

MEMO

110 Kimberley Ave
Bracebridge, ON P1L 1Z8
T: (705) 645-8853
F: (705) 645-7262
www.pel.ca | pinestone@pel.ca



To: Nadine Rush (Nadine.Rush@barrie.ca) **Sender:** Joe Voisin, P.Eng.

Date: May 12th, 2020 **P.N.:** 20-11501B

Reference: Residential Development
521 & 525 Essa Road, City of Barrie
Watermain Demand / Supply Analysis

PEL has conducted a fire flow analysis for the proposed development at 521 & 525 Essa Road located in the City of Barrie. The proposed development on the property consists of three (3) 12-unit, three-storey, back to back townhouse blocks with garage parking, and 12 standard townhouses with individual driveways for a total of 48 units. Access to the development will be provided by one (1) asphalt driveway from Essa Road in the southeast corner of the site. The servicing works include the installation of sanitary, storm, and water services for the proposed buildings as well as a private hydrant located off the west side of Building #4. A copy of servicing plan is appended for reference.

The purpose of this report is to confirm the available fire flows and residual pressure from the existing 300 mm diameter watermain along Essa Road.

Existing Water Servicing

A 300mm diameter watermain currently exists on the west side of Essa Road. We have utilized the information obtained from the City hydrants in the vicinity of the subject site connected to the existing watermain (results attached). Table 1 illustrates the flow test results provided by Vipond:

Table 1: Results of Hydrant Flow Tests

Test #	Outlet Inside Dia. (in.)	Number of Outlets	Residual Reading (PSI)	Flow@ Residual (gal/min)
1	n/a	n/a	50 (static)	n/a
2	1.75	1	49	504
3	2.5	1	48	653
4	2.5	2	48	1216



Proposed Water Demands

The proposed domestic water demands were based on the following criteria:

- Max day factor of 1.50 and peak hour factor of 2.25 based on MOECC Guidelines Table 3-1 in the Design Guidelines for Drinking Water Systems, 2008.
- Medium density townhouse blocks – 2.34 persons per unit
- Residential water demand of 450 L/cap/day.

Based on the above conditions, Table 2 illustrates the proposed domestic demands for the development.

Table 2: Domestic Water Demand

Population	Avg. Daily Demand (L/cap/day)	Peaking Factors (based on MOECC Guidelines)		Flows (L/sec)	
		Peak Hour	Maximum Day	Peak Hour	Maximum Day
113	450	2.25	1.5	1.33	0.89

Fire demands for the proposed development were calculated in accordance with the Fire Underwriters Survey (FUS) as follows:

$$F = 220C(A)^{0.5}$$

Where,

- F = the required fire flow in litres per minute.
C = coefficient related to the type of construction.
A = total floor area of Building #2 (excluding basements)

Table 3: Water Requirements for Fire Fighting

Total Area (sq.m)	Coefficient "C"	Required Flow (L/min)	Require Flow (L/sec)
1430.70	1.0	8,321.4	138.7

Based on the guidance provided in the FUS and applying the relevant reductions and charges in flow for construction type, sprinkler systems and exposure distances, the required fire flow for the development will increase to 153.4 L/sec. Detailed FUS calculations are attached.

Proposed Water Servicing

The proposed development will be serviced via a new 200mm diameter water service from the existing 300mm diameter watermain located on the west side of Essa Road. Based on the provided flow test results, it can be concluded that the max day plus fire flow rate of 154.3 L/sec can be delivered to the proposed buildings with a residual pressure of 26.2 psi. Calculations are appended for further information.



We trust this is satisfactory and invite you to call should you have any questions in this regard.

Sincerely,
PINESTONE ENGINEERING LTD.

Dwight Hordyk, EIT
Project Designer

Attachments



Joe Voisin, P.Eng
Senior Engineer

FLOW TEST RESULTS



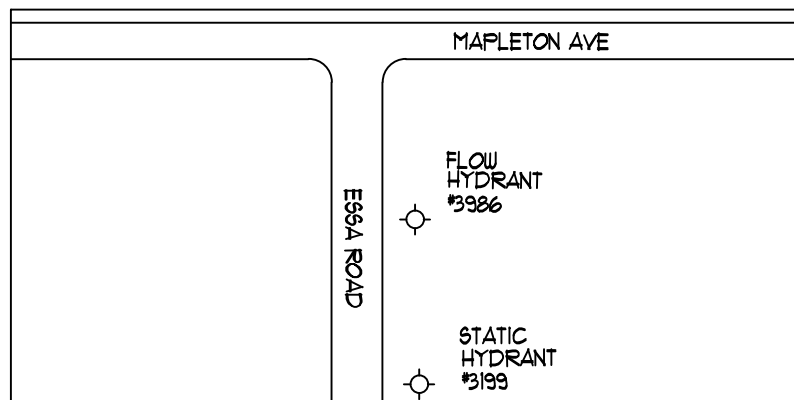
DATE : APRIL 14, 2020 TIME : 10:30 AM

LOCATION : 521 ESSA ROAD

BARRIE

ONTARIO

TEST BY : VIPOND FIRE PROTECTION AND LOCAL PUC



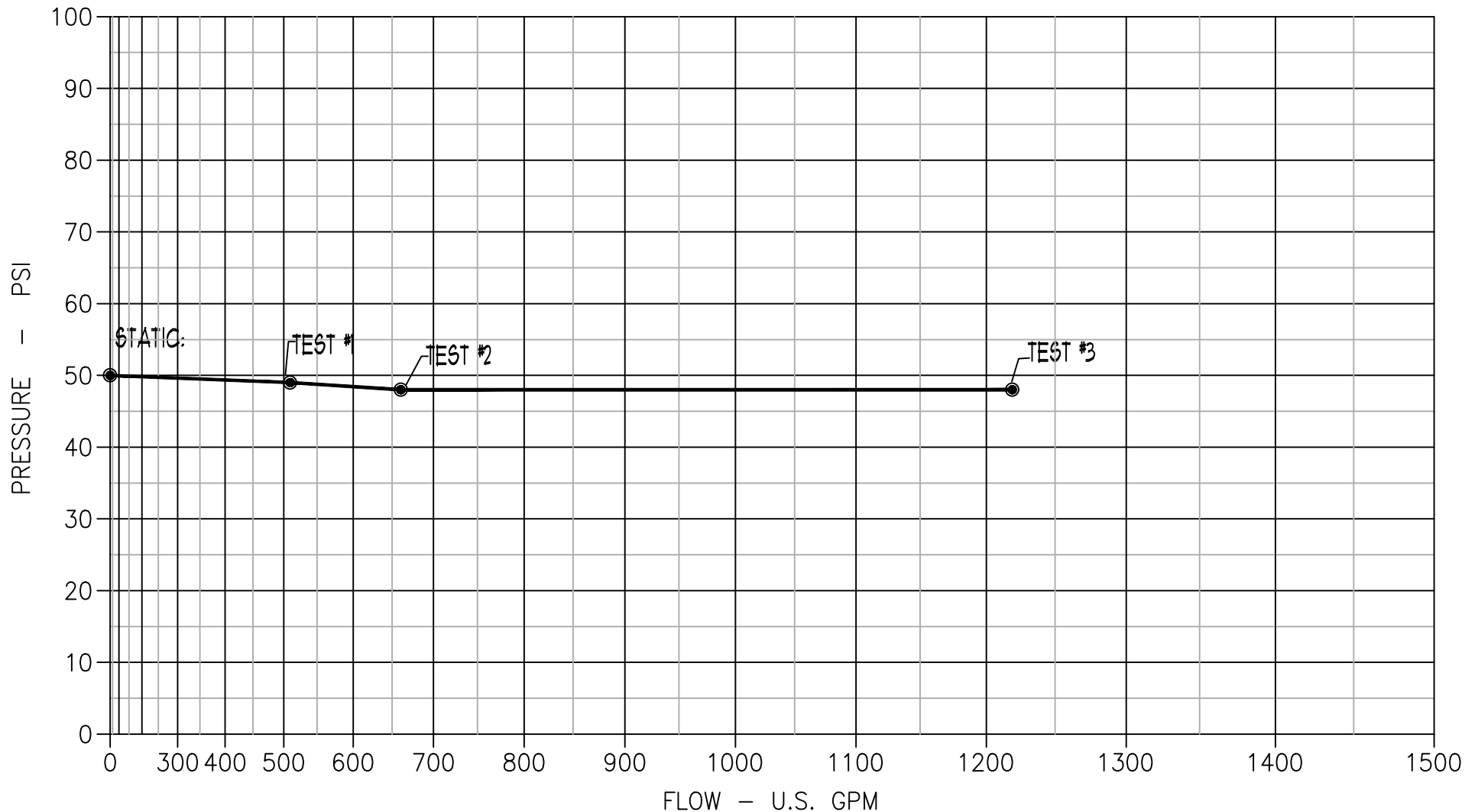
STATIC PRESSURE : 50 PSI UNDERGROUND TYPE & SIZE : N/A

TEST NO.	NO. OF NOZZLES	NOZZLE DIAMETER (INCHES)	DISCHARGE CO-EFFICIENT	RESIDUAL PRESSURE (PSI)	PITOT PRESSURE (PSI)	DISCHARGE (U.S.GPM)
1	1	1 3/4"	0.995	49	32	504
2	1	2 1/2"	0.90	48	15	653
3	2	2 1/2"	0.90	48	13	1216



521 ESSA ROAD	BY :	LEN K.
BARRIE	VIPOND OFFICE :	BARRIE
ONTARIO	TEST BY :	VIPOND & PUC
	DATE :	APRIL 14, 2020

STATIC:		RESIDUAL:		FLOW:
<u>50</u> PSI	TEST#1	<u>49</u> PSI	@	<u>504</u> GPM
	TEST#2	<u>48</u> PSI	@	<u>653</u> GPM
	TEST#3	<u>48</u> PSI	@	<u>1216</u> GPM





SITE 521 & 525
ESSA ROAD

TEST HYDRANTS

ESSA ROAD

MAPLETON AVE.

Scale 1: 2,257

Fire Flow Calculations – Fire Underwriters Survey 1999

521 & 525 Essa Road, City of Barrie

Building #2 Gross Floor Area = 1430.70 m²

Building #2 is used as a worst-case scenario since it has maximum exposure charges (middle building).

Fire demands for the proposed development were calculated in accordance with the Fire Underwriters Survey (FUS) as follows:

$$F = 220C(A)^{0.5}$$

Where,

F = the required fire flow in litres per minute.

C = coefficient related to the type of construction.

A = total floor area of building (excluding basements) calculated as per FUS

C = 1.0 for ordinary construction

$$F = 220 * 1.0 * (1430.70)^{0.5}$$

$$F = 8,321.4 \text{ L/min}$$

$$F = 138.7 \text{ L/sec}$$

Reductions:

Reduction for low hazard occupancy (-15%)

$$\text{Fire Flow} = 117.9 \text{ L/sec}$$

Reduction for sprinkler systems within Buildings #2 (-30%)

$$\text{Fire Flow} = 82.6 \text{ L/sec}$$

Exposure charge for building to the north (~35 m) (+5%)

Exposure charge for building to the south (~10.1 m) (+15%)

Exposure charge for building to the east (~9 m) (+20%)

Exposure charge for building to the west (~9 m) (+20%)

Total charge = 60% or 70.8 L/sec on the 117.9 L/sec fire flow

Required fire flow as per FUS 1999 calculation = 153.4 L/sec

521 & 525 Essa Road Residential Development

FIRE FLOW ANALYSIS

Barrie, Ontario



Project Number: 20-11501B

Date: May 7th, 2020

Design By: DPH

File: Z:\Project Documents\11501B 521-525 Essa Road Townhomes\Water Servicing Memo\Site Fire Flow Analysis.xls

CALCULATION OF RESIDUAL PRESSURE AT BUILDING

1. Boundary Conditions (Based on Fire Flow Test Results):

	Metric	Imperial	
P0 - Starting Pressure	35.16 m	50 psi	
P1 - Pressure at Q1	33.76 m	48 psi	
Q1 - From Fire Flow Test	4603 L/min	1216 U.S. gal/min	
Q2 - Required Flow	9258 L/min	2446 U.S. gal/min	From FUS
P-loss 1	1.41 m	2 psi	
P-loss 2	5.13 m	7 psi	
P2 - Residual Pressure	30.03 m	43 psi	Extrapolated from Fire Flow Test Results

2. Friction Losses Through Water Service:

Hazen-Williams Equation	Metric	Imperial
C _{hw} = Pipe Friction Factor	140	140
k = conversion factor	10.675	4.727
n = constant	1.852	1.852
m = constant	4.8704	4.8704
Q = Flow	0.1543 m ³ /s	2446 U.S. gal/min
d = Pipe Diameter	200 mm	7.87 in
p = Loss/Length	0.0901 m/m	0.0391 psi/ft
Length	80 m	262 ft
Loss	7.21 m	10.3 psi
	71 kPa	

3. Friction Losses Through Apurtenances:

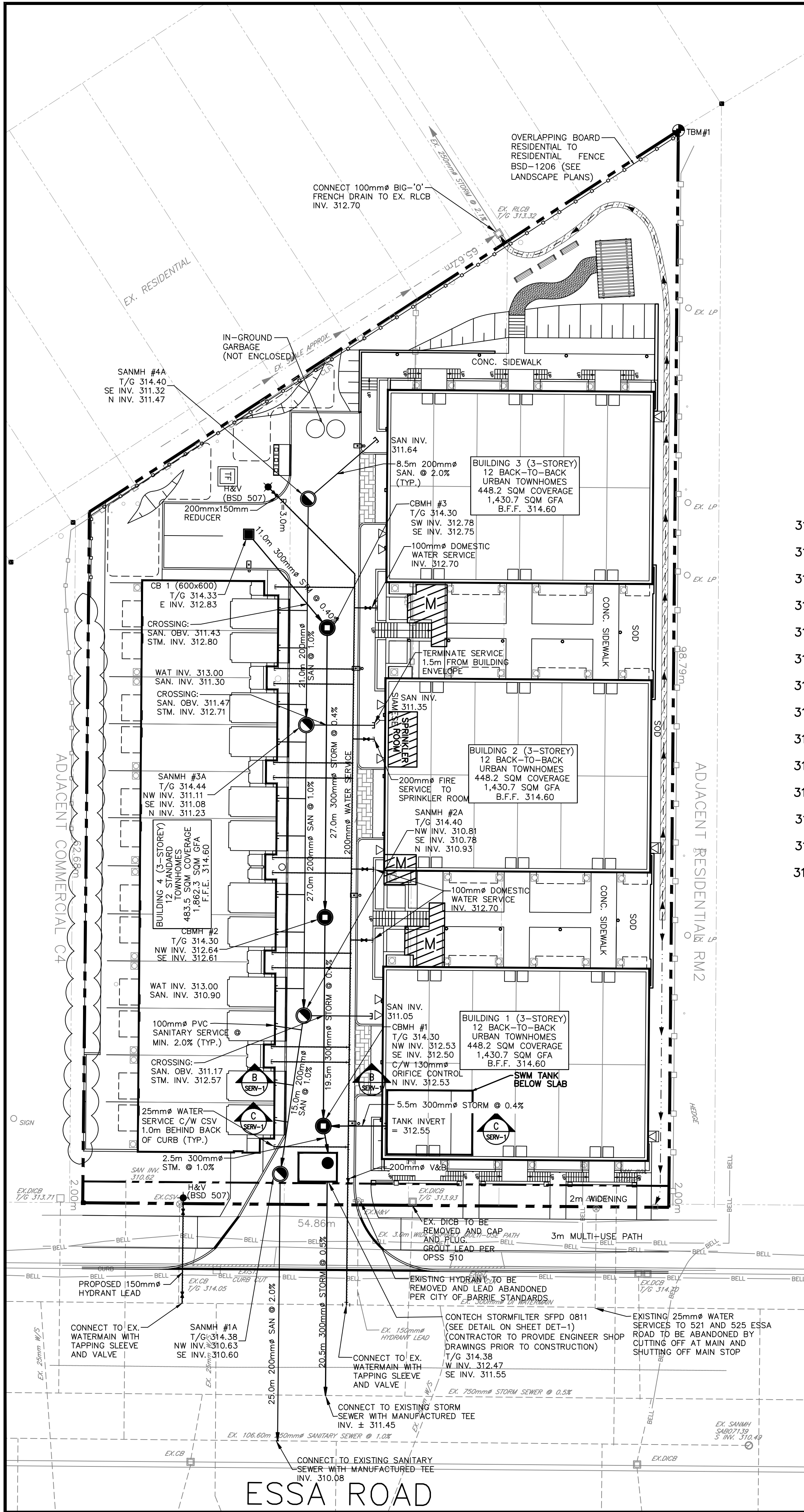
Apurtenances	Number	K	Velocity m/s	Head Loss m	Total Loss m	Total Loss psi
200m Tee (run)	4	0.400	4.912	0.492	1.967	2.797
200mm Tee (branch)	1	1.000	4.912	1.230	1.230	1.748
Valve - 200mm dia.	2	0.17	4.912	0.209	0.418	0.594
Elbow - 200mm dia.	1	0.35	4.912	0.430	0.430	0.612
Total Minor Losses					4.045	5.752

4. Elevation - Elevational differences from existing hydrant to proposed hydrant

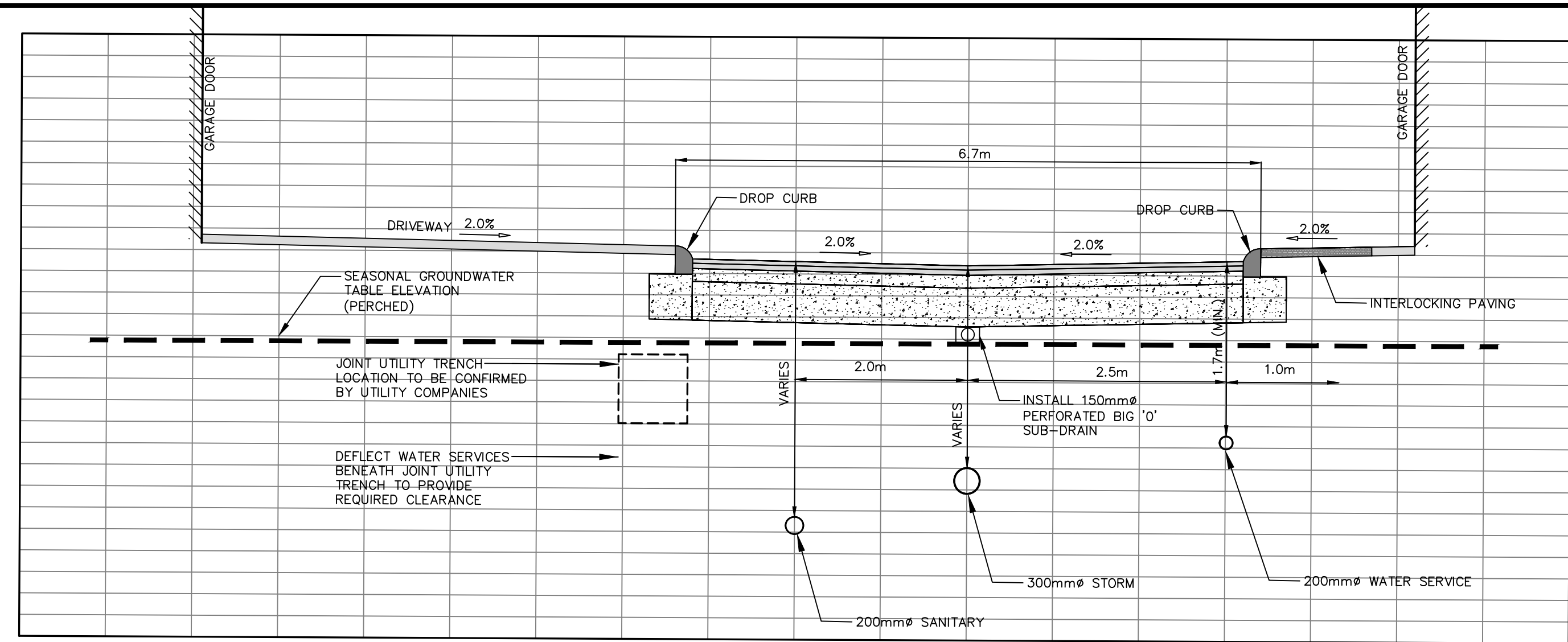
	Metric	Imperial
Elevation at Boundary (i.e. Residual Hydrant):	314.25 m	1031 ft
Elevation at Building:	314.6 m	1032 ft
Elevation Difference = Loss/Gain	0.35 m	0.5 psi

ANALYSIS SUMMARY

Total Losses	11.605 m	
	113.85 kPa	16.5 psi
Residual Pressure after Losses	18.43 m	
	181 kPa	26.2 psi
		PASS
<i>Allowable Residual Pressure</i>	<i>138 kPa</i>	<i>20.0 psi</i>

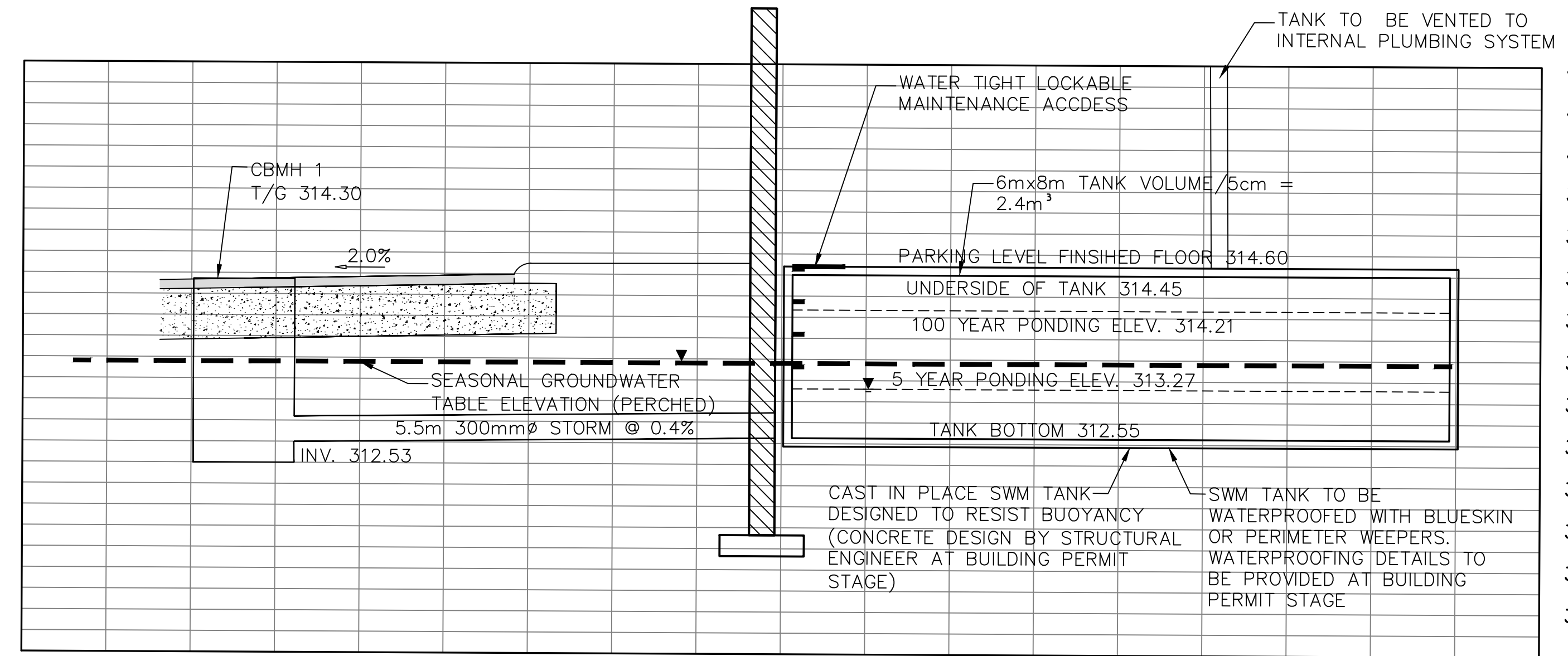


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SECTION B-B
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SECTION C-C
TYPICAL SWM TANK SECTION
H 1:50 V 1:50

NOTE:
REFER TO TREE PROTECTION PLAN FOR
TREE REMOVALS AND PRESERVATION
AREAS.

HORIZONTAL CONTROL MONUMENTS
U.T.M. (ZONE 17) NAD 83
ELEVATIONS SHOW GEODETIC DRIVEN FROM CITY OF
BARRIE BENCHMARK #03120030016 ELEVATION, 314.967.
BEARINGS HERE IN ARE GRID BEARINGS ARE DERIVED
FROM CONTROL MONUMENTS 031950003
(N=4910748.411, E=603095.546) AND ARE REFERRED
TO CENTRAL MERIDIAN (81 DEGREES OF LONGITUDE IN
ZONE, 17 AND ARE BASED ON NAD83)
BENCHMARK V01085470 300.3254 - CONCRETE
HEADWALL ON EASTSIDE OF RED FERN AVENUE, 0.15km
NORTH OF DYER ROAD. TABLET IS SET HORIZONTALLY IN
THE EAST FACE, 16.3m EAST OF CENTERLINE OF ROAD,
52cm WEST OF SOUTH END, 42 cm BELOW THE TOP

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The position of existing above ground and underground utilities and facilities are not necessarily shown on the drawings, and where shown, the accuracy of the position of such utilities and facilities is not guaranteed. Before starting work, the contractor shall confirm the exact location of all existing utilities and facilities, and shall assume all liability for damage to them.

Drawings shall not be used for construction unless sealed and signed. All work to be performed in accordance with the Occupational Health & Safety Act 1990.

Any errors and/or omissions shall be reported to Pinestone Engineering Ltd. without delay.



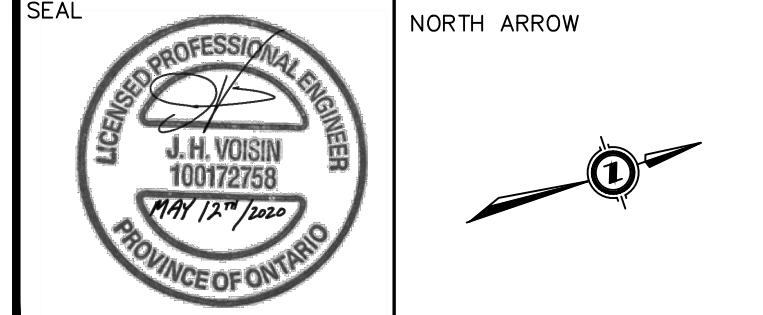
- NOTES**
1. TOPOGRAPHIC SURVEY AND LEGAL INFORMATION COMPLETED BY AZIZ SURVEYORS INC. APRIL 6 2017.
 2. SITE PLAN PREPARED BY PATRICK MARCUS LUCKIE, ARCHITECT APRIL 10TH 2018
 3. LOCATE CURB STOP (CSV'S) WITHIN LANDSCAPE AREAS WHERE POSSIBLE
 4. 100mm WATER SERVICES C/W BYPASS PER CITY STANDARD BSD-533 AND BACK-FLOW PREVENTION PER CITY BY-LAW 2017-121
 5. PRIVATE HYDRANT SHALL BE PAINTED RED.
 6. FINAL SIZE AND LOCATION OF THE DOMESTIC WATER SERVICES TO BE DETERMINED AT BUILDING PERMIT STAGE

- LEGEND**
- PROPOSED CATCHBASIN
 - PROPOSED CONTECH STORMFILTER MODEL NO. SFPD0811
 - PROPOSED CATCHBASIN MANHOLE
 - PROPOSED SANITARY MANHOLE
 - PROPOSED HYDRANT
 - WATER METER LOCATION
 - LIGHT STANDARDS
 - FRENCH DRAIN
 - SIDE YARD SWALE

BENCHMARK
TBM#1
TOP OF IB IN NORTHWEST CORNER OF PROPERTY
ELEVATION 314.30

2	20.05.13	SITE PLAN REVISION	G.N.
1	19.06.06	REVISED PER CITY COMMENTS	G.N.

NO.	YY.MM.DD	REVISION	BY
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DESIGN BY:	J.V.
DRAWN BY:	G.N.
CHECKED:	J.V.
DATE:	MARCH 2020
SCALE:	1:250

CLIENT/PROJECT

521 AND 525 ESSA ROAD RESIDENTIAL DEVELOPMENT		
DRAWING TITLE GENERAL SERVICING PLAN		
PROJECT NO. 20-11501-B	DRAWING NO. SERV-1	REVISION 2