET EXISTING OR PROPOSED ELEVATIONS WITH SODDED SLOPES (MIN. 3H TO 1V) AND/OR RETAINING WALLS AS SPECIFIED.
2. ALL RETAINING WALLS, WALKWAYS, CURBS, ETC., SHALL BE PLACED A MIN. OF 0.3m OFF THE PROPERTY LINE. ALL WALLS 1.0m OR HIGHER SHALL BE DESIGNED BY A P.ENG.
3. SHOULD A RETAINING WALL BE REQUIRED, THE TOP OF WALL ELEVATIONS SHALL BE SET 150mm ABOVE THE PROPOSED SIDE YARD SWALES.
4. RETAINING WALLS 0.6m IN HEIGHT OR GREATER REQUIRE CONSTRUCTION OF A FENCE OR GUARD RAIL AT THE TOP OF THE REAR OF THE WALL. GUARDS FOR RETAINING WALLS SHALL BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH THE REQUIREMENTS OF EXTERIOR GUARDS AS CONTAINED IN THE ONTARIO BUILDING CODE.
5. TOP OF FOUNDATION WALLS FOR BUILDINGS SHALL BE 150mm (MIN) ABOVE FINISHED GRADE.
6. DRIVEWAY SLOPES SHALL NOT BE LESS THAN 2% AND NOT MORE THAN 7.0%. REVERSED SLOPED DRIVEWAYS IN NEW DEVELOPMENTS ARE NOT PERMITTED.
7. IF GRADING IS REQUIRED ON LANDS ADJACENT TO THE DEVELOPMENT WHICH ARE NOT OWNED BY THE DEVELOPER, THEN THE DEVELOPER MUST OBTAIN WRITTEN PERMISSION FROM THE ADJACENT PROPERTY OWNER TO ALLOW THE DEVELOPER TO GRADE ON THE ADJACENT LANDS, OTHERWISE RETAINING WALLS MUST BE USED.
8. THE WRITTEN PERMISSION REQUIRED FROM THE ADJACENT LANDOWNER SHALL BE OBTAINED PRIOR TO ENTERING THE LANDS. SHOULD PERMISSION NOT BE OBTAINED OR IS WITHDRAWN PRIOR TO COMMENCING THE WORK, THEN THE DEVELOPER SHALL LIMIT HIS ACTIVITIES TO THE LIMITS OF THE DEVELOPMENT SITE.
9. DRIVEWAY AND DRIVEWAY APPROACHES SHALL BE LOCATED SUCH THAT HYDRO VAULTS AND OTHER STREET FURNITURE ARE A MIN. OF 1.2m FROM THE DRIVEWAY ENTRANCE CURB RADII.
10. ANY CHANGES IN GRADES AND CATCH BASINS REQUIRE THE APPROVAL OF THE CITY'S MANAGER OF DEVELOPMENT ENGINEERING.
11. ALL DRIVEWAYS FROM PROPERTY LINES FOR THE FIRST 7.5m SHALL BE WITHIN 5% MAXIMUM GRADE, THEREAFTER, ALL DRIVEWAYS SHALL BE WITHIN 10% MAXIMUM GRADES.

SILTATION AND EROSION CONTROL

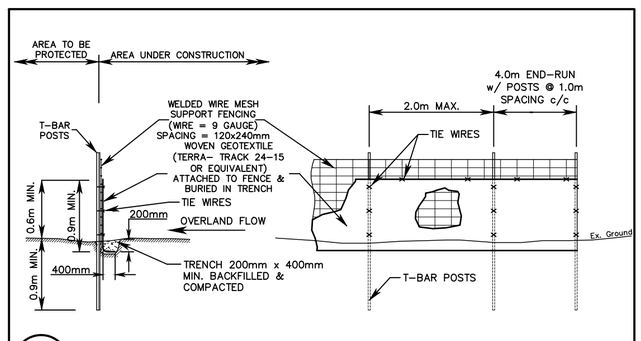
1. SILTATION CONTROL BARRIERS SHALL BE PLACED AS DETAILED.
2. ALL SILTATION CONTROL MEASURES SHALL BE CLEANED AND MAINTAINED AFTER EACH RAINFALL AS DIRECTED AND TO THE SATISFACTION OF THE CITY OF BURLINGTON AND/OR THE HALTON CONSERVATION AUTHORITY.
3. ADDITIONAL SILT CONTROL LOCATIONS MAY BE REQUIRED AS DETERMINED BY THE ENGINEER, THE CITY OF BURLINGTON AND/OR THE HALTON CONSERVATION AUTHORITY.

WATERMAINS:

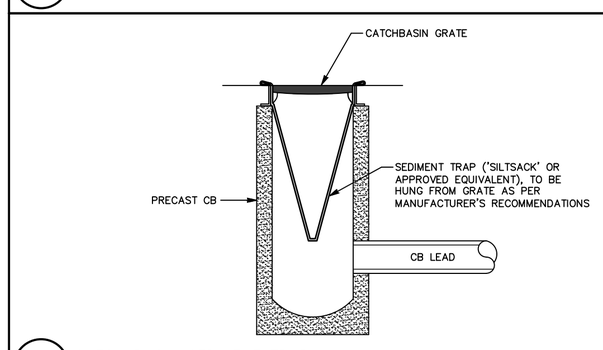
1. FLEXIBLE WATERMAIN PIPE UP TO 300mm DIAMETER TO BE P.V.C. DR-18 AND CONFORM TO A.W.W.A. C-900 WITH MECHANICAL JOINTS AS PER A.W.W.A. C-110, AND TO BE INSTALLED WITH A 10 GAUGE TRACER WIRE.
2. FLEXIBLE PIPE BEDDING TO BE OPSD 802.010 WITH COMPACTED GRANULAR B MATERIAL.
3. MINIMUM COVER TO BE 1.7m TO TOP OF PIPE.
4. DEFLECTION AT JOINTS NOT TO EXCEED 2.5 DEGREES AND SHALL BE EQUAL AT ALL JOINTS.
5. GATE VALVES AND BOXES FOR 150mm DIAMETER WATERMAINS AS PER A.W.W.A. STANDARD C-500 AND ARE TO OPEN TO THE LEFT (COUNTER CLOCKWISE).
6. HYDRANTS SHALL MEET THE REQUIREMENTS OF A.W.W.A. STANDARD C-502 AND SHALL BE SET IN ACCORDANCE WITH REGION OF HALTON, AND CITY OF BURLINGTON BUILDING DEPARTMENT STANDARDS, COMPLETE WITH STEAMER CONNECTIONS. THE 100mm STEAMER PORT SHALL FACE THE FIRE ROUTE AND SHALL BE UNOBSTRUCTED BY ANY PROPOSED LANDSCAPING.
7. ALL FITTINGS TO HAVE MECHANICAL RESTRAINTS THAT MEET UNI-B-13-92.
8. ALL TEMPORARY AND PERMANENT WATERMAIN PLUGS ARE TO BE CONSTRUCTED IN ACCORDANCE WITH OPSD 1103.01.
9. TAPPING AT EXISTING WATERMAINS SHALL BE UNDERTAKEN IN ACCORDANCE WITH REGION OF HALTON REQUIREMENTS.
10. ALL WATER CUSTOMERS SUPPLIED BY A WATERMAIN TO BE SHUT DOWN SHALL BE NOTIFIED BY THE CONTRACTOR AT LEAST 48 HOURS IN ADVANCE OF THE SHUT DOWN AS PER REGION OF HALTON SPECIFICATIONS. NOTIFICATION SHALL TAKE PLACE UNDER THE ENGINEER'S DIRECTION.
11. MINIMUM HORIZONTAL SEPERATION BETWEEN WATERMAINS (INCLUDING PRIVATE SERVICES) AND STORM AND SANITARY SEWERS SHALL BE 2.5m. WATERMAINS MUST HAVE A MINIMUM VERTICAL CLEARANCE OF 500mm BETWEEN ALL OTHER UTILITIES WHEN CROSSING.



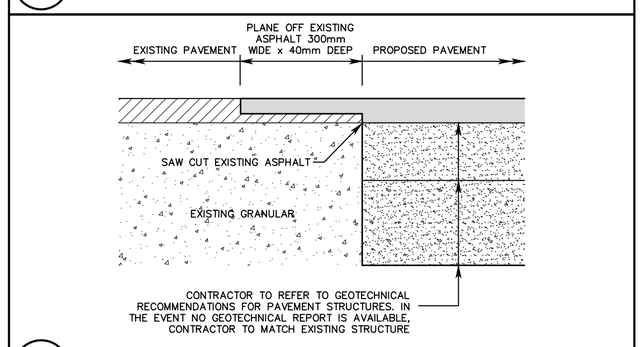
KEY MAP
N.T.S.



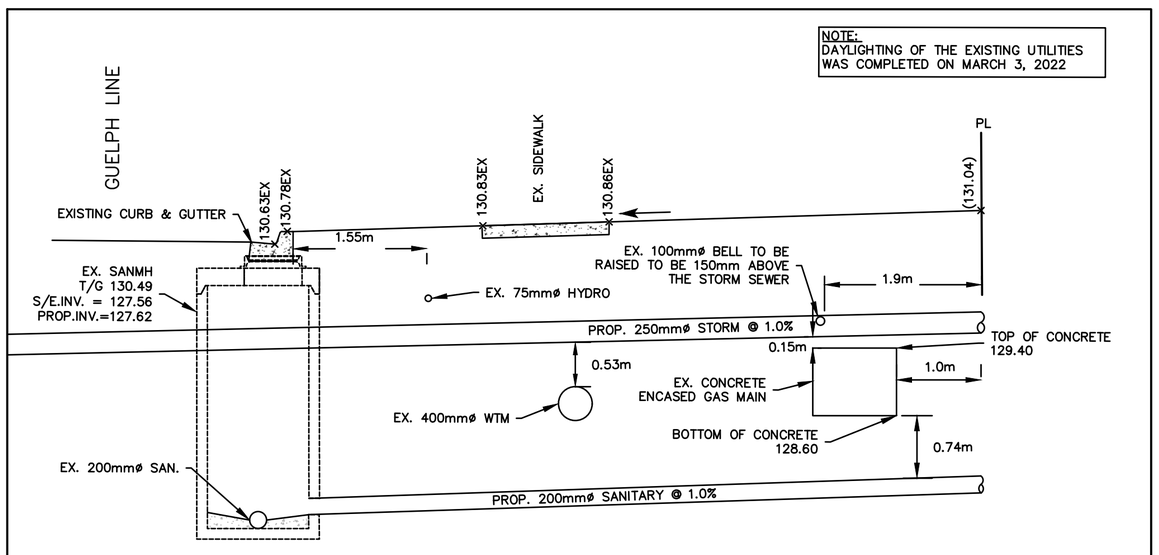
DETAIL 3 HEAVY-DUTY SILT FENCE (PER OPSD 219.130)
SCALE: N.T.S.



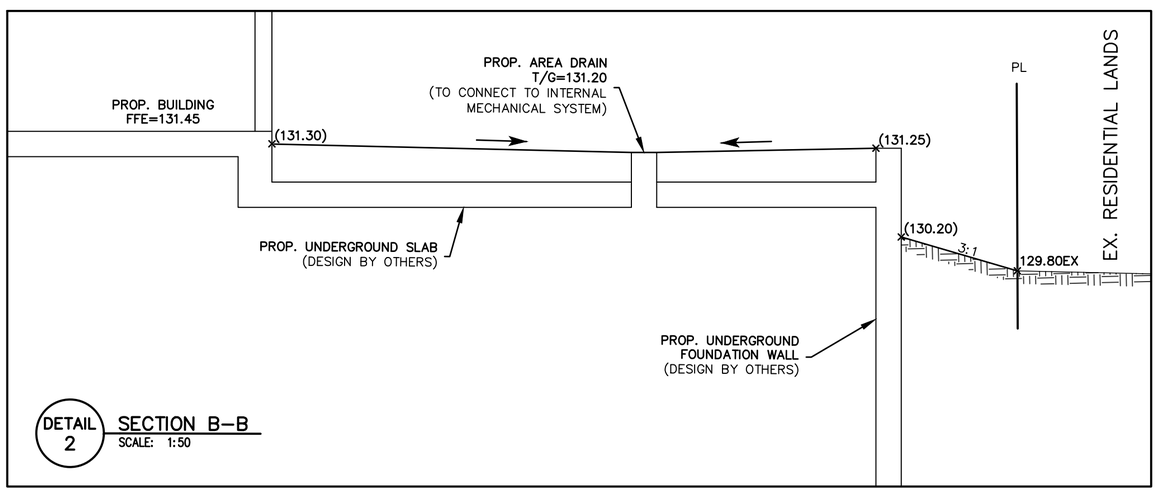
DETAIL 4 CATCH BASIN SEDIMENT TRAP
SCALE: N.T.S.



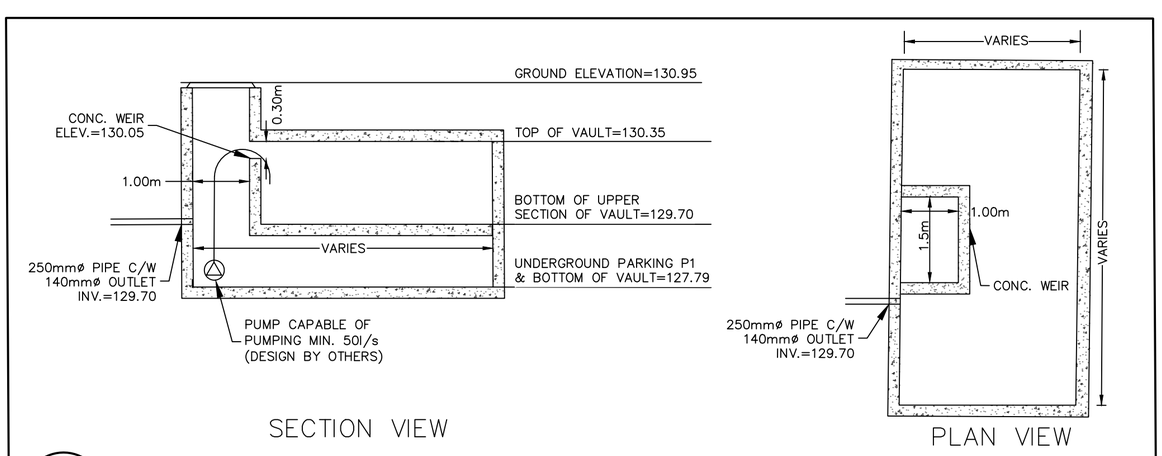
DETAIL 5 ASPHALT LAP JOINT
SCALE: N.T.S.



DETAIL 1 SECTION A-A
SCALE: 1:50



DETAIL 2 SECTION B-B
SCALE: 1:50



DETAIL 6 STORMWATER STORAGE VAULT (DESIGN BY OTHERS)
SCALE: N.T.S.

BENCH MARK NOTE:
CITY OF BURLINGTON BENCHMARK NO.397

BRASS PLAQUE ON THE EASTERLY FACE OF POSTAL STATION "B" ON THE WEST SIDE GUELPH LINE OPPOSITE PALMER DRIVE. PLAQUE IS LOCATED ,.25M SOUTH WESTERLY FROM THE SOUTHEAST CORNER AND 0.45 M ABOVE GRADE.

ELEVATION = 131.500M (DATUM CGVD 1928:1978)

NO.	DATE	BY	REVISIONS

NOTES TO CONTRACTOR:

1. CONTRACTORS AND SUBCONTRACTORS SHALL NOT SCALE FROM THIS DRAWING.
2. ANY INCONSISTENCIES AND OMISSIONS FOUND ON THE DRAWINGS MUST BE REPORTED TO THE ENGINEER FOR CLARIFICATION BEFORE COMMENCING THE WORK.
3. PRIOR TO THE START OF CONSTRUCTION, THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS AND ELEVATIONS AND REPORT ALL FINDINGS TO THE ENGINEER. ONCE CONSTRUCTION HAS COMMENCED, THE CONTRACTOR ACCEPTS RESPONSIBILITY FOR ALL DIMENSIONS, ELEVATIONS, AND SITE CONDITIONS.
4. THE POSITIONS OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVER-GROUND UTILITIES AND STRUCTURES ARE NOT NECESSARILY SHOWN ON THE DRAWINGS. WHERE SHOWN ON THE DRAWING, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, THE CONTRACTOR SHALL INFORM THEMSELVES OF THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.
5. ALL DRAWINGS REMAIN THE PROPERTY OF THE ENGINEER AND SHALL NOT BE REPRODUCED, REUSED, OR REVISED WITHOUT THE WRITTEN CONSENT OF S. LLEWELLYN AND ASSOCIATES LIMITED.

DESIGN	YM	CHK'D	SN	DATE MAR. 10, 22
DRAWN	YM	CHK'D	SN	

SCALE 1:200 (0, 5, 10, 20)

APPROVALS

STAMP: LICENSED PROFESSIONAL ENGINEER — S. J. NELSON — 100228748 — Mar.11/22 — PROVINCE OF ONTARIO

S. LLEWELLYN & ASSOCIATES LIMITED
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CLIENTS
INFINITY DEVELOPMENT GROUP
2275 UPPER MIDDLE ROAD, OAKVILLE, ON

PROJECT NAME
1396 GUELPH LINE
BURLINGTON, ON

TITLE
PRELIMINARY NOTES & DETAILS

PROJECT No. 22024
DRAWING No. C103

City of Burlington: Pre-Submission Document Terms of Reference
1396 Guelph Line
January 19, 2022

NOTE: These general Terms of Reference (below) will be used to assess the materials and technical studies submitted in support of a *Planning Act* application(s) and are to be reviewed upon the submission of and prior to the deeming of 'complete' of the application(s). The following Terms of Reference are intended as a guide to assist proponents in the preparation of materials and technical studies due upon submission (see: Section 12 of Development Application Pre-Consultation Form) and to provide recommendations as to the information content of those materials that would assist City of Burlington, Region of Halton, Conservation Halton and external agency partners in their review, once circulated. In circumstances where these Terms of Reference are generally not adhered to, submission materials may be returned to the proponent/applicant and/or a file not initiated.

1) General Requirements

- Correct application fees (based on most current fee schedule)
- Correct number of application forms and copies of reports
- Application form fully completed and commissioned
- Landowner's authorization and consent to enter property signed
- Three CDs or flash drives containing electronic copies of all materials
- Consistency within technical reports in terms of the development concept evaluated, and supporting appendices and drawings.
- Consultants have coordinated data and conclusions so that reports are consistent between disciplines
- Clear and legible drawings
- All electronic file submissions must be named using the following naming protocol: "Address_StudyName_MM-DD-YYYY". If a document is revised and resubmitted the file name should indicate that it is a revised submission and the date of the revision should be noted: "Address_StudyName_Revised_MM-DD-YYYY".
- Two digital copies of all plans are required along with paper copies. Digital plans must be submitted in Autocad and/or GIS Shapefile format that must be geospatially positioned to match the City of Burlington's Geographic and Projected Coordinate Systems (Geographic Coordinate System: GCS_North_American_1983; Projected Coordinate System: NAD83_UTM_ZONE 17N).
- Pre-Application Community Meeting Notes
- BUD Meeting Minutes

2) Planning Justification Report

- Signed by a Registered Professional Planner
- Contains a written acknowledgement by the RPP that they have reviewed all supporting technical studies in consideration of their planning opinion.
- Contains a review of the applicable policies of the Provincial Policy Statement.
- Contains a review of the applicable policies of A Place to Grow Growth Plan
- Contains a review of the applicable policies of the Provincial Greenbelt Plan.
- Contains a review of the applicable policies of the Niagara Escarpment Plan.
- Contains a review of the applicable policies of the Parkway Belt West Plan.
- Contains a review of Ontario Regulation 162/06.
- Contains a review of all other relevant Provincial legislation.
- Contains a review of the applicable policies of the Region of Halton Official Plan.
- Contains a detailed explanation of how the proposed development is consistent and/or conforms to all relevant Provincial Plans and policies.
- Contains a review and analysis of the applicable policies of the City of Burlington Official Plan (2008) and 'New Official Plan' (2020).
- Contains an analysis of the Intensification Criteria in the Burlington Official Plan.
- Contains a fulsome discussion of the results of the required technical studies and how they have been used to refine the redevelopment proposal.
- Contains a discussion of how input received at the Pre-application consultation meeting has been used to refine the redevelopment proposal.
- Contains a discussion of how input received from the Burlington Urban Design Panel has been used to refine the proposal.
- Contains an explanation of how the proposed development is compatible with surrounding land uses including height, setbacks, massing and design.
- Contains a comprehensive justification for any rental conversion or demolition of rental units which includes reference to the Region's State of Housing Report and a plan for relocation of existing tenants.
- Draft Official Plan Amendment and/or Amending Zoning By-law.
- Contains a robust justification of any removal or conversion of employment lands.
- Contains an explanation of why the requested change represents good planning and adheres to Provincial and municipal plans and policies.
- If land division is required, contains an explanation of the proposed process (condominium type, subdivision, consent), timing and next steps.

3) Survey and Severance Sketch / Conceptual Site Plan

- Legible, metric scale drawing on 24x36 inch paper (or digital)
- Prepared and signed by an OLS Surveyor
- Clearly identifies all development constraints including easements, MTO setbacks, floodlines & hazard lands, natural heritage buffers, required right-of-way widenings, daylight triangles, etc.
- Survey / Reference Plan of site showing PINs, easements and property boundaries, etc.

4) Land Assembly Documents

- Documentation which demonstrates that a reasonable, bona fide offer has been made to acquire lands to facilitate the orderly development of an area.

5) Financial Impact Study

- Description and summary of the development proposal
- Fiscal Impact Study Approach (methodology), reference documents, assumptions and databases used.
- An estimation of One-Time Revenues (Development Charges) including to what extent will the development charges to be paid by the development cover the capital cost of providing services to the development.
- An estimation of Other Fees and Charges (development application fees, cash-in-lieu, building permit fees, etc.)
- Property taxes from the development and assessment assumptions
- An assessment of current revenues (non-tax revenues) to be projected from the development
- An assessment of the implication for expenditure and the incremental costs for the development (based on Financial Information Return data – income statement and balance sheet)
- An assessment of the net operating impact (comparison of revenues and expenditures and the associated surplus/deficit on the City of Burlington's finances from the development)
- An assessment of whether the taxes to be paid by the development will cover the expected incremental increase in operating costs (both facility related and general per-capita related), as well as capital costs not covered by development charges
- Realistic cost estimation of identified capital program and long-term life-cycle analyses including asset management, operational, energy use, phasing, capital works prioritization and cash flow analysis

- Study results and conclusions

6) Housing Impact Statement

- Completed in accordance with Section 3.1.1(2)(h) and other applicable policies of the City's New Official Plan (2020)
- Comprehensive review of the proposal from an existing use and a proposed use perspective with a focus on affordability, unit/bedroom count, etc.
- Identify and discuss the proposed development in the context of Halton Region's Housing policies, and the Region's most recent State of Housing Report (note: the Region issues a State of Housing Report annually and any justification should reflect the current year report);
- Should identify and discuss other relevant and current housing information available;

7) Pedestrian Level Wind Study

- Completed in accordance with the City's Pedestrian Level Wind Study Guidelines and Terms of Reference.

8) Shadow Study:

- Completed in accordance with the City's Shadow Study Guidelines and Terms of Reference.

9) Arborist Report and Tree Preservation Plan (*only required if existing trees will be impacted, including by construction access and stockpiling of material and can be scoped to the trees that will be impacted)

- Is prepared by a qualified professional (e.g. Arborist certified by the International Society of Arboriculture (ISA), including ISA number; qualified by Ministry of Training, Colleges and Universities (MTCU) or Ontario Training and Apprentice Board (OTAB); registered professional Forester in Ontario, etc.)
- Contains legible drawings on 24x36
- Includes all dimensions in metric, to scale, and on a consistent base map layer
- Includes bar scale
- Shows the proposed development (including property lines, easements, regulated areas, paved areas, buildings and entrances, landscaped areas, regulated limits, etc.) and is coordinated with the Site Plan, Grading and Servicing drawings
- Arborist Report should describe the scope and methodology of proposed construction works and the tree preservation measures

- Identifies all existing trees (over 10cm diameter at breast height (DBH) measured at 1.4m above the ground) on site and within 3m of the property lines, and trees of any size on city property, their common and botanical name, size (DBH and height), structural and physiological condition, ownership, comments and notes, recommendations, and photos (particularly those requested for removal)
- Identifies trees proposed to be removed and retained, and the methods to be used to ensure preservation and protection of trees to be retained, including location and detail of tree protection fencing in accordance with the City of Burlington's Tree Protection and Preservation Specification SS12A: https://www.burlington.ca/en/services-for-you/resources/Forestry%20Operations/Tree_Protection_and_Preservation/City-of-Burlington-Standard-Specification-for-Tree-Protection-and-Preservation.pdf
- Minimum Tree Protection Zones and Critical Root Zones clearly shown and labeled in addition to tree protection fencing
- Percentage of injury should be clearly shown on the plan and noted in the Arborist Report, and impacts and damage mitigation methods outlined
- Clearly show the excavation limits on the plan (e.g. foundations or footings, trenching, etc.) and discuss damage mitigation measures (e.g. root pruning) in the Arborist Report
- Alternate layouts and construction measures should be considered and discussed in the Arborist Report to ensure any proposed removals are necessary and justified (i.e. there are no alternatives to the removal)
- Abbreviations should be defined and industry standard terminology used
- If removal or damage to trees on neighboring properties or boundary trees is required, provide either: 1) letter of consent from adjacent property owners that they are aware of the proposed development and potential impact to their trees or boundary trees and have no objections, OR 2) the Arborist Report should include preservation methods that can be implemented to mitigate damage to neighboring or boundary trees
- Arborist Report should describe compensatory tree planting if trees are proposed to be removed (layout to be shown on the Landscape Concept Plan)

10) Landscape Concept Plan

- Is stamped and signed by a qualified member of the Ontario Association of Landscape Architects
- Contains legible drawings on 24x36 inch paper
- Includes all dimensions in metric, to scale, and on a consistent base map layer
- Includes bar scale
- Identifies the location and general design intent of the proposed landscaped areas and buffers, and outdoor amenity areas

- Identifies minimum required soil volumes, and location of any structural soil cell installation areas to achieve minimum soil volumes ($30m^3$ of soil per tree in a single tree pit, $15m^3$ per tree in a shared planting environment. Excavation for each planting environment should be 0.75m to 1.2m depth and should not exceed 1.5m depth)
- Identifies the location, type and height of proposed fencing
- Identifies property lines, easements, regulated areas, impermeable surfaces (including curbs, roads, driveways, sidewalks, etc.), buildings and entrances, landscaped beds, lawns or other permeable surface areas, other information as needed
- Identifies the location of all underground, at grade and overhead utilities
- Identifies the location of any storm water management infrastructure, including swales, sub-drains, catch basins, pipes, and other quality and quantity controls as required

11) Functional Servicing Report

- Is prepared, signed and stamped by a Professional Engineer.
- Contains legible drawings , including all dimensions, plotted to a metric scale of 1:200, 1:250, 1:300 or 1:500 on 24x36 inch paper, and on a consistent base map layer .
- Follows the terms of reference agreed upon by the Regional and City staff in advance of study commencement. Includes a copy of this approved Terms of Reference as an Appendix.
- Includes digital copies of models.
- Includes all dimensions in metric, to scale, and on a consistent base map layer.

12) Hydrogeological Assessment

- Is prepared, signed and stamped by a qualified person (Professional Geoscientist or Professional Engineer)
- Follows the requirements for Completion of Hydrogeological Studies to Facilitate Conservation Halton's reviews (www.conservationhalton.ca/policies-and-guideline)
- Follows the terms of reference agreed upon by Conservation Halton, Regional and City staff in advance of study commencement. Includes a copy of this approved Terms of Reference as an Appendix.
- Contains legible drawings
- Includes digital copies of models
- Includes all dimensions in metric, to scale, and on a consistent base map layer.

13) Noise & Vibration Feasibility Study

- Is prepared, signed and stamped by a Professional Engineer.
- Includes determination of project feasibility
- Includes assessment of existing and proposed transportation sources of noise and stationary sources of noise and vibration.
- Includes traffic/train counts confirmed by relevant agencies and includes correspondence from those agencies in an appendix.
- Includes assessment of outdoor and indoor acoustical environments, including those onsite and on neighbouring noise sensitive land uses
- Includes clearly defined environmental sound levels for transportation sources of noise and stationary sources of noise as per City's requirements and the MOECC publication NPC-216 and NPC-300 as amended
- Includes investigation of feasible means of noise impact mitigation, including a chart outlining noise control measures required to achieve sound levels of 55dBA (or as close as possible) for each outdoor living area
- Includes all calculations and modeling (i.e. STAMSON output)
- Includes technical details, and clarifies the responsibility for the implementation and maintenance of the required noise control measures.
- Includes recommendations for warning clauses.

14) Traffic Impact Study

- Confirmation of Scope of Work by Burlington Transportation Services staff
- Signed by CET or signed and stamped by a Professional Engineer
- Follows Regional TIS Guidelines for Regional roads
- Follows MTO Guidelines for sites within MTO permit control area
- Includes correspondence about traffic projections from City, Region and MTO in an Appendix.
- Includes SYNCHRO files as an electronic attachment (not a PDF)
- Traffic counts are not completed during school holiday times, and are completed during the mid-week period (Tuesday through Thursday).
- Traffic counts are no older than one year.
- Electronic copy of all signal warrant calculation files (not a PDF)
- Includes all traffic counts and modelling data in an Appendix and electronically
- Includes a multi-modal approach to transportation analysis

- Incorporates Travel Demand Measurement measures

15) Stormwater Management Report

- Please refer to the City of Burlington Stormwater Management Design Guidelines, approved by City Council on June 22, 2020, please be advised of new IDF curves for the City of Burlington: https://www.burlington.ca/en/services-for-you/Stormwater.asp
- Refers to the Ministry of the Environment "Stormwater Management Planning and Design Manual" and the TRCA/CVC Low Impact Development Stormwater Management Planning and Design Guide.
- Is prepared, signed and stamped by a Professional Engineer
- Includes pre and post development drainage area plans that are legible, plotted to an acceptable metric scale, plotted on 24" by 36" paper and plotted on a consistent base map layer
- Includes site grading and servicing plans that are legible, plotted to a metric scale of 1:200, 1:250, 1:300 or 1:500, plotted on 24" by 36" paper and plotted on a consistent base map layer
- Includes digital copies of modeling, modelling program acceptability to be confirmed with City Staff prior to use and prior to submission of report.
- Includes a list of all past reports and current technical documents that have been consulted.
- Includes all calculations, modelling, and parameters (as per City Standard Drawings S-IDF, S-2D, S-3D, etc., as amended)
- Includes clearly defined stormwater criteria for the site (including source) and demonstrates in report how these criteria will be satisfied.
- Addresses all interim conditions as well as the ultimate condition
- Contains engineering details and cross-sections showing existing utility locations if any temporary and/or permanent encroachments are proposed.
- Provide chemical analysis of groundwater to determine if it satisfies the City's storm sewer discharge criteria for water quality. (including documentation from the Geotechnical or Environmental Engineer in the appendix)
- If groundwater cannot be directly outletted to the municipal storm system, detail where it will outlet, i.e. treated then outlet to storm or outlet to the sanitary system.
- Provide an estimate of groundwater flow to be permanently managed in the site storm system (including documentation from the Geotechnical Engineer or Hydro-geologist in the appendix)

- Provide comment on whether or not it is anticipated a permit to take water would be necessary either temporarily during construction or permanently.

16) Grading and Servicing Plans

- Must be separate Plans
- Are stamped and signed by a Professional Engineer
- Contains legible drawings, plotted to a metric scale of 1:200, 1:250, 1:300 or 1:500, on 24" by 36" paper and plotted on a consistent base map layer
- Identifies property lines, dedications, easements, regulated areas, impermeable surfaces (including curbs, roads, driveways, sidewalks, etc.), buildings and entrances, and other information as needed
- Identifies the location of all underground, at grade and overhead utilities
- Identifies the location of all storm water management infrastructure, including swales, sub-drains, catch basins, pipes, and other quality and quantity controls as required
- Identifies Municipal Benchmark and Horizontal Control

17) Geotechnical Study (including Groundwater)

- Is prepared, signed and stamped by a Professional Engineer.
- Contains legible drawings
- Includes digital copies of models
- Includes all dimensions in metric, to scale, and on a consistent base map layer.
- Includes groundwater information (for example: dewatering during construction vs. permanent dewatering to be accommodated in a stormpond). Includes estimated volumes of groundwater to be permanently managed.
- Indicates if a Permit to Take Water would be required either during construction or permanently.
- Includes testing of groundwater to ensure it meets municipal stormwater discharge criteria. (City and Regional staff have been contacted if groundwater does not meet discharge criteria.)
- Contains sufficient quantity and distribution of boreholes to map soil and groundwater conditions for the soil type.
- Provides sufficient monitoring data to address groundwater level seasonality.
- Contains results of any geotechnical test completed.
- Discusses infiltration capabilities if Low Impact Development is proposed.

- Contains shoring and excavation details (for example: tiebacks, caissons, foundations, forming, piles) if underground parking or encroachments are proposed.
- Includes cross-sections, and dimensions from property lines and details of over-digging.
- Includes a stable slope assessment if required at the preconsultation stage. This study refers to the Ministry of Natural Resources and Forestry Technical Guidelines "Natural Hazards Manual Technical Guide – River and Stream Systems: Erosion Hazard Limit" and final topographical survey drawings with stable top of bank delineation signed and stamped by a Professional Engineer.
- Contains confirmation of the need for pre-construction surveys of surrounding buildings, to an extent determined by a Professional Engineer specializing in vibration, OR confirmation that pre-construction surveys are not warranted.

18) Environmental Site Assessment Report

- Completed in accordance with Ontario Regulation 153/04 as amended
- Regional Environmental Site Screen Questionnaire included
- Prepared, signed and stamped by a Qualified Person
- Letter of Reliance for City and Regional staff
- If the Phase One Study recommends a Phase Two Study, then the Phase Two is included with the submission
- If the Phase Two Study recommends site remediation, then the remediation plan is included to ensure that remediation feasibility has been considered.

19) Urban Design Brief:

- Contains a itemized and detailed analysis of how the proposed development meets the urban design objectives and policies of the Official Plan and any relevant approved urban design guidelines.
- Indicates how the proposed development responds to its surrounding context (both existing and planned).
- Provides a close examination and understanding of the surrounding area including blocks, streets, and buildings that could influence overall site and building design.
- Describes the overall architectural expression; building relationship to streetscape and adjacent properties; pedestrian, cycling, and transit connections; sustainable building elements; and other urban design features that ensure design excellence.
- Contains an explanation of how the proposed development is compatible with surrounding land uses including height, setbacks, massing and design.

- Contains a discussion of how input received from the Burlington Urban Design Panel has been used to refine the proposal.
- Include the BUD Meeting Minutes as an Appendix.

20) Waste Management Report

- Contains a loading plan showing turning radii for trucks
- Contains building elevations illustrating vertical clearance for truck access
- Contains details of layout for waste storage areas
- If no public waste collection is proposed, includes a letter confirming private pick-up.

21) Risk Assessments (MIACC & D6)

- Is signed by qualified professional
- Illustrates how the proposal satisfies Provincial D6 Guidelines criteria

22) Construction Management and Mobility Plan:

- Legible, metric scale drawing on 24" x 36" paper
- Clearly identify property lines, easements, floodlines & hazard lands, natural heritage buffers, existing trees/vegetation to be preserved (and tree preservation fencing), etc.
- Clearly identify limits of above ground development, including buildings, parking, sidewalks, curbs, etc.
- Clearly identify limits of underground parking structure, including dimensioning distance from property lines
- Includes shoring and excavation details
- Clearly identify limits of all elements of the underground parking structure including foundation drainage system/shoring/tiebacks/etc.
- Clearly identify limits of temporary perimeter/security fencing, covered sidewalk protection (if proposed) and tree protection fencing
- Clearly identify proposed temporary (trailers/material storage/fencing/etc.) and/or permanent encroachments (tiebacks/shoring/etc.) into the Right of Way and identify approximate time line of closure
- Clearly identify any proposed temporary sidewalk and/or lane closures and identify approximate time line of closure.
- Identify haul route, i.e. what roads are to be used for material deliveries

- Identify crane location and swing radius – please note that further detail/additional requirements will be provided at the site plan stage
- Drawing must clearly note that no trades parking or truck staging will be allowed on the Municipal Right of Way
- The applicant is advised that if the Official Plan Amendment/Re-Zoning application is approved, at the Site Plan stage additional construction management details may be required, including requirement of Road Occupancy and Municipal Consent permits if applicable.