APPENDICES

Appendix A : HYDRAULIC ANALYSIS EXCERPTS

South Nepean Town Centre - Domestic Water Demand Estimates

Densities as per City Guidelines:

Apartments	1.8	ppu
Townhomes	2.7	ppu
Mid-Rise (2-4)	100	units/ha
Mid-Rise (4-6)	200	units/ha
High Density	250	units/ha

Area ID	Residential Area	# of Units	Population	Institutional Area (ha)	Daily Rate of Demand (L/cap/day)	Daily Rate of Demand (L/ha/day)	Avg Day Demand		Max Day Demand[1]		Peak Hour Demand[2]	
							(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Block 1	1.60	160	432	0.00	350	0	105.0	1.75	262.5	4.38	577.5	9.63
Block 2	1.72	172	464	0.00	350	0	112.9	1.88	282.2	4.70	620.8	10.35
Block 3	1.24	310	558	0.00	350	0	135.6	2.26	339.1	5.65	745.9	12.43
Block 4	1.45	290	783	0.00	350	0	190.3	3.17	475.8	7.93	1046.7	17.45
Block 7	0.00	0	0	0.00	350	0	0.0	0.00	0.0	0.00	0.0	0.00
Block 8	0.00	0	0	0.00	350	0	0.0	0.00	0.0	0.00	0.0	0.00
Block 9-16	0.78	41	111	0.00	350	0	26.9	0.45	67.3	1.12	148.0	2.47
Block 5	0.00	0	0	0.62	0	25000	10.8	0.18	16.1	0.27	29.1	0.48
Block 6	0.00	0	0	1.62	0	25000	28.1	0.47	42.2	0.70	75.9	1.26
Total Site :	**2348**						**610**	**10.16**	**1485**	**24.75**	**3244**	**54.07**

Average day water demand for residential areas: 350 L/cap/d

The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:

1 maximum day demand rate = 2.5 x average day demand rate for residential

2 peak hour demand rate = 2.2 x maximum day demand rate for residential

Water demand criteria used to estimate peak demand rates for commercial/institutional areas are as follows:

1 maximum day demand rate = 1.5 x average day demand rate

2 peak hour demand rate = 1.8 x maximum day demand rate

Scenario 1A:
- Entire study area serviced by Zone BARR with no direct connections between KB and NTC;
- Represents a scenario where KB is developed independently of NTC (**Figure 2-3**);
- Existing (2012) demands under existing network conditions;
- KB area connected to existing development north of Strandherd;

Scenario 1B:
- Entire study area serviced by Zone BARR with no direct connections between KB and NTC;
- Represents a scenario where KB is developed independently of NTC (**Figure 2-3**);
- Existing (2012) demands under existing conditions;
- KB area connected to existing development north of Strandherd and a new watermain connection to the existing 254mm diameter pipe on Fraser Fields Way (for additional fire flow support);

Scenario 1C:
- Study area serviced by Zone BARR with direct connections between KB and NTC;
- Represents a scenario where both areas are developed concurrently (**Figure 2-4**);
- Existing (2012) demands under existing conditions;
- KB area connected to existing development north of Strandherd and two new 305mm diameter watermains connections across the future stormwater facilities to the NTC lands.

Model results are summarized in **Table 2-3**. Under existing network conditions, 100% of the nodes in the KB & NTC lands exceed the 80 psi threshold requiring pressure reduction measures per the Ontario Building/Plumbing Code.

With respect to minimum pressures under peak demand conditions, all pressures at nodes in the NTC lands remain greater than 51 psi whereas the minimum pressure in the KB lands is 64psi. These minimum pressure values are within acceptable guideline ranges.

Available fire flow to the KB lands is restricted by existing smaller diameter watermain, as shown in Scenario 1A, the minimum fire flow observed is 10,080L/min. With a third connection along Fraser Fields, the fire flow increases to 12,120. If the KB lands were connected to the NTC lands (Scenario 1C) the available fire flow would exceed 15,000L/min.

Table 2-3: Pre Zone Reconfiguration - Results Under Various Scenarios

		AVDY (psi)	PKHR (psi)	Available Fire Flow (L/min) @ 20 psi
Scenario & Area	**Zone**	**Max**	**Min**	
Scenario 1A: KB	BARR	99-102	64-67	10,080
Scenario 1A: NTC	BARR	82-103	51-72	> 15,000
Scenario 1B: KB	BARR	99-102	66-69	12,120
Scenario 1B: NTC	BARR	82-103	51-72	> 15,000
Scenario 1C: KB	BARR	99-102	67-70	> 15,000
Scenario 1C: NTC	BARR	82-103	51-72	> 15,000

* Pressures greater than 80psi exceed the allowable range as per the OBC

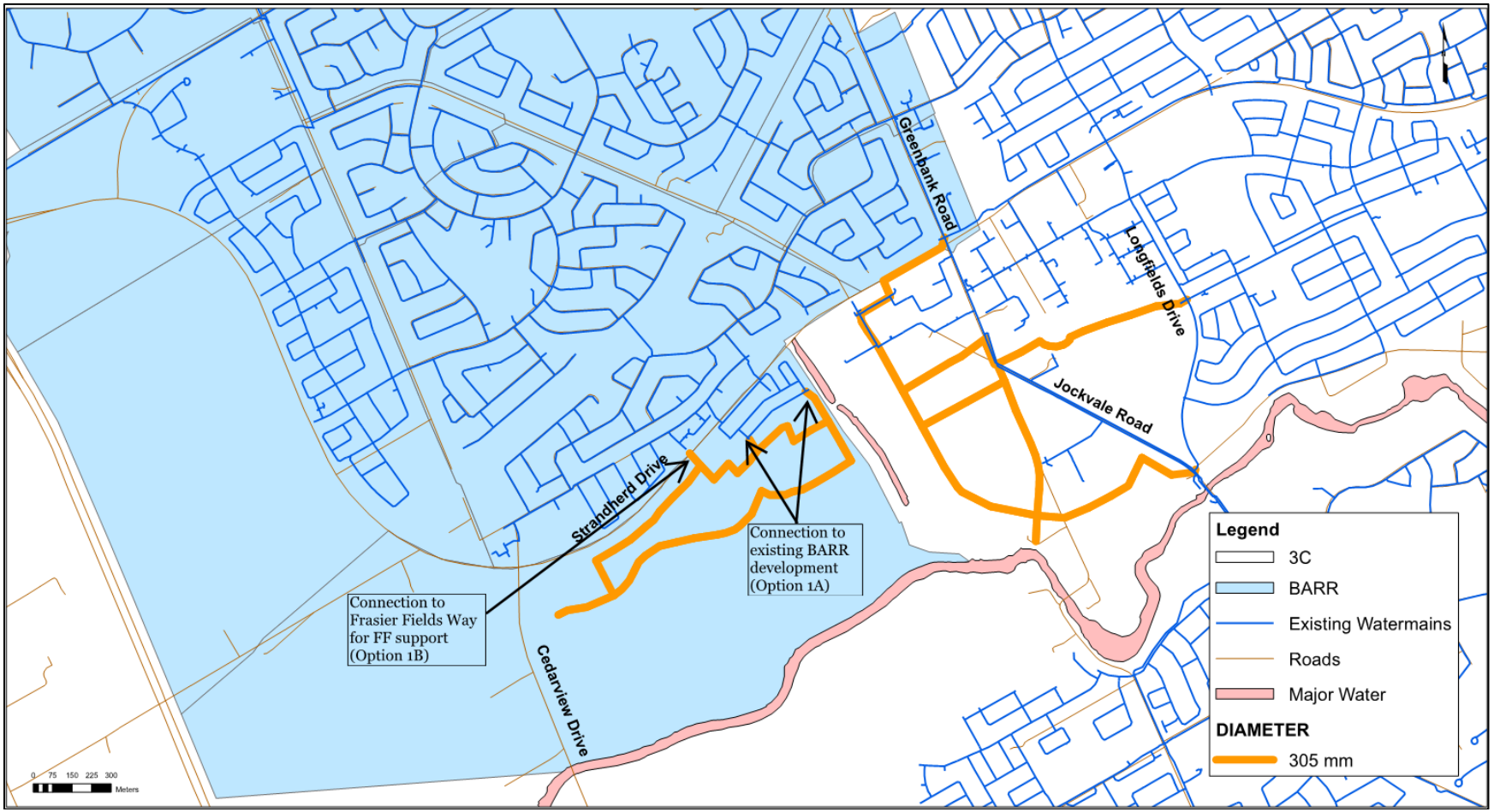


Figure 2-3: Proposed Pipe Layout Pre Zone Reconfiguration – Scenarios 1A and 1B

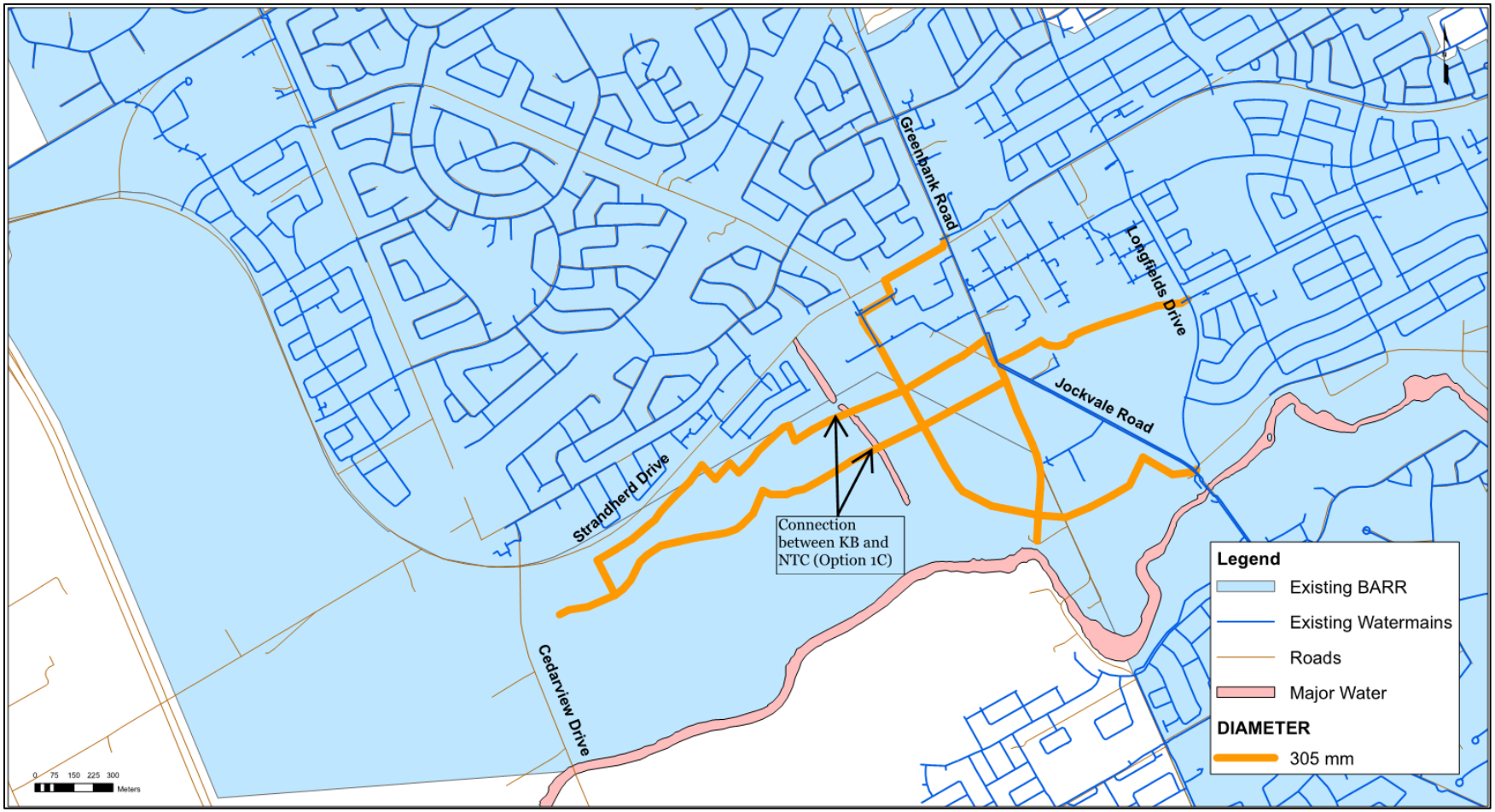


Figure 2-4: Proposed Pipe Layout Pre Zone Reconfiguration – Scenario 1C

2.7.2 Post Zone Reconfiguration – Future Demand Conditions

Scenario 2A: Prior to 406mm diameter watermain along Strandherd
- Represents scenario where KB operates at BARR pressure (*blue*) and NTC operates at 3C pressure (*white*) post zone reconfiguration (**Figure 2-5**);
- 2031 demands under 2031 network conditions;
- KB area connected to existing development north of Strandherd and a new watermain connection to the existing 254mm diameter pipe on Fraser Fields Way;

Scenario 2B: Post construction of 406mm watermain along Strandherd
- Represents scenario where KB operates at BARR pressure (*blue*) and NTC operates at 3C pressure (*white*) post zone reconfiguration (**Figure 2-6**);
- 2031 demands under 2031 network conditions;
- KB area connected to existing development north of Strandherd and to a future BARR 406mm diameter watermain along Strandherd;

Scenario 3: KB and NTC both serviced by Zone 3C
- Represents scenario where study area operates at 3C pressure (*white*) post zone reconfiguration (**Figure 2-7**);
- 2031 demands under 2031 network conditions;
- Two 305mm diameter watermains connecting KB and NTC across future stormwater facilities;
- KB area not connected to existing development along Strandherd.

Model results are summarized in **Table 2-4**. As shown in Scenario2A and 2B, keeping the KB lands in Zone Barr results in maximum pressures exceeding the 80 psi threshold and would require pressure reduction measures per the Ontario Building/Plumbing Code (similar to existing development conditions). If the KB development is switched to Zone 3C post reconfiguration, the maximum pressures drop below the threshold. For all scenarios, the maximum pressures within the NTC lands remain just below the maximum pressures threshold and therefore would not require pressure reduction measures.

Available fire flow to the KB lands is restricted by existing smaller diameter watermain in the development to the north. In order for fire flows to increase to greater than 15,000 L/min, connections to a new larger diameter watermain along Strandherd would be required. Similarly, if the KB lands were to be directly connected to the NTC lands and disconnected from Zone Barr, this alternative would also increase fire flows to KB lands to greater than 15,000L/min.

Table 2-4: Post Zone Reconfiguration - Results Under Various Scenarios

		AVDY (psi)	PKHR (psi)	Available Fire Flow (L/min) @ 20 psi
Scenario & Area	**Zone**	**Max**	**Min**	
Scenario 2A: KB	BARR	95-98	78-81	10,980
Scenario 2A: NTC	3C	59-80	51-70	> 15,000
Scenario 2B: KB	BARR	91-94	80-83	> 15,000
Scenario 2B: NTC	3C	59-80	51-70	> 15,000
Scenario 3: KB	3C	76-79	66-69	> 15,000
Scenario 3: NTC	3C	59-80	51-70	> 15,000

* Pressures greater than 80psi exceeds the allowable maximum pressure per the OBC

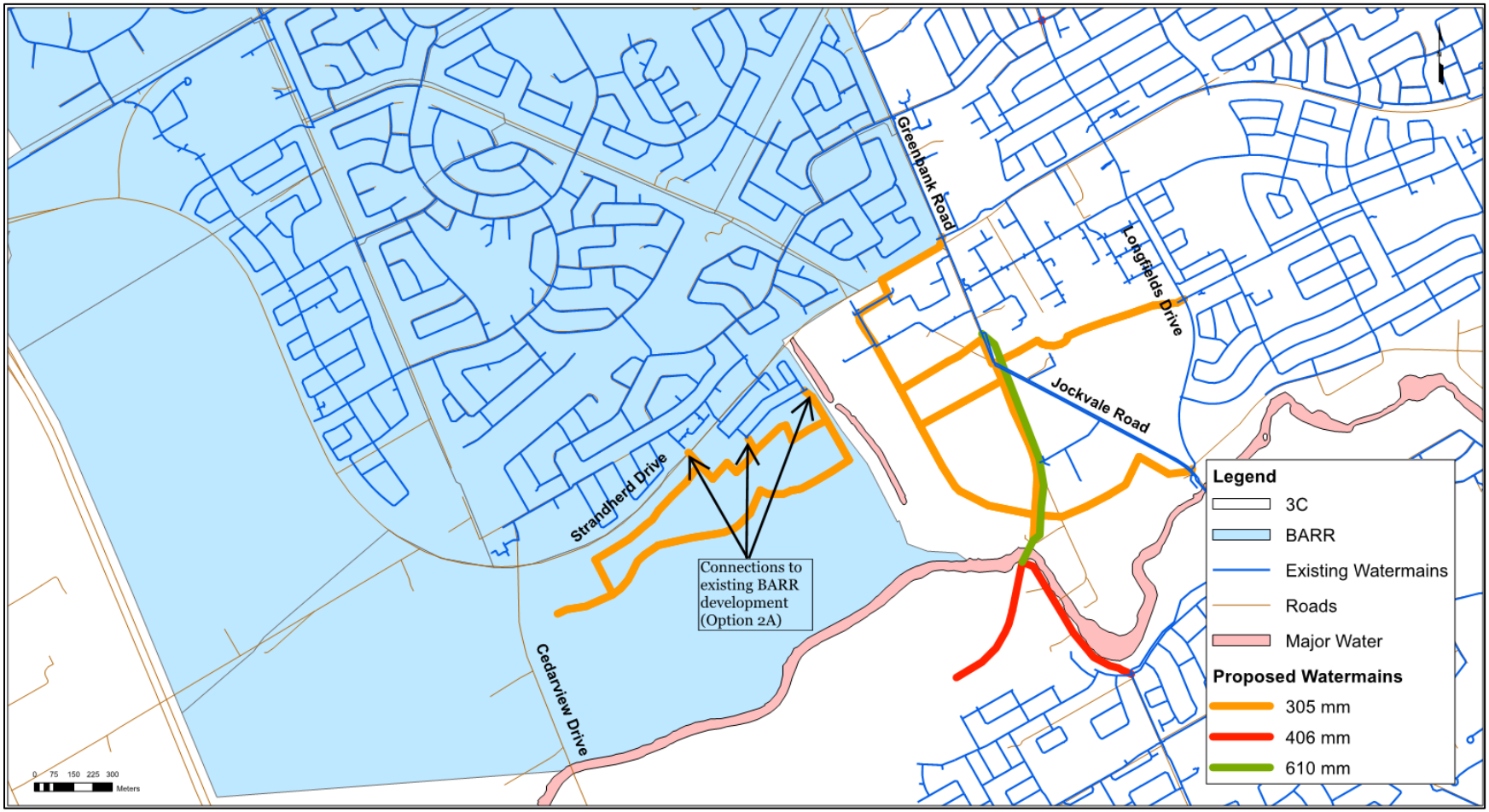


Figure 2-5: Proposed Pipe Layout Post Zone Reconfiguration – Scenario 2A

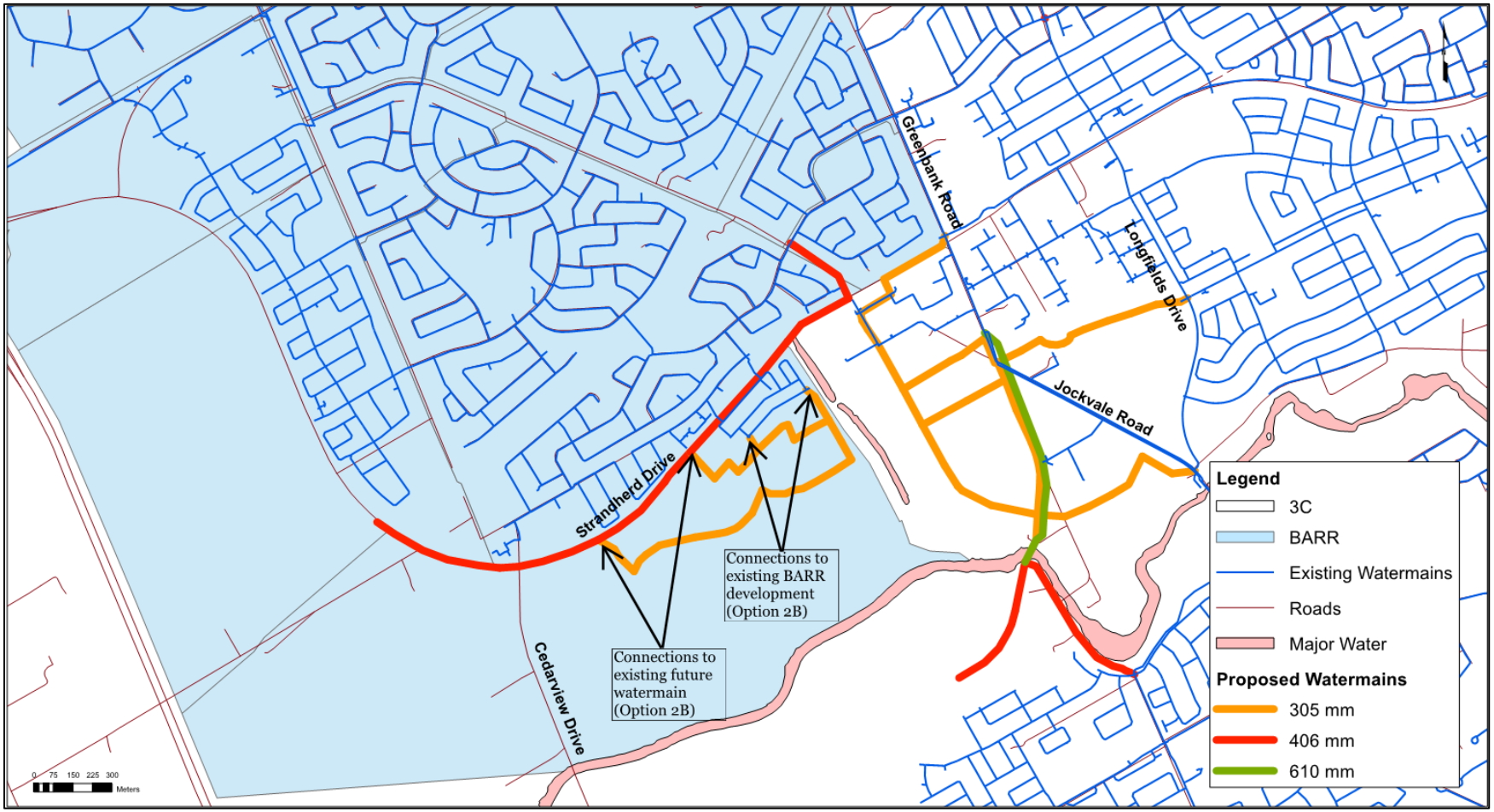


Figure 2-6: Proposed Pipe Layout Post Zone Reconfiguration – Scenario 2B

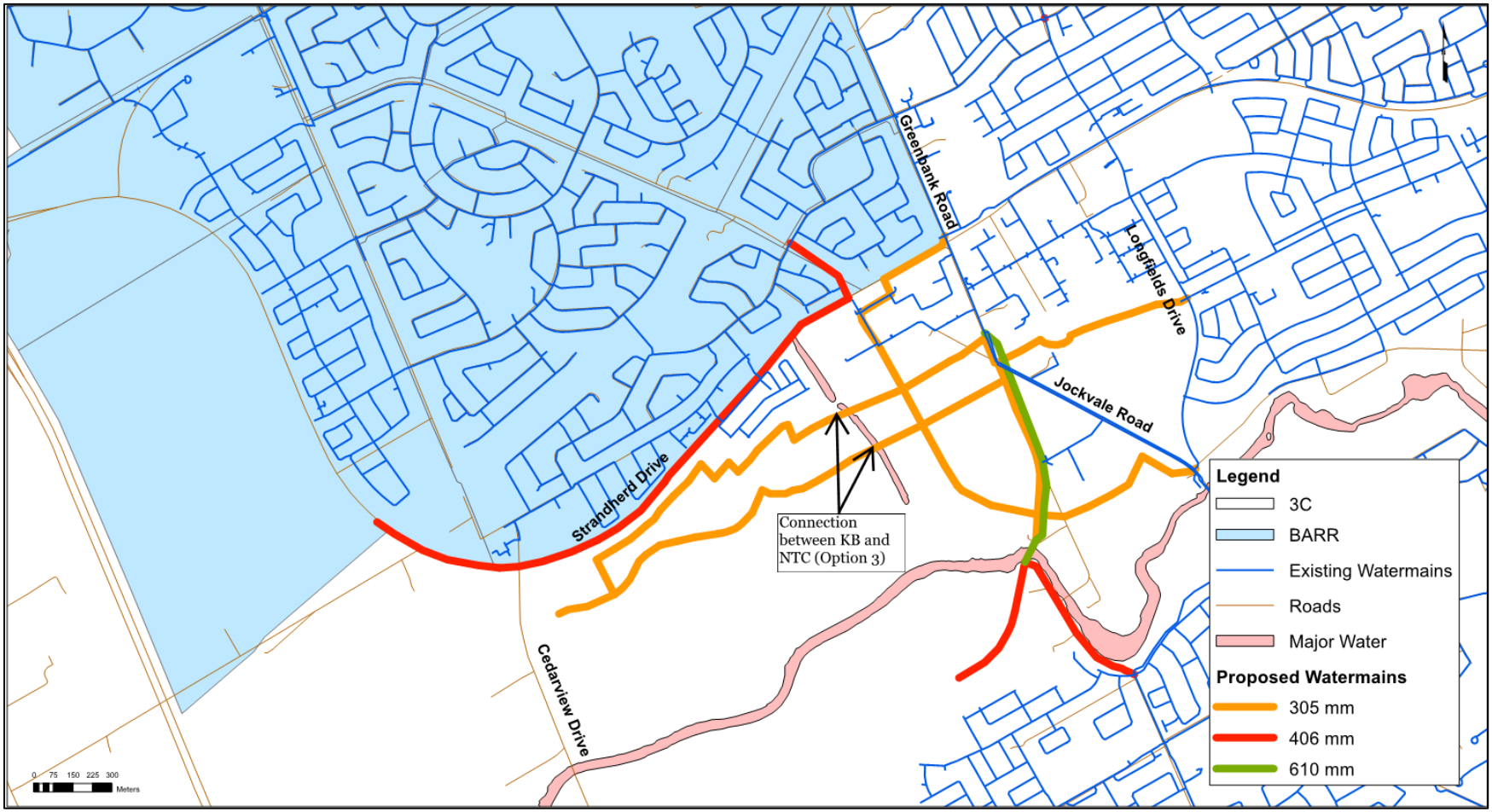


Figure 2-7: Proposed Pipe Layout Post Zone Reconfiguration – Scenario 3

Appendix B : SANITARY SEWER CALCULATIONS

Stantec

SUBDIVISION:

SOUTH NEPEAN TOWN CENTRE

DATE: 31/10/2019
REVISION: 2
DESIGNED BY: AJ
CHECKED BY: KS

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401085

Draft Plan Approval Preliminary Design

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	**FLOW**	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)	VEL. (ACT.)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)	(m/s)
R302A	302	301	1.24	0	0	310	558	1.24	558	3.36	6.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	1.24	1.24	0.4	6.5	27.0	200	PVC	SDR 35	0.50	23.6	**27.42%**	0.74	0.53
I303A	303	301	0.00	0	0	0	0	0.00	0	3.80	0.0	0.00	0.00	0.00	0.00	0.00	0.00	1.61	1.61	0.00	0.00	0.8	1.61	1.61	0.5	1.3	32.3	200	PVC	SDR 35	0.50	23.6	**5.56%**	0.74	0.33
R301A, R301B, R301C, R301D	301	300	3.19	0	213	0	575	4.43	1133	3.21	11.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.61	0.00	0.00	0.8	3.19	6.04	2.0	14.6	174.3	200	PVC	SDR 35	0.50	23.6	**61.62%**	0.74	0.68
R300B, R300A, R300C, I300D	300	300A	4.04	0	450	0	1215	8.47	2348	3.02	23.0	0.00	0.00	0.00	0.00	0.00	0.00	0.62	2.23	0.00	0.00	1.1	4.66	10.70	3.5	27.6	31.9	250	PVC	SDR 35	0.50	42.9	**64.45%**	0.86	0.80
																												250							

PROJECT #: 115075
DESIGNED BY: CMS
CHECKED BY: MJP
DATE: August 20, 2015

SANITARY SEWER DESIGN SHEET

South Nepean Collector - Phase 2 & 3

Theoretical Future Full Service Peak Wastewater Flow

NOVATECH
Engineers, Planners & Landscape Architects

Location			Areas				Population				Individual Design Flows			Cumulative Design Flows				
Area I.D.	Existing / Proposed Land Use	Upstream Node	Gross Commercial Area (ha)	Gross Institutional Area (ha)	Gross Residential Area (ha)	Total Gross Area (ha)	Residential Popultation Density (people / ha)	Individual Residential Population	Cumulative Residential Population	Residential Peaking Factor (Harmon Eqn[1])	Commercial Peak Flow Rate[2] (50,000 L/ha/d) (L/s)	Institutional Peak Flow Rate[2] (50,000 L/ha/d) (L/s)	Infiltration / Inflow Rate (0.28 L/s/ha) (L/s)	Commercial (L/s)	Institutional (L/s)	Infiltration / Inflow (L/s)	Residential Peak Flow Rate (350 L/cap/d) (L/s)	Cumulative Peak Design Flow (L/s)
A1	Commercial	130	12.80			12.80					11.1	0.0	3.6	11.1	0.0	3.6	0.0	14.7
A2-A	Commercial	130	85.18			85.18					73.9	0.0	23.9	85.1	0.0	27.4	0.0	112.5
A2-B	Commercial	130	32.46			32.46					28.2	0.0	9.1	113.2	0.0	36.5	0.0	149.8
A3-A	Low Density Residential	130			16.18	16.18	95.2	1540	1540	3.67	0.0	0.0	4.5	113.2	0.0	41.1	22.9	177.2
A3-B	Institutional	130		10.30		10.30			1540	3.67	0.0	8.9	2.9	113.2	8.9	43.9	22.9	189.0
A3-C	Medium Density Residential	130			5.19	5.19	162.0	841	2381	3.53	0.0	0.0	1.5	113.2	8.9	45.4	34.0	201.6
A3-D	Commercial	130	0.58			0.58			2381	3.53	0.5	0.0	0.2	113.7	8.9	45.6	34.0	202.2
A3-E	Low Density Residential	130			35.68	35.68	95.2	3397	5778	3.19	0.0	0.0	10.0	113.7	8.9	55.5	74.6	252.8
A3-F	Medium Density Residential	130			8.26	8.26	162	1338	7116	3.10	0.0	0.0	2.3	113.7	8.9	57.9	89.4	269.9
A3-G	Institutional	130		0.90		0.90			7116	3.10	0.0	0.8	0.3	113.7	9.7	58.1	89.4	270.9
A4	Low Density Residential	130			34.44	34.44	95.2	3279	10395	2.94	0.0	0.0	9.6	113.7	9.7	67.8	123.7	314.9
A2-C	Commercial (ex. snow dump)	120	15.25			15.25			10395	2.94	13.2	0.0	4.3	127.0	9.7	72.0	123.7	332.4
A3-H	Low Density Residential	120			6.09	6.09	95.2	580	10974	2.91	0.0	0.0	1.7	127.0	9.7	73.7	129.6	340.0
A5	Commercial	110	17.72			17.72			10974	2.91	15.4	0.0	5.0	142.4	9.7	78.7	129.6	360.3
A6-A	Commercial	100	15.18			15.18			10974	2.91	13.2	0.0	4.3	155.5	9.7	82.9	129.6	377.8
A6-B	Institutional	100		6.05		6.05			10974	2.91	0.0	5.3	1.7	155.5	15.0	84.6	129.6	384.7
A6-C	Medium Density Residential	90			4.87	4.87	162.0	789	11763	2.88	0.0	0.0	1.4	155.5	15.0	86.0	137.4	393.9
A6-D	Low Density Residential	90			17.56	17.56	95.2	1672	13435	2.83	0.0	0.0	4.9	155.5	15.0	90.9	153.8	415.2
A6-E	Low Density Residential	90			6.94	6.94	95.2	661	14096	2.81	0.0	0.0	1.9	155.5	15.0	92.9	160.2	423.6
A7-A	Commercial	90	13.62			13.62			14096	2.81	11.8	0.0	3.8	167.4	15.0	96.7	160.2	439.2
A7-B	High Density Residential	90			11.01	11.01	135.0	1486	15582	2.76	0.0	0.0	3.1	167.4	15.0	99.8	174.3	456.4
A7-C	Medium Density Residential	90			6.97	6.97	162.0	1129	16711	2.73	0.0	0.0	2.0	167.4	15.0	101.7	184.9	468.9
A7-D	Medium Density Residential	90			11.74	11.74	162.0	1902	18613	2.68	0.0	0.0	3.3	167.4	15.0	105.0	202.4	489.7
A7-E1/E2	Medium Density Residential	90			9.24	9.24	162.0	1497	20110	2.65	0.0	0.0	2.6	167.4	15.0	107.6	215.9	505.8
A8-A	Commercial	80	28.45			28.45			20110	2.65	24.7	0.0	8.0	192.0	15.0	115.5	215.9	538.5
A8-B	High Density Residential	80			39.34	39.34	135.0	5311	25421	2.55	0.0	0.0	11.0	192.0	15.0	126.6	262.4	596.0
A8-C	Institutional	80		10.52		10.52			25421	2.55	0.0	9.1	2.9	192.0	24.1	129.5	262.4	608.1
A8-D	Low Density Residential	80			16.87	16.87	120.9	2040	27461	2.52	0.0	0.0	4.7	192.0	24.1	134.2	279.8	630.2
ROW Along SNC Sewer Alignment	-	80				14.34			27461	2.52	0.0	0.0	4.0	192.0	24.1	138.2	279.8	634.2
TOTAL		***80***	***221.24***	***27.77***	***230.38***	***493.73***	***-***	***27461***	***27461***	***2.52***	***192.0***	***24.1***	***134.2***	***192.0***	***24.1***	***138.2***	***279.8***	***634.2***

Residential Land Use	Population Density (Units / ha)	Persons per Unit	Persons per ha
Low Density (singles and semis)	26 – 28 (28 used)	2.7 – 3.4 (3.4 used)	95.2
Medium Density (row/townhouse)	50 – 60 (60 used)	2.7	162.0
High Density (apartments)	60 – 75 (75 used)	1.8	135.0

Notes:

1. Harmon Equation = $1 + [14 / (4+(P/1000)^{1/2})] \times K$

Where: P = population; K = correction factor = 1.0

2. Instituional / Commercial Peaking Factor = 1.5

Reported Design Flows / Assumptions:

1. Area A4: Existing single family units currently serviced by Jockvale pump station to be redirected to SNC

2. Area A8-D: proposed 600 medium density residential units

FALLOWFIELD RD

GREENBANK RD

MOODIE DR

HWY 416

MCKENNA CASEY DR

STRANDHERD DR

JOCK RIVER

LONGFIELDS DR

JOCKVALE RD

A1 12.80ha

A2-A 85.18ha

A2-B 32.46ha

A2-C 15.25ha

A3-A 16.18ha

A3-B 10.30ha

A3-C 5.19ha

A3-D 0.58ha

A3-E 35.68ha

A3-F 8.26ha

A3-G 0.90ha

A3-H 6.09ha

A4 34.44ha

A5 17.72ha

A6-A 15.18ha

A6-B 6.05ha

A6-C 4.87ha

A6-D 17.56ha

A6-E 6.94ha

A7-A 13.62ha

A7-B 11.01ha

A7-C 6.97ha

A7-D 11.74ha

A7-E1 7.70ha

A7-E2 1.54ha

A8-A 28.45ha

A8-B 39.34ha

A8-C 10.52ha

A8-D 10.87ha

130 120 110 100 90 80 70 60 50 40 30 20 10

LEGEND

- EXISTING / PROPOSED HIGH DENSITY RESIDENTIAL
- EXISTING / PROPOSED MEDIUM DENSITY RESIDENTIAL
- EXISTING / PROPOSED LOW DENSITY RESIDENTIAL
- EXISTING / PROPOSED COMMERCIAL
- EXISTING / PROPOSED INSTITUTIONAL
- OTHER LANDS (OPEN SPACE, PARKS, AND SWMFS)
- SOUTH NEPEAN COLLECTOR PHASE 1
- SOUTH NEPEAN COLLECTOR PHASE 2
- SOUTH NEPEAN COLLECTOR PHASE 3
- 80 SOUTH NEPEAN COLLECTOR NODE ID

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

SOUTH NEPEAN COLLECTOR SEWER

SANITARY DRAINAGE AREAS AND LAND USE

SCALE 1:20 000

DATE AUG 2015 | JOB 115075 | FIGURE FIG. 1

5.4 SOUTH NEPEAN URBAN AREA SECONDARY PLAN (AREA 7)

The Subject Property is located within Area 7 of the South Nepean Urban Area Secondary Plan, also known as the South Nepean Town Centre (SNTC). The Secondary Plan for the SNTC is based entirely on the key components of the SNTC Community Design Plan (CDP). However, the CDP also contains non-statutory components such as urban design guidelines.

The Community Design Plan for the South Nepean Town Centre, as it relates to the Subject Property, is discussed in greater detail below.

5.5 SOUTH NEPEAN TOWN CENTRE COMMUNITY DESIGN PLAN

The South Nepean Town Centre covers an area of approximately 165 hectares and is located between Strandherd Drive to the north, Longfields Drive to the east, the Jock River to the south, and the Kennedy-Burnett stormwater management facility to the west. The Town Centre is surrounded by existing residential communities including the communities of Barrhaven, Longfields, Chapman Mills, Heart's Desire, Stonebridge, and Barrhaven South.

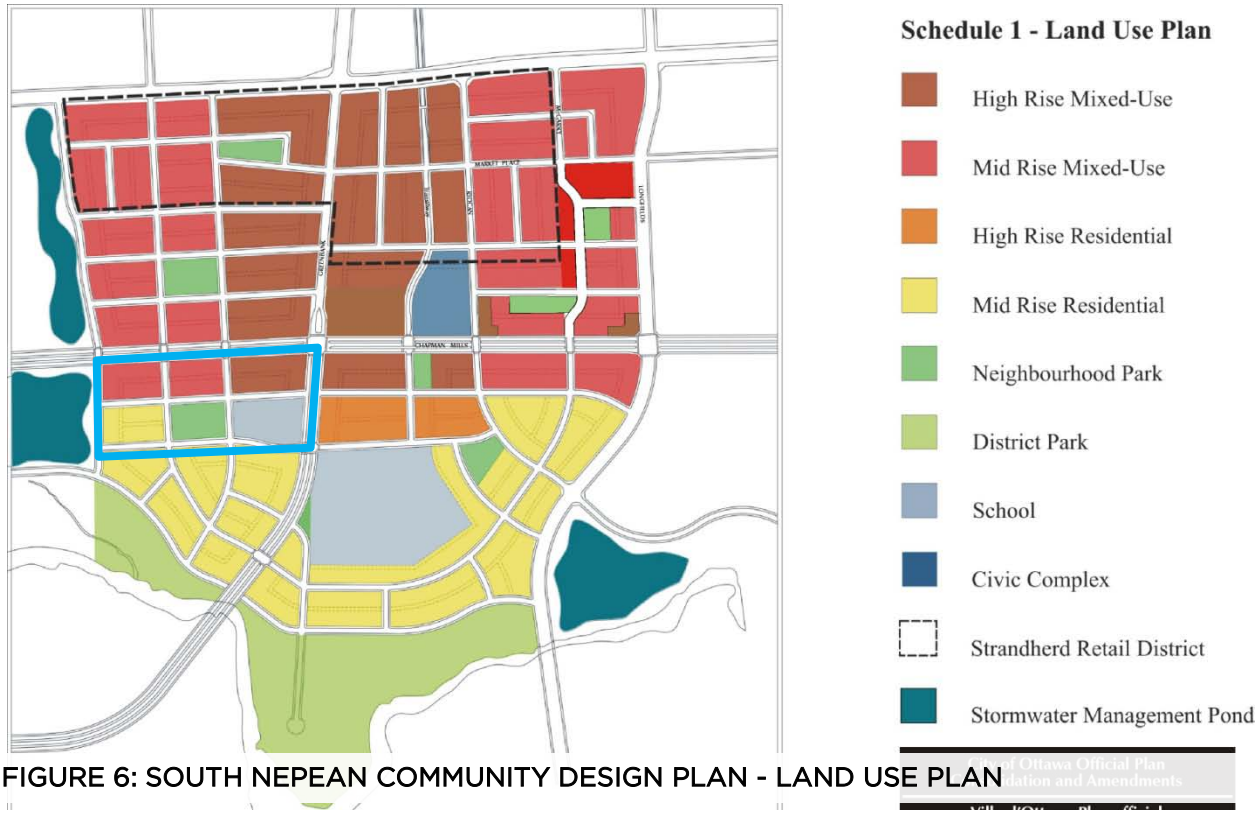


FIGURE 6: SOUTH NEPEAN COMMUNITY DESIGN PLAN - LAND USE PLAN

The majority of the Town Centre is undeveloped, through several large-format retail centres are located within the defined "Strandherd Retail District" along Strandherd Drive north of the Subject Property.

The CDP sets goals for the development of the Town Centre which include the development of a compact, urban built form; development that reflects high-quality urban design standards; the provision of a broad range of uses; the provision of parks and open space in a range of forms and locations; the provision of a balanced transportation network to serve the Town Centre and surrounding areas; and the provision of a logical progression of development.

The CDP is structured around a framework of five elements that include streets, blocks, greenspaces, transit and density. The two rapid transit lines provide the focus around which the land uses are arranged.

Based on the land use policies contained within Section 4 of the CDP, the Town Centre could accommodate over 22,000 residents and over 12,000 employment opportunities at its ultimate build-out. The success of the CDP is to be determined over the long-term rather than in the short-term.

The Subject Property is within several land use designations as shown on Schedule 1 of the CDP including: High Rise Mixed-Use, Mid Rise Mixed-Use, Mid Rise Residential, Neighbourhood Park, and a School site (southeast corner) (Figure 6).

Section 4.2 contains the policies for the High Rise Mixed-Use designation. This policy area represents the primary retail and mixed-use development area within the Town Centre and is envisioned as a lively and active mixed-use district. Permitted uses in the High Rise Mixed Use designation include apartments, a broad variety of retail, office, and service commercial uses, public and institutional uses, schools, places of worship, and community facilities. Policies for this designation set out a minimum building height six (6) storeys and a maximum of twelve (12) storeys. This section also sets out the maximum lot coverage for stand-alone residential buildings at 30% of the total area of any block and prescribes a net density target of 250 units per hectare. Non-residential uses are required at-grade along Greenbank Road and Chapman Mills Drive.

Policies for the Mid Rise Mixed-Use land designation are contained in Section 4.3. Similar to the High Rise Mixed-Use designation, permitted uses in this designation include apartments, live-work units, retail, office, and service commercial uses, public and institutional uses, schools, places of worship, and community facilities. The minimum building height for this designation is four (4) storeys and the maximum is six (6) storeys. Stand-alone residential buildings are permitted to cover up to 50% of the total area of any block and a net density target of 200 units per hectare is prescribed.

Finally, within the Mid Rise Residential policy area (defined in Section 4.5), permitted uses include apartments, street, block and stacked townhouses, public and institutional uses, schools, places of worship, and community facilities. Buildings within this designation are to be between two (2) and four (4) storeys and the area has a net density target of 100 units per hectare.

A Neighbourhood Parks are contemplated by the CDP on the Subject Property. Section 4.6 states that these areas are envisioned as public parks, plazas, community facilities, or conservation uses. The CDP lays out specific size requirements for parks and plazas as

Appendix C : STORM SEWER CALCULATIONS

Stantec

SNTC LANDS ASSESSMENT

DATE: 2019-10-30
REVISION: 1
DESIGNED BY: AJ
CHECKED BY: AMP

STORM SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160401085

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																						PIPE SELECTION											
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM. AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETEI (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)	VEL. (ACT) (m/s)	TIME OF FLOW (min)
L201A, L201D, L201C, L201B	201	200	3.50	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	2.431	2.431	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	518.6	138.4	1200	1200	CIRCULAR	CONCRETE	-	0.10	1286.2	**40.32%**	1.10	0.89	2.60
																				12.60																			
L118A	110	108	0.14	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.00	0.092	0.092	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	19.7	37.4	675	675	CIRCULAR	CONCRETE	-	0.20	392.2	**5.03%**	1.06	0.47	1.33
L116A, L116B	108	106	0.23	0.00	0.00	0.00	0.00	0.57	0.00	0.00	0.00	0.130	0.223	0.000	0.000	0.000	0.000	0.000	0.000	11.33	72.05	97.65	114.44	167.24	0.0	0.0	44.5	85.7	675	675	CIRCULAR	CONCRETE	-	0.20	392.2	**11.36%**	1.06	0.58	2.46
																				13.79																			
L204A, L204B, L204C	204	106	3.27	0.00	0.00	0.00	0.00	0.71	0.00	0.00	0.00	2.329	2.329	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	496.9	157.8	1200	1200	CIRCULAR	CONCRETE	-	0.10	1286.2	**38.64%**	1.10	0.87	3.04
																				13.04																			
L114A	106	104	0.23	0.00	0.00	0.00	0.00	0.73	0.00	0.00	0.00	0.168	2.720	0.000	0.000	0.000	0.000	0.000	0.000	13.79	64.77	87.67	102.69	149.99	0.0	0.0	489.3	105.6	1200	1200	CIRCULAR	CONCRETE	-	0.11	1349.0	**36.27%**	1.16	0.90	1.96
L112A, L112B	104	102	0.40	0.00	0.00	0.00	0.00	0.56	0.00	0.00	0.00	0.222	2.942	0.000	0.000	0.000	0.000	0.000	0.000	15.75	60.05	81.20	95.08	138.83	0.0	0.0	490.7	50.6	1200	1200	CIRCULAR	CONCRETE	-	0.12	1409.0	**34.83%**	1.21	0.93	0.91
																				16.66																			
L203B, L203A	203	202	1.99	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.00	1.377	1.377	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	293.8	155.1	1200	1200	CIRCULAR	CONCRETE	-	0.10	1286.2	**22.85%**	1.10	0.74	3.50
L202B, L202C, L202D, C202A	202	102	1.40	0.54	0.00	0.00	0.00	0.62	0.65	0.00	0.00	0.860	2.238	0.354	0.354	0.000	0.000	0.000	0.000	13.50	65.55	88.73	103.94	151.83	0.0	0.0	494.6	114.9	1200	1200	CIRCULAR	CONCRETE	-	0.10	1286.2	**38.46%**	1.10	0.87	2.21
																				15.71																			
L110A, L110B, L110C,L102A	102	100	0.49	0.00	0.00	0.00	0.00	0.62	0.00	0.00	0.00	0.303	5.482	0.000	0.354	0.000	0.000	0.000	0.000	16.66	58.11	78.55	91.96	134.25	0.0	0.0	962.0	142.5	1200	1200	CIRCULAR	CONCRETE	-	0.11	1349.0	**71.32%**	1.16	1.10	2.17
L100A	100	200	0.10	0.00	0.00	0.00	0.00	0.59	0.00	0.00	0.00	0.059	5.541	0.000	0.354	0.000	0.000	0.000	0.000	18.83	54.00	72.94	85.37	124.58	0.0	0.0	902.8	18.6	1920	1220	ELLIPTICAL	CONCRETE	-	0.16	2907.0	**31.06%**	1.58	1.17	0.27
																				19.09																			
	200	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	7.972	0.000	0.354	0.000	0.000	0.000	0.000	19.09	53.54	72.31	84.63	123.50	0.0	0.0	1256.6	55.7	1920	1220	ELLIPTICAL	CONCRETE	-	0.10	2298.2	**54.68%**	1.25	1.10	0.85
																				19.94									1920	1220								
			11.75	0.54	0.00	0.00	0.00					7.97		0.35		0.00		0.00																				

Notes:
1. Site storm sewers have been upsized for HGL purposes

Paerez, Ana

To: Thiffault, Dustin
Subject: RE: SNTC PCSWMM

From: Kallie Auld [mailto:k.auld@novatech-eng.com]
Sent: Tuesday, May 08, 2018 3:36 PM
To: Moroz, Peter <peter.moroz@stantec.com>
Subject: RE: SNTC PCSWMM

Hi Peter,

Link to the files is as follows. Should you have any issues with it, please let me know.

https://novatechengineering-my.sharepoint.com/personal/k_auld_novatechengineering_onmicrosoft_com/Documents/Forms/All.aspx?slrid=b136659e-702d-5000-9160-e219a181579a&RootFolder=%2Fpersonal%2Fk_auld_novatechengineering_onmicrosoft_com%2FDocuments%2FStreet%20B%20Files&FolderCTID=0x012000CC62E99572F55543B4184832A91D2B0A

Assumptions made in the model are as follows:

Outfall boundary conditions:
These elevations are from the values provided in the Jock River Reach One Sub-Watershed Study, at "Point *9" or Chainage 4+241.
NWL = 89.50m
2-year = 90.55m
5-year = 90.92m
100-year = 91.58m

As peak flows from the subdivision are unlikely to coincide with the peak flows in the Jock River, we have run our HGL analysis using two scenarios:

1. 5-year flows in the storm sewers, 100-year flood elevation at the outlet
2. 100-year flows in the storm sewers, 5-year flood elevation at the outlet

The 5-year flow with the 100-year flood elevation produces the highest HGL within the Street 'B' storm sewers. The packaged model has been run in this scenario. Hotstart files for the 25mm, 2-year and 100-year events have been included as attachments as well. The boundary conditions listed above are also included in the description field for the outfall node for reference.

Drainage Areas:
I have also included a PDF of our drainage area plans. For the Caivan lands directly tributary to Street 'B', we have assumed a high-point at the mid-point of the connecting streets in the western corner, and half-way up through the block at the eastern corner. For the park, we have assumed the entire area is tributary to the nearest catchbasin pair on Street 'B' – CB43-44.

As the storm sewers are designed for the 5-year event, the orifices in the western portion of the site have been sized accordingly. For the block in the eastern corner of the site, on-site storage for all events exceeding the 5-year storm has been provided as a single storage node, and the connecting orifice has been sized accordingly.

If you have any questions or comments, please let me know.

Cheers,

Kallie Auld, P.Eng., Project Coordinator | Water Resources
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 294 | Fax: 613.254.5867

From: Kallie Auld
Sent: May-08-18 3:27 PM
To: 'Moroz, Peter' <peter.moroz@stantec.com>
Subject: RE: SNTC PCSWMM

test

Kallie Auld, P.Eng., Project Coordinator | Water Resources
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x 294 | Fax: 613.254.5867

From: Moroz, Peter [mailto:peter.moroz@stantec.com]
Sent: May-08-18 3:19 PM
To: Kallie Auld <k.auld@novatech-eng.com>
Subject: SNTC PCSWMM

Hi Kallie, as discussed.

Peter

Peter Moroz P.Eng., MBA
Managing Principal, Community Development

Stantec
400 - 1331 Clyde Avenue Ottawa ON K2C 3G4

Phone: (613) 724-4082
Cell: (613) 294-2851

peter.moroz@stantec.com

CATCHBASIN TABLE

CB No.	STATION	T/G ELEVATION	INVERT	ICD DIA.
1	3+081.96	93.33	91.79	
2	3+081.96	93.33	91.71	83mm
3	3+174.07	93.27	91.67	
4	3+174.06	93.27	91.58	94mm
5	3+267.41	93.17	91.57	
6	3+267.41	93.17	91.48	108mm
7	2+072.65	93.33	91.73	
8	2+072.65	93.33	91.65	102mm
9	6+054.11	93.49	91.66	
10	6+055.96	93.55	91.55	Mcon-CBMH
11	6+114.05	93.41	91.64	
12	6+114.05	93.43	91.53	94mm
13	5+048.92	93.30	91.70	
14	5+048.92	93.30	91.62	94mm
15	5+101.71	93.32	91.72	
16	5+101.74	93.32	91.63	102mm
17	5+171.91	93.17	91.50	
18	5+171.92	93.22	91.39	108mm
19	4+014.50	92.92	91.33	
20	4+014.50	92.95	91.24	94mm
21	4+080.40	92.72	91.13	
22	4+080.40	92.72	91.05	108mm
23	4+114.13	92.69	91.20	
24	4+114.13	92.69	91.11	83mm
25	4+147.29	92.73	91.13	
26	4+147.29	92.73	91.04	83mm
27	4+212.67	92.96	91.25	
28	4+212.67	92.88	91.16	108mm
29	7+220.96	93.02	91.28	
30	7+220.96	93.06	91.17	108mm
31	7+159.38	93.07	91.47	
32	7+159.38	93.07	91.38	94mm
33	8+024	93.25	91.65	
34	8+024	93.25	91.56	108mm
35	7+098.88	93.27	91.53	
36	7+098.88	93.27	91.45	94mm
37	7+047.04	93.35	91.75	
38	7+047.04	93.35	91.67	83mm
39	1+157.11	93.27	91.57	
40	1+157.11	93.27	91.49	127mm
41	1+266.46	93.44	91.84	
42	1+266.46	93.44	91.75	94mm
43	1+319.56	93.40	91.80	
44	1+319.56	93.40	91.72	127mm
45	1+420.15	93.41	91.81	
46	1+420.10	93.41	91.73	102mm
47	1+474.88	93.47	91.87	
48	1+474.86	93.47	91.79	83mm
49	1+537.84	93.68	92.07	
50	1+537.22	93.62	91.97	83mm
67	6+417.24	94.07	90.50	
68	6+417.24	94.07	90.39	
69	3+020.35	93.21	91.61	
70	3+017.78	93.24	91.52	

REAR YARD CATCHBASIN TABLE

RYCB No.	T/G ELEVATION	INVERT
CB73	93.41	89.24
CB74	93.47	89.39
CB75	93.55	89.62
CB76	93.34	89.05
CB77	93.38	89.44
RYCB1	93.65	92.00
RYCB2	93.59	92.03
RYCB4	93.44	91.76
RYCB5	93.53	91.96
RYCB6	93.22	91.11
RYCB7	93.19	91.29
RYCB8	93.54	91.85
RYCB9	93.40	91.50
RYE1	93.56	91.75
RYE2	93.28	91.63
RYE3	93.55	92.35
RYE4	93.48	91.77
RYE5	93.41	91.77
RYE6	93.26	91.83
RYE7	93.55	91.88
RYE8	93.56	92.00
RYE9	93.49	92.23
RYE10	93.47	91.74
RYE11	93.60	91.95
RYE12	93.60	91.95
RYT1	93.72	92.72
RYT2	93.23	91.37
RYT3	93.72	92.17
RYT4	93.76	92.09
RYT5	93.76	91.87
RYT6	93.45	91.55
RYT7	93.44	92.44
RYT8	93.50	91.64
RYT9	93.50	92.50
RYT10	93.21	91.57
RYT11	93.58	91.70
RYT12	93.51	92.03
RYT13	93.42	91.54
RYT14	93.39	91.40
RYT15	93.38	92.38
RYT16	93.41	91.73
RYT17	93.41	91.74
RYT18	93.40	91.52

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTE:
CONTRACTOR TO CONFIRM ELEVATIONS OF INFRASTRUCTURE IN THE STREET PRIOR TO EXTENDING SERVICES INTO THE SITE AND SHALL NOTIFY ENGINEER OF ANY DISCREPANCIES IMMEDIATELY.

No.	REVISION	mm/dd/yy	BY
3	WORKING DRAWING - FOR INFORMATION ONLY		
2	REISSUED WITH DRAFT PLAN OF SUBDIVISION	MAY 23/18	MSP
1	REISSUED WITH DRAFT PLAN OF SUBDIVISION	JAN 26/18	MSP

SCALE
1:500
1:500
0 5 10 15 20

DESIGN SAZ
CHECKED DDB
DRAWN RBG
CHECKED DDB
APPROVED MSP

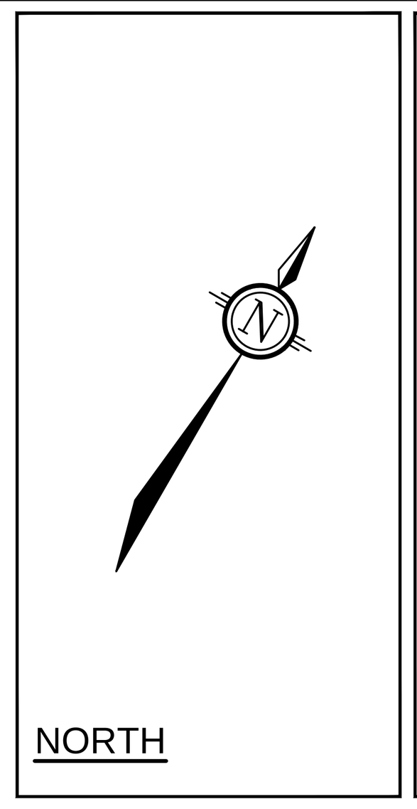
FOR REVIEW ONLY

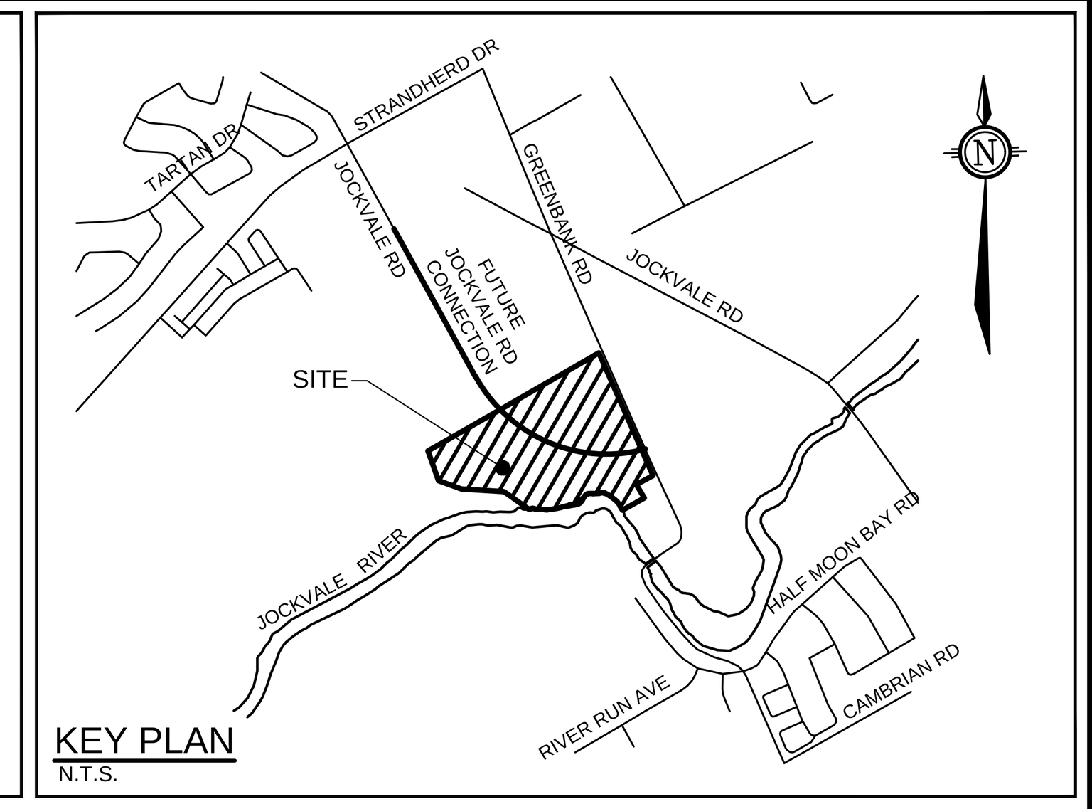
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
GENERAL PLAN OF SERVICES

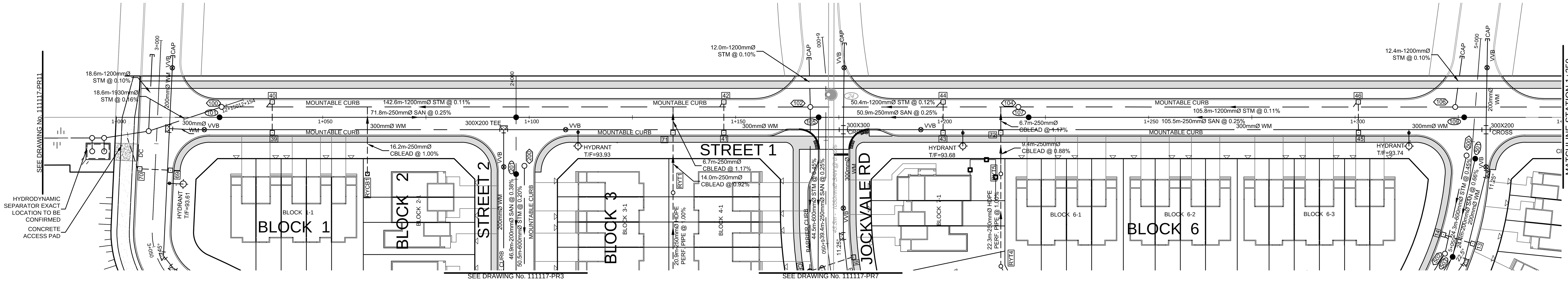
PROJECT No. 111117
REV. REV # 2
DRAWING No. 111117-GP1



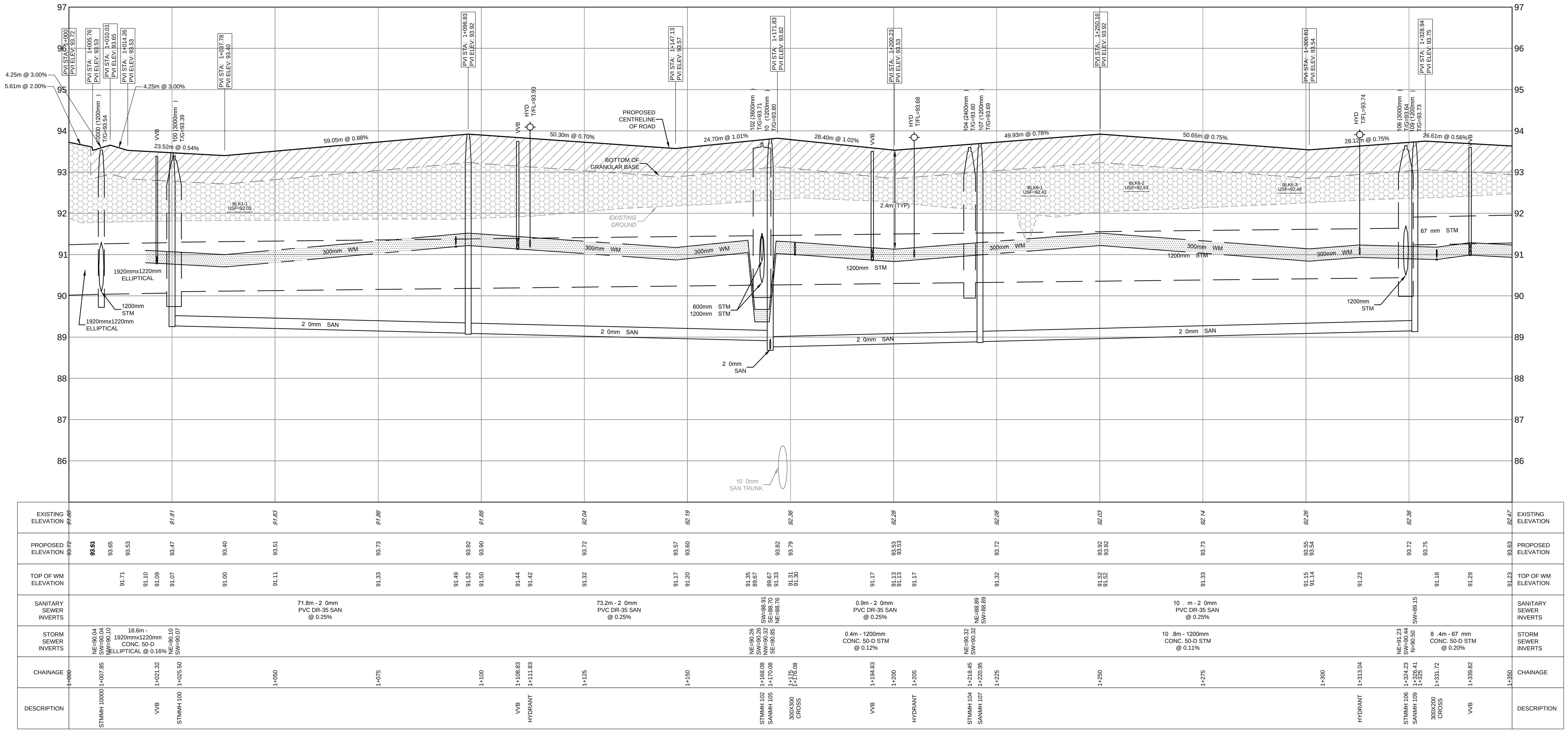


LEGEND

200mm	PROPOSED WATERMAIN AND DIAMETER
	PROPOSED VALVE LOCATION
V&VB	VALVE & VALVE BOX
V&VC	VALVE & VALVE CHAMBER
HYD	PROPOSED HYDRANT C/W VALVE & LEAD
T/F=98.45	PROPOSED TOP OF BOTTOM FLANGE
BEND	PROPOSED BEND AND THRUSTBLOCK 11.2, 22, 4 or TEE (SEE PLAN AND PROFILES)
MH 101	PROPOSED SANITARY MH & SEWER
MH 100	PROPOSED STORM MH & SEWER
	PROPOSED CB LEAD
CB 2	PROPOSED ROAD CATCHBASIN
DICB 2	PROPOSED DITCH INLET CATCHBASIN
RYCB 2	PROPOSED REARYARD CATCHBASIN
CBMH 2	PROPOSED CATCHBASIN MANHOLE
RYE 2	PROPOSED REARYARD ELBOW
RYT 2	PROPOSED REARYARD TEE
	DIRECTION OF FLOW
MH 101	EXISTING SANITARY MH & SEWER
MH 102	EXISTING STORM MH & SEWER
200mmØ WM	EXISTING WATERMAIN
	ROAD GRANULAR DEPTH
	AREA TO BE FILLED WITH SUITABLE MATERIAL FREE OF TOPSOIL, DELETERIOUS AND ORGANIC MATERIAL



STREET 1



NOTE:
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NOTE:

CONTRACTOR TO CONFIRM ELEVATIONS OF INFRASTRUCTURE IN THE STREET PRIOR TO EXTENDING SERVICES INTO THE SITE AND SHALL NOTIFY ENGINEER OF ANY DISCREPANCIES IMMEDIATELY.

No.	REVISION	mm/dd/yy	BY
2	ISSUED TO STANTEC FOR COORDINATION	SEP 19/19	MSP
1	REISSUED WITH DRAFT PLAN OF SUBDIVISION	JAN 26/18	MSP

SCALE
1:500 HORIZONTAL
1:50 VERTICAL

DESIGN	SAZ
CHECKED	DDB
DRAWN	RBG
CHECKED	DDB
APPROVED	MSP

FOR REVIEW ONLY

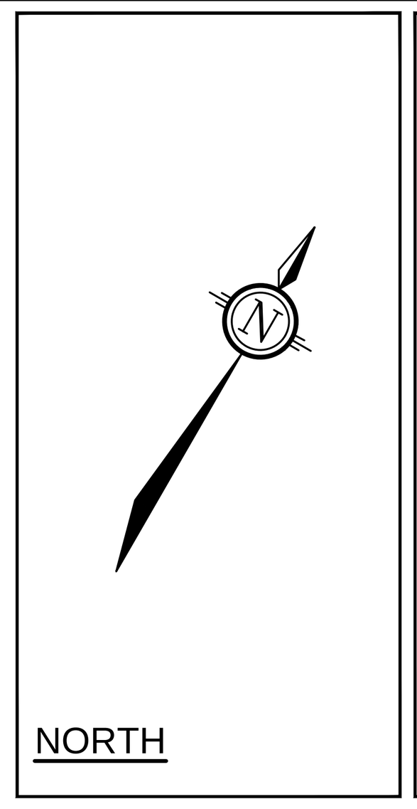
NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

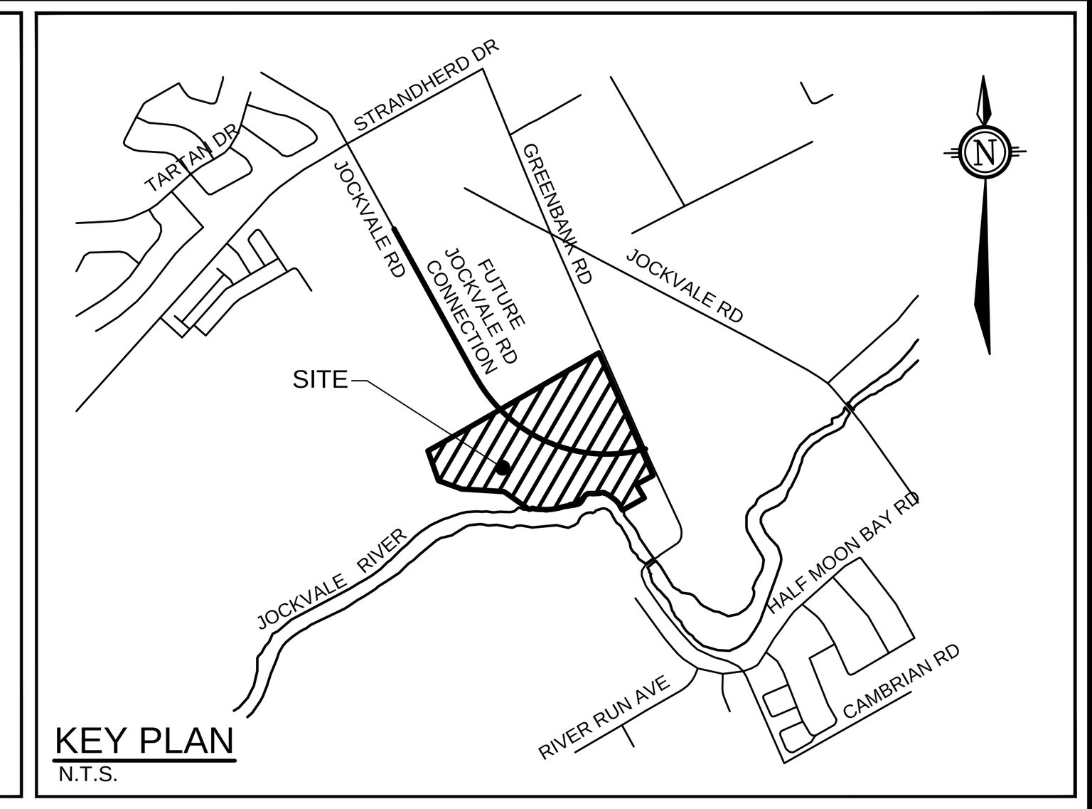
LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
PLAN AND PROFILE
STREET 1
STATION 1+100-1+425

PROJECT No. 111117
REV # 2
DRAWING No. 111117-PR1

M:\2011\111117\CAD\Design\111117-PR1210.dwg, PR1, Sep 18, 2019 - 10:03am, dgraydon

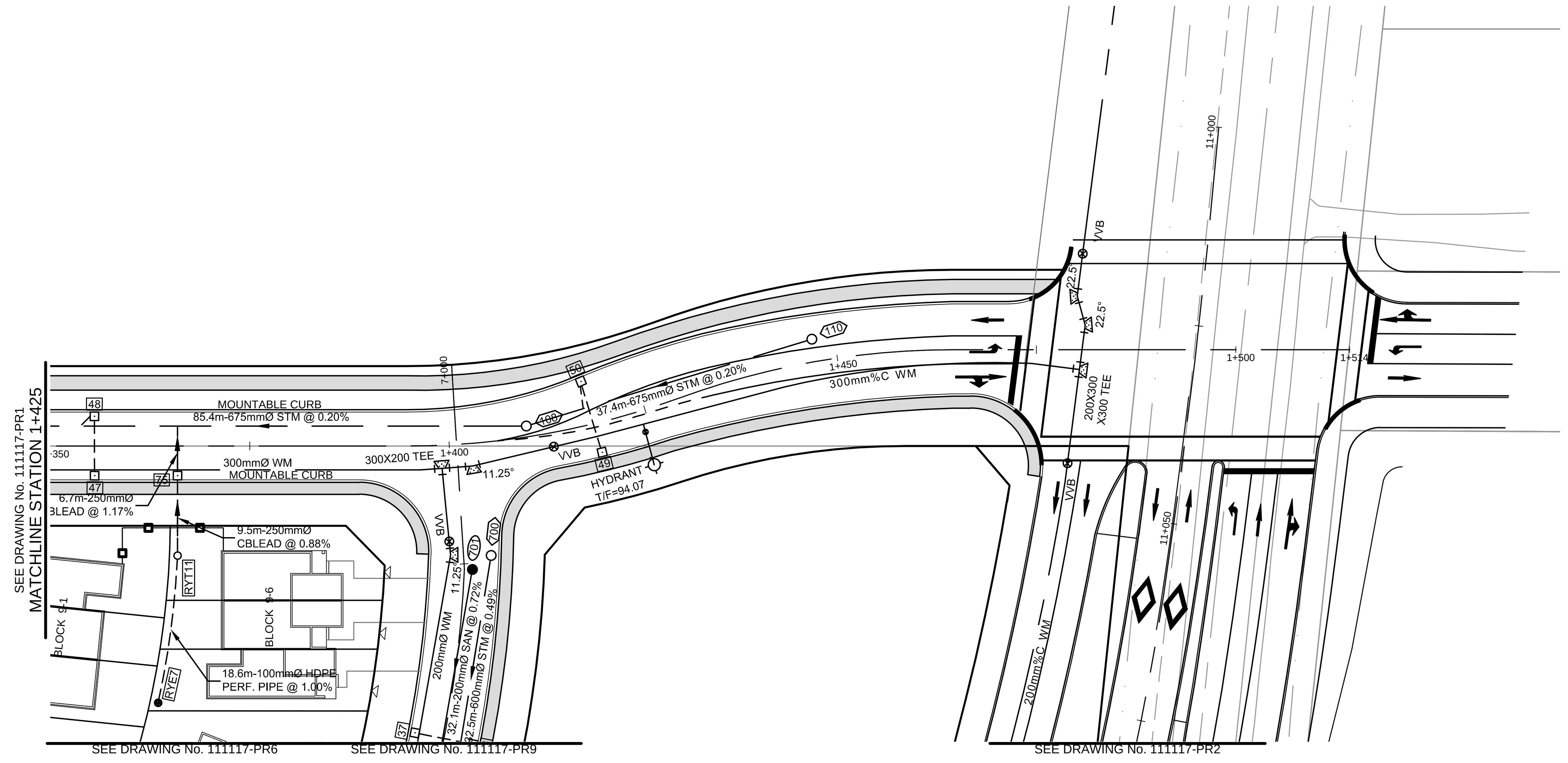

NORTH



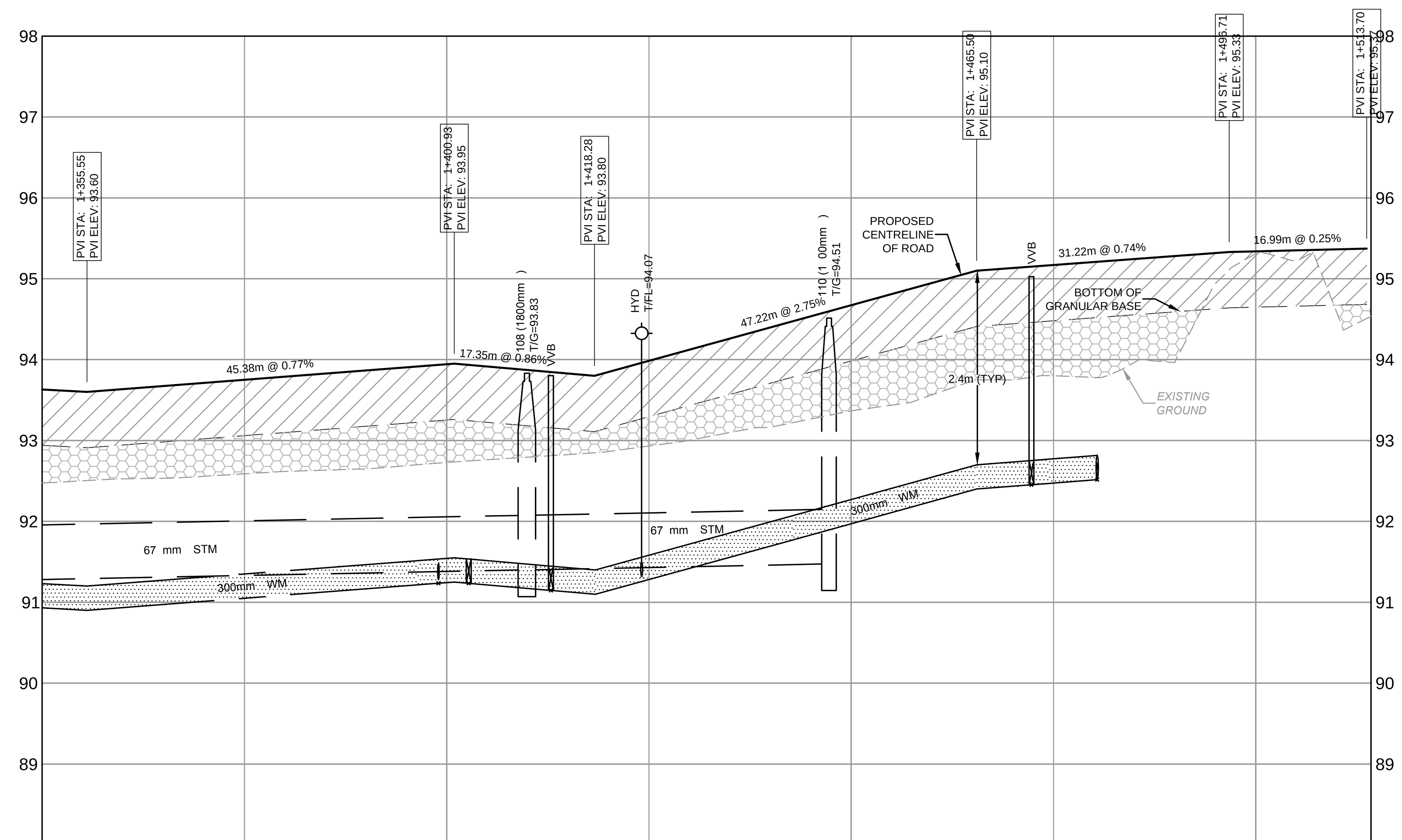
KEY PLAN
N.T.S.

LEGEND

- 200mm — PROPOSED WATERMAIN AND DIAMETER
- PROPOSED VALVE LOCATION
- V&VB — VALVE & VALVE BOX
- V&VC — VALVE & VALVE CHAMBER
- HYD — PROPOSED HYDRANT C/W VALVE & LEAD
- T/F=98.45 — PROPOSED TOP OF BOTTOM FLANGE
- BEND — PROPOSED BEND AND THRUSTBLOCK 11.2 , 22. , 4 or TEE (SEE PLAN AND PROFILES)
- MH 101 — PROPOSED SANITARY MH & SEWER
- MH 100 — PROPOSED STORM MH & SEWER
- PROPOSED CB LEAD
- CB 2 — PROPOSED ROAD CATCHBASIN
- DICB 2 — PROPOSED DITCH INLET CATCHBASIN
- RYCB 2 — PROPOSED REARYARD CATCHBASIN
- CBMH 2 — PROPOSED CATCHBASIN MANHOLE
- RYE 2 — PROPOSED REARYARD ELBOW
- RYT 2 — PROPOSED REARYARD TEE
- DIRECTION OF FLOW
- MH 101 — EXISTING SANITARY MH & SEWER
- MH 102 — EXISTING STORM MH & SEWER
- 200mmØ WM — EXISTING WATERMAIN
- ROAD GRANULAR DEPTH
- AREA TO BE FILLED WITH SUITABLE MATERIAL FREE OF TOPSOIL, DELETERIOUS AND ORGANIC MATERIAL



STREET 1



EXISTING ELEVATION	92.47, 92.59, 92.73, 92.93, 93.37, 93.80, 95.31, 94.53	EXISTING ELEVATION
PROPOSED ELEVATION	93.63, 93.60, 93.75, 93.94, 93.95, 93.80, 93.99, 94.67, 95.10, 95.17, 95.33, 95.34, 95.37	PROPOSED ELEVATION
TOP OF WM ELEVATION	91.23, 91.20, 91.35, 91.53, 91.54, 91.55, 91.53, 91.45, 91.40, 91.56, 91.58, 92.70, 92.75, 92.82	TOP OF WM ELEVATION
SANITARY SEWER INVERTS		SANITARY SEWER INVERTS
STORM SEWER INVERTS	8 .4m - 67 mm CONC. 50-D STM @ 0.20%; NE=91.40 SW=91.40; 37.4m - 67 mm CONC. 50-D STM @ 0.20%; SW=91.47	STORM SEWER INVERTS
CHAINAGE	1+350, 1+375, 1+398.98, 1+400, 1+402.72, 1+409.91, 1+412.88, 1+424.09, 1+425, 1+447.25, 1+450, 1+472.27, 1+475, 1+480.40, 1+500, 1+514.25	CHAINAGE
DESCRIPTION	300X200 TEE; 11.2 H.BEND; STMMH 108; VVB; HYDRANT; STMMH 110; VVB; 200X300 X300 TEE	DESCRIPTION

NOTE:
THE POSITION OF ALL POLE LINES, CONDUITS, WATERMAINS, SEWERS AND OTHER UNDERGROUND AND OVERGROUND UTILITIES AND STRUCTURES IS NOT NECESSARILY SHOWN ON THE CONTRACT DRAWINGS, AND WHERE SHOWN, THE ACCURACY OF THE POSITION OF SUCH UTILITIES AND STRUCTURES IS NOT GUARANTEED. BEFORE STARTING WORK, DETERMINE THE EXACT LOCATION OF ALL SUCH UTILITIES AND STRUCTURES AND ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

NOTE:

CONTRACTOR TO CONFIRM ELEVATIONS OF INFRASTRUCTURE IN THE STREET PRIOR TO EXTENDING SERVICES INTO THE SITE AND SHALL NOTIFY ENGINEER OF ANY DISCREPANCIES IMMEDIATELY.

No.	REVISION	mm/dd/yy	BY
2	ISSUED TO STANTEC FOR COORDINATION	SEP 19/19	MSP
1	REISSUED WITH DRAFT PLAN OF SUBDIVISION	JAN 26/18	MSP

SCALE
1:500 HORIZONTAL (0 5 10 15 20)
1:50 VERTICAL (0 0.5 1.0 1.5 2.0)

DESIGN SAZ · CHECKED DDB · DRAWN RBG · CHECKED DDB · APPROVED MSP

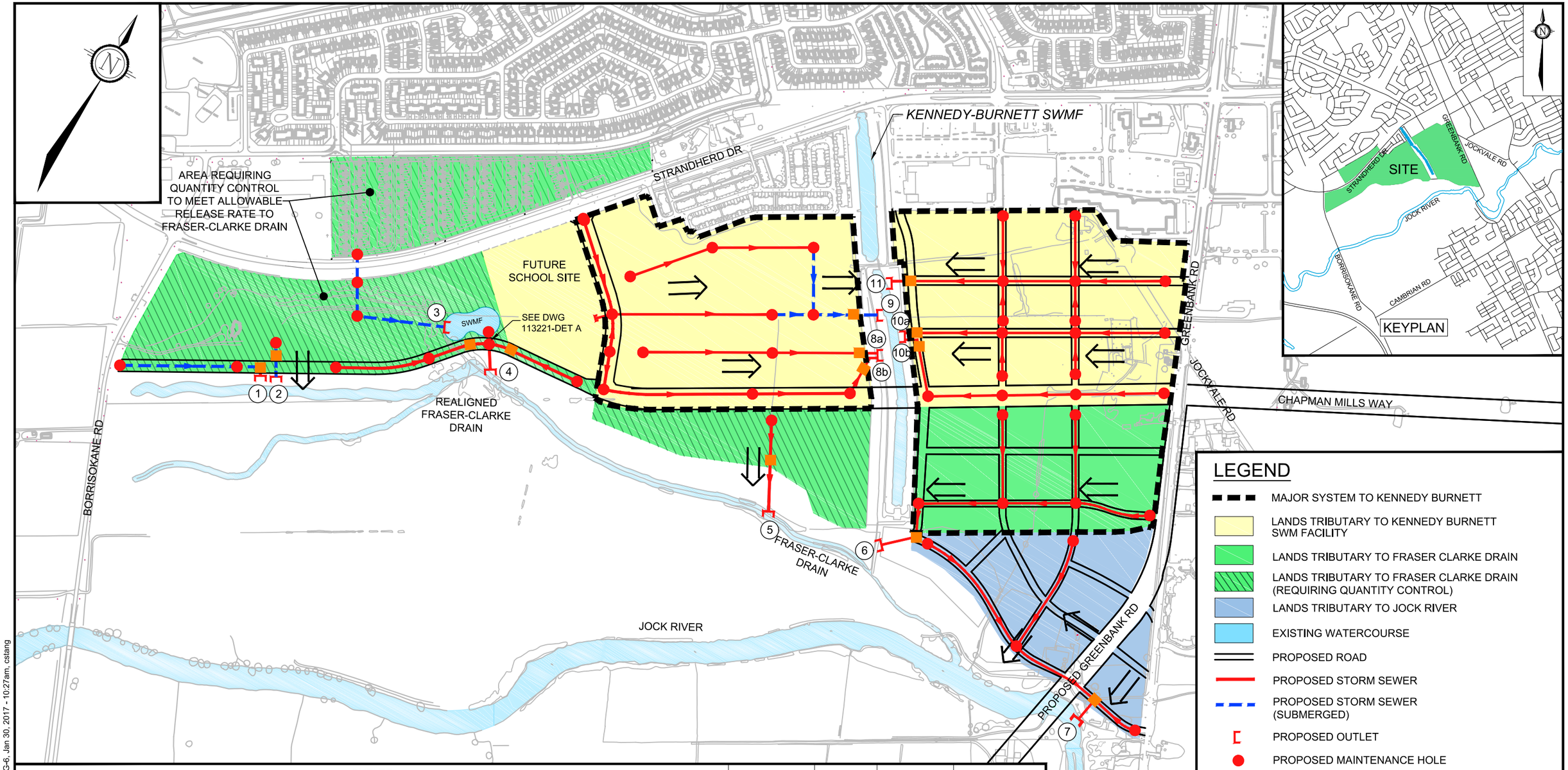
FOR REVIEW ONLY

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

LOCATION
CITY OF OTTAWA
3370 GREENBANK ROAD

DRAWING NAME
PLAN AND PROFILE
STREET 1
STATION 1+425-1+635

PROJECT No. 111117
REV # 2
DRAWING No. 111117-PR2



LEGEND

- MAJOR SYSTEM TO KENNEDY BURNETT
- LANDS TRIBUTARY TO KENNEDY BURNETT SWM FACILITY
- LANDS TRIBUTARY TO FRASER CLARKE DRAIN
- LANDS TRIBUTARY TO FRASER CLARKE DRAIN (REQUIRING QUANTITY CONTROL)
- LANDS TRIBUTARY TO JOCK RIVER
- EXISTING WATERCOURSE
- PROPOSED ROAD
- PROPOSED STORM SEWER
- PROPOSED STORM SEWER (SUBMERGED)
- PROPOSED OUTLET
- PROPOSED MAINTENANCE HOLE
- PROPOSED HYDRO DYNAMIC SEPARATOR (HDS)
- MAJOR OVERLAND FLOW DIRECTION

	OUTLET						SUBMERGED SEWERS	DEPTH TO OBVERT	MAX GRADE RAISE	STM HGL (D/S - U/S)
ID	WATER COURSE	DRAINAGE AREA	NWL	PIPE INVERT	PIPE SIZE	PEAK FLOW *CONTROLLED				
1	FRASER-CLARKE DRAIN	0.97 ha	90.25	90.15	600mm	28 L/s*	75m	1.5m	1.1m	91.75m - 92.30m
2	FRASER-CLARKE DRAIN	5.34 ha	90.25	89.85	965 x 1525mm ELLIPTICAL	187 L/s*	400m	1.5m	0.9m	91.75m - 92.20m
3	MINTO SWM POND	14.64 ha	90.00	89.81	1220mm x 1930mm ELLIPTICAL	1,785 L/S	195m	1.5m	0.8m	91.65m - 92.23m
4	FRASER-CLARKE DRAIN	1.29 ha + 14.64 ha	89.90	89.90	1050mm	692 L/S*	0m	1.5m	1.0m	91.65m - 92.25m
5	FRASER-CLARKE DRAIN	6.49 ha	89.87	89.87	965 x 1525mm ELLIPTICAL	363 L/S*	0m	1.8m	0.9m	91.65m - 92.00m
6	FRASER-CLARKE DRAIN	11.83 ha	89.90	89.90	1220mm x 1930mm ELLIPTICAL	1,649 L/S	0m	1.8m	0.8m	91.75m - 92.65m
7	JOCK RIVER	9.24 ha	89.20	89.20	965 x 1525mm ELLIPTICAL	1,252 L/S	0m	1.8m	0.1m	91.60m - 92.45m
8A	KENNEDY-BURNETT SWMF	6.58 ha	90.20	90.20	1050mm	915 L/S	0m	1.5m	0.9m	91.80m - 92.80m
8B	KENNEDY-BURNETT SWMF	2.44 ha	90.20	90.20	825mm	444 L/S	0m	1.8m	0.9m	91.80m - 92.76m
9	KENNEDY-BURNETT SWMF	15.49 ha	90.20	90.00	1220mm x 1930mm ELLIPTICAL	2,034 L/S	200m	1.5m	1.2m	91.90m - 93.18m
10A	KENNEDY-BURNETT SWMF	6.68 ha	90.20	90.20	1050mm	928 L/S	0m	2.0m	0m	91.80m - 92.80m
10B	KENNEDY-BURNETT SWMF	2.07 ha	90.20	90.20	825 mm	365 L/S	0m	2.0m	0m	91.80m - 92.78m
11	KENNEDY-BURNETT SWMF	10.90 ha	90.20	90.20	1220mm x 1930mm ELLIPTICAL	1,892 L/S	0m	1.8m	0.3m	91.90m - 92.78m

NOVATECH
Engineers, Planners & Landscape Architects
Suite 200, 240 Michael Cowpland Drive
Ottawa, Ontario, Canada K2M 1P6
Telephone (613) 254-9643
Facsimile (613) 254-5867
Website www.novatech-eng.com

KENNEDY-BURNETT SWMF SERVICING OPTIONS

OPTION 4: HYBRID EXPANDED K-B SWIMF / HDS UNITS

SCALE 1 : 7500 (0, 100, 200, 300)
DATE JAN 2017 | JOB 113221 | FIGURE FIG-6

From:	Greg MacDonald
To:	Frank Cairo
Cc:	Bram Potechin
Subject:	RE: Caivan p/f Dam - Greenbank Road
Date:	Tuesday, September 25, 2018 2:57:59 PM

Still working on it.

Greg MacDonald, P. Eng.
Director, Land Development and Public Sector Infrastructure
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

From: Frank Cairo <frank.cairo@caivan.com>
Sent: Tuesday, September 25, 2018 1:57 PM
To: Greg MacDonald <g.Macdonald@novatech-eng.com>
Cc: Bram Potechin <bram@mpottawa.com>
Subject: RE: Caivan p/f Dam - Greenbank Road

Any update on this Greg?

From: Greg MacDonald <g.Macdonald@novatech-eng.com>
Sent: September-07-18 9:54 AM
To: Frank Cairo <frank.cairo@caivan.com>
Subject: RE: Caivan p/f Dam - Greenbank Road

I will get this information together and provide to Mr. Pritchard and copy you.

Greg MacDonald, P. Eng.
Director, Land Development and Public Sector Infrastructure
NOVATECH Engineers, Planners & Landscape Architects
240 Michael Cowpland Drive, Suite 200, Ottawa, ON, K2M 1P6 | Tel: 613.254.9643 x279 | Cell: 613.890.9705 | Fax: 613.254.5867

From: Frank Cairo <frank.cairo@caivan.com>
Sent: Wednesday, September 05, 2018 3:31 PM
To: Greg MacDonald <g.Macdonald@novatech-eng.com>
Subject: Fwd: Caivan p/f Dam - Greenbank Road

Greg,

Please see below. Would you please assist with the request of Mr. Pritchard?

Thank you.

Frank

Begin forwarded message:

From: Bram Potechin <bram@mpottawa.com>
Date: September 5, 2018 at 3:27:29 PM EDT
To: Frank Cairo <frank.cairo@caivan.com>
Cc: Samantha Viner <sviner@mpottawa.com>
Subject: FW: Caivan p/f Dam - Greenbank Road

Hi Frank,

Please see Andrew's request below. Novatech seems to be in control of the process for Claridge. Please ask Novatech to respond to Andrew's request for information.

Bram

Merovitz Potechin

Bram S. Potechin
B.A., LL.B.
Suite 300 – 1565 Carling Avenue
Ottawa, ON K1Z 8R1
Direct Line 613.563.6688
Main Line 613.563.7544
Fax 613.563.4577
bram@mpottawa.com
www.merovitzpotechin.com

From: Pritchard, Andrew [mailto:andrew.pritchard@nortonrosefulbright.com]
Sent: September-05-18 10:51 AM
To: Bram Potechin <bram@mpottawa.com>
Cc: Samantha Viner <sviner@mpottawa.com>
Subject: RE: Caivan p/f Dam - Greenbank Road

Thank you for your message Bram.

In order to be proceeding on the basis as much information as possible you kindly arrange to provide the following :

1) description of all lands assessed for benefit in respect of the Burnett Municipal drain and the owners of those lands

2) confirmation of which owners have consented to the abandonment and copies of those consents.

On receipt of that material I will reach out to our client.

Best Regards. Andrew.

J. Andrew Pritchard
Senior Partner
Associé principal

Norton Rose Fulbright Canada LLP / S.E.N.C.R.L., s.r.l.
45 O'Connor Street, Suite 1500, Ottawa, ON K1P 1A4, Canada
T: +1 613.780.8607 | M: +1 613.302.9043 | F: +1 613.230.5459
andrew.pritchard@nortonrosefulbright.com

NORTON ROSE FULBRIGHT

From: Bram Potechin [mailto:bram@mpottawa.com]
Sent: September-05-18 8:55 AM
To: Pritchard, Andrew
Cc: Samantha Viner
Subject: FW: Caivan p/f Dam - Greenbank Road

Hello Andrew,

During our recent conversation, you enquired and I indicated that I would ask about the need for the abandonment of the Burnett drain.

My client has provided an explanation in the email below, responding to my earlier email enquiry. My client also received the attached letter from Novatech Engineers, consultants for Claridge Homes. Claridge appears adamant that it will proceed with an application for abandonment of the drain, if your client does not participate by signing the required documents.

The letter from Novatech indicates a significant cost that would be incurred by your client if he does not agree to participate in the abandonment process.

Once you have had an opportunity to consult with your client, please let me know if the information that I have provided answers the question you posed during our conversation and will induce your client to deliver signed documents.

I look forward to your reply.

Regards,
Bram

Merovitz Potechin

Bram S. Potechin
B.A., LL.B.

Suite 300 – 1565 Carling Avenue
Ottawa, ON K1Z 8R1
Direct Line 613.563.6688
Main Line 613.563.7544
Fax 613.563.4577
bram@mpottawa.com
www.merovitzpotechin.com

From: Frank Cairo [mailto:frank.cairo@caivan.com]
Sent: September-04-18 10:49 PM
To: Bram Potechin <bram@mpottawa.com>
Cc: Samantha Viner <sviner@mpottawa.com>
Subject: RE: Caivan p/f Dam - Greenbank Road

Good evening Bram,

Please see the attached memo from Novatech addressing the Drainage Act matter. In addition to the matters outlined in the memo, please note that Drains protected under the drainage act are generally difficult to deal with in subdivision processing. This is due to the fact that any modifications to the drains (entombment, realignment etc) require a drainage act process be completed in addition to the standard approvals that would be required from the Conservation Authority, City an Province. This, historically speaking, adds a minimum of an additional year to the approval process. In a recent example we are dealing with in Richmond, the process commenced for the Van Gaal drain in 2012 and is still not complete despite our pushing legally and politically.

In short, the abandonment will add value to the lands and expedite the approval timing for the project. This will also avoid the titleholder (Nam Dam) being assessed fees later at the conclusion of a Drainage Act process (driven by Claridge) if the abandonment petition is not signed.

Please let me know if you have any additional questions.

Thank you,

Frank

From: Bram Potechin <bram@mpottawa.com>
Sent: August-23-18 2:34 PM
To: Frank Cairo <frank.cairo@caivan.com>
Cc: Samantha Viner <sviner@mpottawa.com>
Subject: Caivan p/f Dam - Greenbank Road

Hello Frank,

In my discussions with Andrew Pritchard, Andrew asked that I try and determine what is the development proposal that requires the drain to be released.

Please let me know why it is imperative that the drain be released, in furtherance of the development of the property.

Thanks,
Bram

Merovitz Potechin

Bram S. Potechin
B.A., LL.B.
Suite 300 – 1565 Carling Avenue
Ottawa, ON K1Z 8R1
Direct Line 613.563.6688
Main Line 613.563.7544
Fax 613.563.4577
bram@mpottawa.com
www.merovitzpotechin.com

NOVATECH
Engineers, Planners & Landscape Architects

August 31, 2018

Caivan Communities
Suite 302 - 2934 Baseline Road
Ottawa, ON K2H 1B2

Attention: **Mr. Frank Cairo**

Dear Sir:

Re: Abandonment of Burnett Municipal Drain

I am writing to you to enquire as to when we can expect the signing of the documents forwarded to you in December 2017. These documents would allow the City to proceed to Council with a report to abandon the Municipal Drain status on the Burnett Municipal Drain (documents attached again for your ease of reference). Removing the Municipal Drain status on the Burnett Municipal Drain provides a direct benefit to Dam's property, as follows:

1. It allows future alterations of the drain to proceed without having to go through the Drainage Act. Proceeding through the Drainage Act would require the preparation of a Drainage Engineer's Report to Council. Preparation of a Drainage Engineer's Report to Council would cost in the range of $30,000 - $60,000 and would take about a year to complete. The cost of the report would be the responsibility of the four tributary land owners. The City would retain the consultant and manage the report through the process.
2. As an alternative to proceeding with an Engineers Report (for abandoning the Drain) the City can proceed with a report to Council under Section 84 of the Act, recommending that the Municipal Drain status be abandoned. This would require the signatures of the tributary landowners (attached document) and then the report would proceed to Council. This process is very quick, as compared to an Engineer's Report, and would be at no cost to Dam.
3. Removing the Municipal Drain status on the Burnett Municipal Drain is an administrative matter and requires no physical work. Dam's lands would remain as they are today.

We look forward to receiving Dam's signature on the attached document. However, if for whatever reason this is not imminent, our client Claridge will continue to proceed with its development in a phased approach to not affect the Burnett Municipal Drain. At the same time, a request will be made to the City to initiate the abandonment process, through Section 84(3) of the Drainage Act, as noted in 2. above, of which Dam will be responsible for its portion of the cost.

Yours truly,

NOVATECH

Greg MacDonald, P.Eng.
Director | Land Development & Public-Sector Infrastructure

Attachs.

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

c.c. Jim Burghout, Claridge Homes

Suite 200, 240 Michael Cowpland Drive, Ottawa ON K2M 1P6 Tel: 613.254.9643 Fax: 613.254.5867 www.novatech-eng.com

Appendix D : GEOTECHNICAL INVESTIGATION

Geotechnical Engineering

Environmental Engineering

Hydrogeology

Geological Engineering

Materials Testing

Building Science

Archaeological Studies

Paterson Group Inc.
Consulting Engineers
154 Colonnade Road South
Ottawa (Nepean), Ontario
Canada K2E 7J5

Tel: (613) 226-7381
Fax: (613) 226-6344
www.patersongroup.ca

patersongroup

Geotechnical Investigation

Proposed Residential Development
3288 Greenbank Road - Ottawa

Prepared For

Caivan Communities

March 6, 2019

Report: PG2743-2

Tables of Contents

Appendices

1.0 Introduction

Paterson Group (Paterson) was commissioned by Caivan Communities to conduct a geotechnical investigation for the proposed residential development to be located at 3288 Greenbank Road, in the City of Ottawa (refer to Figure 1 - Key Plan presented in Appendix 2).

The objective of the investigation was to:

- ❏ determine the subsoil and groundwater conditions at this site by means of test holes.
- ❏ provide geotechnical recommendations for the design of the proposed development including construction considerations which may affect the design.

The following report has been prepared specifically and solely for the aforementioned project which is described herein. The report contains our findings and includes geotechnical recommendations pertaining to the design and construction of the proposed development as understood at the time of this report.

Investigating the presence or potential presence of contamination on the proposed development was not part of the scope of work. Therefore, the present report does not address environmental issues.

2.0 Proposed Development

It is understood that the proposed development consists of townhouse style housing blocks and multi-storey apartment buildings. Local roadways, car parking and landscaped areas are further anticipated for the proposed development.

3.0 Method of Investigation

3.1 Field Investigation

The field program for our investigation was carried out in February 2019 and October 2012. As part of our investigations, eleven (11) boreholes and 8 test pits were completed across the subject site extending to a maximum 10 m depth. The test hole location was placed in a manner to provide general coverage of the subject site taking into account existing test holes completed by others. The test hole locations are illustrated on Drawing PG2743-4 - Test Hole Location Plan presented in Appendix 2.

The boreholes were completed using a track-mounted auger drill rig operated by a two person crew. All fieldwork was conducted under the full-time supervision of Paterson personnel under the direction of a senior engineer from the geotechnical division. The testing procedure consisted of augering to the required depths and at the selected locations sampling the overburden.

Sampling and In Situ Testing

Soil samples were collected from the borehole using a 50 mm diameter split-spoon (SS) sampler, using 73 mm diameter thin walled (TW) Shelby tubes in conjunction with a piston sampler, or from the auger flights. All soil samples were visually inspected and initially classified on site. The split-spoon samples were placed in sealed plastic bags and the Shelby tubes were sealed at both ends on site. All samples were transported to the our laboratory for examination and classification. The depths at which the split-spoon, Shelby tube and auger samples were recovered from the test holes are shown as SS, TW and AU, respectively, on the Soil Profile and Test Data sheets presented in Appendix 1.

The Standard Penetration Test (SPT) was conducted in conjunction with the recovery of the split-spoon samples. The SPT results are recorded as “N” values on the Soil Profile and Test Data sheets. The “N” value is the number of blows required to drive the split-spoon sampler 300 mm into the soil after a 150 mm initial penetration using a 63.5 kg hammer falling from a height of 760 mm.

Undrained shear strength testing was conducted in cohesive soils using a field vane apparatus.

The overburden thickness was evaluated by a dynamic cone penetration testing (DCPT) at BH 6, BH 8 and BH 10. The DCPT consists of driving a steel drill rod, equipped with a 50 mm diameter cone at the tip, using a 63.5 kg hammer falling from a height of 760 mm. The number of blows required to drive the cone into the soil is recorded for each 300 mm increment.

The subsurface conditions observed at the test hole locations were recorded in detail in the field. The soil profiles are presented on the Soil Profile and Test Data sheets in Appendix 1 of this report.

Groundwater

Flexible standpipes were installed in the boreholes to monitor the groundwater level subsequent to the completion of the sampling program. The groundwater observations are noted on the Soil Profile and Test Data sheets presented in Appendix 1.

Sample Storage

All samples will be stored in the laboratory for a period of one month after issuance of the report. They will then be discarded unless we are otherwise directed.

3.2 Field Survey

The test holes were located in the field by JD Barnes. It is understood that the elevations are referenced to a geodetic datum. The ground surface elevation and location of the test holes are presented on Drawing PG2743-4 - Test Hole Location Plan in Appendix 2.

3.3 Laboratory Testing

The soil samples recovered from the field investigation were examined in our laboratory to review field notes and soil samples.

Seven (7) Shelby tube samples were submitted for unidimensional consolidation and one (1) sample submitted for Atterberg limit testing from our test holes completed during our investigation. Eight (8) additional soil samples were submitted for atterberg limit testing as part of our current investigation.

The results of the consolidation testing are presented on the Consolidation Test sheets presented in Appendix 1 and are further discussed in Sections 4 and 5.

4.0 Observations

4.1 Surface Conditions

Currently, the subject site consists of agricultural lands and associated farmhouse and outbuildings. The majority of the ground surface across the subject site is relatively flat and slopes gradually downwards to the south.

4.2 Subsurface Profile

Generally, the soil conditions encountered at the test hole locations consist of a cultivated topsoil/organic layer followed by a stiff, brown silty clay deposit overlying a glacial till layer. Practical refusal to augering or DCPT was encountered at BH 1, BH 6, BH 8 and BH 10 at depths varying between 8.2 and 14.8 m. It should be noted that BH 2 was terminated due to damage of drilling augers on dense till material at a 5.3 m depth. Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for specific details of the soil profiles encountered at each test hole location.

Based on available geological mapping, the bedrock in this area mostly consists of interbedded limestone and dolomite of the Gull River formation with an overburden drift thickness of 5 to 15 m depth.

4.3 Groundwater

Groundwater levels (GWL) were measured in the piezometers installed in the boreholes and results are summarized in Table 1. It should be noted that surface water can become perched within a backfilled borehole, which can lead to higher than normal groundwater level readings. The long-term groundwater level can also be estimated based on moisture levels and colour of the recovered soil samples. Based on these observations, the long-term groundwater table is expected between 1.5 to 2.5 m below original ground surface. It should be noted that groundwater levels are subject to seasonal fluctuations. Therefore, the groundwater levels could vary at the time of construction.

Table 1 - Summary of Groundwater Level Readings				
Borehole Number	**Ground Surface Elevation (m)**	**Groundwater Level (m)**	**Groundwater Elevation (m)**	**Recording Date**
BH 1	92.89	1.30	91.59	November 7, 2012
BH 2	92.37	1.08	91.29	November 7, 2012
BH 3	92.66	0.55	92.11	November 7, 2012
BH 4	92.81	1.76	91.05	November 7, 2012
BH 5	92.06	-	92.06	November 7, 2012
BH 6	92.19	1.08	91.11	November 7, 2012
BH 7	92.38	2.71	89.67	November 7, 2012
BH 8	92.88	1.35	91.53	November 7, 2012
BH 9	92.64	3.32	89.32	November 7, 2012
BH 10	92.40	1.63	90.77	November 7, 2012
BH 11	92.19	1.08	91.11	November 7, 2012

5.0 Discussion

5.1 Geotechnical Assessment

From a geotechnical perspective, the subject site is adequate for the proposed residential development. However, due to the presence of the sensitive silty clay layer, the proposed development will be subjected to grade raise restrictions.

Our permissible grade raise recommendations are discussed in Subsection 5.3 and the recommended permissible grade raise areas for housing are presented in Drawing PG2743-2 - Permissible Grade Raise Areas - Housing in Appendix 2. Also, the recommended permissible grade raise areas for apartment buildings are presented in Drawing PG2743-3 - Permissible Grade Raise Areas - Apartment Buildings in Appendix 2. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

The above and other considerations are further discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing organic materials, should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures.

Fill Placement

Fill used for grading beneath the building areas should consist, unless otherwise specified, of clean imported granular fill, such as Ontario Provincial Standard Specifications (OPSS) Granular A or Granular B Type II. Granular material should be tested and approved prior to delivery to the site. The fill should be placed in lifts of 300 mm thick or less and compacted using suitable compaction equipment for the lift thickness. Fill placed beneath the building areas should be compacted to at least 98% of the Standard Proctor Maximum Dry Density (SPMDD).

Non-specified existing fill along with site-excavated soil can be used as general landscaping fill and beneath parking areas where settlement of the ground surface is of minor concern. In landscaped areas, these materials should be spread in thin lifts and at least compacted by the tracks of the spreading equipment to minimize voids. If these materials are to be used to build up the subgrade level for areas to be paved, they should be compacted in thin lifts to a minimum density of 95% of the SPMDD. Non-specified existing fill and site-excavated soils are not suitable for use as backfill against foundation walls unless a composite drainage blanket connected to a perimeter drainage system is provided.

5.3 Foundation Design

Bearing Resistance Values

Strip footings, up to 2.5 m wide, and pad footings, up to 5 m wide, placed on an undisturbed, stiff silty clay bearing surface can be designed using a bearing resistance value at SLS of **100 kPa** and a factored bearing resistance value at ULS of **200 kPa**. Footings designed using the bearing resistance value at SLS given above will be subjected to potential post construction total and differential settlements of 25 and 20 mm, respectively.

The bearing resistance values are provided on the assumption that the footings will be placed on undisturbed soil bearing surfaces. An undisturbed soil bearing surface consists of one from which all topsoil and deleterious materials, such as loose, frozen or disturbed soil, whether in situ or not, have been removed, in the dry, prior to the placement of concrete for footings.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to the in-situ bearing medium soils above the groundwater table when a plane extending down and out from the bottom edge of the footing at a minimum of 1.5H:1V passes only through in situ soil of the same or higher capacity as the bearing medium soil.

Settlement/Grade Raise

Consideration must be given to potential settlements which could occur due to the presence of the silty clay deposit and the combined loads from the proposed footings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. For dwellings, a minimum value of 50% of the live load is recommended by Paterson.

Generally, the potential long term settlement is evaluated based on the compressibility characteristics of the silty clay. These characteristics are estimated in the laboratory by conducting unidimensional consolidation tests on undisturbed soil samples collected using Shelby tubes in conjunction with a piston sampler. Seven (7) site specific consolidation tests were conducted. The results of the consolidation tests are presented in Table 2 and in Appendix 1.

The value for p'_c is the preconsolidation pressure and p'_o is the effective overburden pressure of the test samples. The difference between these values is the available preconsolidation. The increase in stress on the soil due to the cumulative effects of the fill surcharge, the footing pressures, the slab loadings and the lowering of the groundwater should not exceed the available preconsolidation if unacceptable settlements are to be avoided.

The values for C_{cr} and C_c are the recompression and compression indices, respectively. These soil parameters are a measure of the compressibility due to stress increases below and above the preconsolidation pressures. The higher values for the C_c, as compared to the C_{cr}, illustrate the increased settlement potential above, as compared to below, the preconsolidation pressure.

Table 2 - Summary of Consolidation Test Results

Borehole	Sample	Elevation	p'_c	p'_o	C_{cr}	C_c	Q
BH 3	TW 4	88.45	104	50	0.021	2.253	A
BH 4	TW 4	88.53	103	55	0.019	2.146	A
BH 6	TW 3	87.16	119	63	0.022	1.064	A
BH 7	TW 3	87.35	113	68	0.016	1.683	A
BH 8	TW 3	87.78	111	62	0.015	2.000	A
BH 11	TW 1	88.41	119	58	0.014	1.253	A

* - Q - Quality assessment of sample - G: Good A: Acceptable P: Likely disturbed

The values of p'_c, p'_o, C_{cr} and C_c are determined using standard engineering testing procedures and are estimates only. Natural variations within the soil deposit will affect the results. The p'_o parameter is directly influenced by the groundwater level. Groundwater levels were measured during the site investigation. Groundwater levels vary seasonally which has an impact on the available preconsolidation. Lowering the groundwater level increases the p'_o and therefore reduces the available preconsolidation. Unacceptable settlements could be induced by a significant lowering of the groundwater level. The p'_o values for the consolidation tests during the investigation are based on the long term groundwater level being at 0.5 m below the existing groundwater table. The groundwater level is based on the colour and undrained shear strength profile of the silty clay.

The total and differential settlements will be dependent on characteristics of the proposed buildings. For design purposes, the total and differential settlements are estimated to be 25 and 20 mm, respectively. A post-development groundwater lowering of 0.5 m was assumed.

The potential post construction total and differential settlements are dependent on the position of the long term groundwater level when building are situated over deposits of compressible silty clay. Efforts can be made to reduce the impacts of the proposed development on the long term groundwater level by placing clay dykes in the service trenches, reducing the sizes of paved areas, leaving green spaces to allow for groundwater recharge or limiting planting of trees to areas away from the buildings. However, it is not economically possible to control the groundwater level.

To reduce potential long term liabilities, consideration should be given to accounting for a larger groundwater lowering and to provide means to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the dwellings, etc). Buildings on silty clay deposits increases the likelihood of movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking compared to unreinforced foundations.

Based on the consolidation testing results and subsurface profile encountered at the borehole locations, a permissible grade raise restriction was calculated for loadings associated with housing and for loadings associated with a 4 storey apartment building with an underground parking level. The recommended permissible grade raise areas for housing and apartment buildings are defined in Drawing PG2743-2 - Permissible Grade Raise Areas - Housing and Drawing PG2743-3 - Permissible Grade Raise Areas - Apartment Buildings in Appendix 2.

If higher grade raises and/or higher loading conditions are required, post construction settlements can be reduced by several methods. The following options can be considered and are further discussed in Subsection 5.4:

- ❏ preloading and surcharging
- ❏ lightweight fill (LWF)

Bearing resistance values for footing designs should be determined on a per lot basis at the time of construction.

5.4 Foundation Options

Based on the above discussion, several options could be considered for the foundation support of the proposed buildings:

Scenario A

Where the grade raise is close to, but below, the maximum permissible grade raise, consideration should be given to using more reinforcement in the design of the foundation (footings and walls) to reduce the risks of cracking in the concrete foundation. The use of control joints within the brick work between the garage and basement area should also be considered.

Scenario B

Where the grade raise cannot be accommodated with soil fill, the following options could be used alone or in combination.

Option 1 - Use of Lightweight Fill

Lightweight fill (LWF) can be used, consisting of EPS (expanded polystyrene) Type 19 or 22 blocks or other light weight materials which allow for raising the grade without adding a significant load to the underlying soils. However, these materials are expensive and, in the case of the EPS, are more difficult to use under the groundwater level, as they are buoyant, and must be protected against potential hydrocarbon spills. Use lightweight fill within the interior of the garage and porch areas to reduce the fill-related loads.

As an alternative to lightweight fill in the interior of the garage and porch, a structural slab can be designed to create a void beneath the floor slab and therefore reduce fill-related loads. Additional information can be provided once the design of the buildings is known.

Option 2 - Preloading or Surcharging

It is possible to preload or surcharge the proposed site in localized areas provided sufficient time is available to achieve the desired settlements based on theoretical values from the settlement analysis. If this option is considered, a monitoring program using settlement plates and electronic piezometers will have to be implemented. This program will determine the amount of settlement in the preloaded or surcharged areas. Obviously, preloading to proposed finished grades will allow for consolidation of the underlying clays over a longer time period. Surcharging the site with additional fill above the proposed finished grade will add additional load to the underlying clays accelerating the consolidation process and allowing for accelerated settlements. Once the desired settlements are achieved, the site can be unloaded and the fill can be used elsewhere on site.

With both the preloading and surcharging methods, the loading period can be reduced by installing vertical wick drains or sand drains in the silty clay layer to promote the movement of groundwater towards the ground surface. However, vertical drains are expensive for this type of residential project.

Underground Utilities

The underground services may be subjected to unacceptable total or differential settlements. In particular, the joints at the interface building/soil may be subjected to excessive stress if the differential settlements between the building and the services are excessive. This should be considered in the design of the underground services.

Once the required grade raises are established, the above options could be further discussed along with further recommendations on specific requirements.

5.5 Design for Earthquakes

A seismic site response **Class D** is applicable for foundations designed for the subject site according to the OBC 2012. A higher site class, such as Class C, may be applicable for foundations constructed within the east portion of the subject site. However, the higher site class should be confirmed by a site specific shear wave velocity test. The soils underlying the site are not susceptible to liquefaction.

5.6 Basement Slab

With the removal of all topsoil and deleterious fill, containing organic matter, within the footprints of the proposed buildings, undisturbed native soil surface will be considered acceptable subgrade on which to commence backfilling for floor slab construction. Any soft areas should be removed and backfilled with appropriate backfill material. OPSS Granular B Type II, with a maximum particle size of 50 mm, are recommended for backfilling below the floor slab. It is recommended that the upper 200 mm of sub-slab fill consist of 19 mm clear crushed stone.

5.7 Pavement Structure

For design purposes, the pavement structure presented in the following tables could be used for the design of car parking areas and access lanes/local residential streets. These guidelines should be reviewed once the details of the development are known.

Table 4 - Recommended Pavement Structure - Car Parking Areas	
Thickness (mm)	**Material Description**
50	**Wear Course** - HL 3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill	

Table 5 - Recommended Pavement Structure - Local Residential Roadways	
Thickness (mm)	**Material Description**
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Binder Course -** Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
400	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil	

Table 6 - Recommended Pavement Structure - Roadways with Bus Traffic	
Thickness mm	**Material Description**
40	**Wear Course -** Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** - Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course** - Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
600	**SUBBASE** - OPSS Granular B Type II
	SUBGRADE - Either in situ soil or OPSS Granular B Type II material placed over in situ soil

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for this project.

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type I or II material. Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a geotextile, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

Pavement Structure Drainage

Satisfactory performance of the pavement structure is largely dependent on the contact zone between the subgrade material and the base stone in a dry condition. Failure to provide adequate drainage under conditions of heavy wheel loading can result in the fine subgrade soil being pumped into the voids in the stone subbase, thereby reducing load carrying capacity.

Due to the low permeability of the subgrade materials consideration should be given to installing subdrains during the pavement construction as per City of Ottawa standards. The subdrain inverts should be approximately 300 mm below subgrade level. The subgrade surface should be crowned to promote water flow to the drainage lines.

6.0 Design and Construction Precautions

6.1 Foundation Drainage and Backfill

A perimeter foundation drainage system is recommended for proposed structures. The system should consist of a 100 to 150 mm diameter, geotextile-wrapped, perforated, corrugated, plastic pipe, surrounded on all sides by 150 mm of 10 mm clear crushed stone, placed at the footing level around the exterior perimeter of the structure. The pipe should have a positive outlet, such as a gravity connection to the storm sewer.

Backfill against the exterior sides of the foundation walls should consist of free-draining, non frost susceptible granular materials. The site materials will be frost susceptible and, as such, are not recommended for re-use as backfill unless a composite drainage system (such as system Platon or Miradrain G100N) connected to a drainage system is provided.

6.2 Protection Against Frost Action

Perimeter footings of heated structures are required to be insulated against the deleterious effect of frost action. A minimum 1.5 m thick soil cover (or equivalent) should be provided in this regard.

A minimum of 2.1 m thick soil cover (or equivalent) should be provided for other exterior unheated footings.

6.3 Excavation Side Slopes

The excavation for the current phase of the proposed development will be mostly through sandy silt and/or clayey silt/silty clay. Above the groundwater level, for excavations to depths of approximately 3 m, the excavation side slopes should be stable in the short term at 1H:1V. Flatter slopes could be required for deeper excavations or for excavation below the groundwater level. Where such side slopes are not permissible or practical, temporary shoring should be used. The subsoil at this site is considered to be mainly a Type 2 or 3 soil according to the Occupational Health and Safety Act and Regulations for Construction Projects.

The slope cross-sections recommended above are for temporary slopes. Excavated soil should not be stockpiled directly at the top of excavations and heavy equipment should be kept away from the excavation sides.

Slopes in excess of 3 m in height should be periodically inspected by the geotechnical consultant in order to detect if the slopes are exhibiting signs of distress.

It is recommended that a trench box be used at all times to protect personnel working in trenches with steep or vertical sides. It is expected that services will be installed by "cut and cover" methods and excavations will not be left open for extended periods of time.

6.4 Pipe Bedding and Backfill

Bedding and backfill materials should be in accordance with the most recent Material Specifications and Standard Detail Drawings from the City of Ottawa.

The pipe bedding for sewer and water pipes should consist of at least 150 mm of OPSS Granular A material. Where the bedding is located within the firm grey silty clay, the thickness of the bedding material should be increased to a minimum of 300 mm. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD. The bedding material should extent at least to the spring line of the pipe.

The cover material, which should consist of OPSS Granular A, should extend from the spring line of the pipe to at least 300 mm above the obvert of the pipe. The material should be placed in maximum 300 mm thick lifts and compacted to a minimum of 95% of its SPMDD.

Generally, it should be possible to re-use the moist (not wet) brown silty clay above the cover material if the excavation and filling operations are carried out in dry weather conditions. Wet silty clay materials will be difficult to re-use, as the high water contents make compacting impractical without an extensive drying period.

Where hard surface areas are considered above the trench backfill, the trench backfill material within the frost zone (about 1.8 m below finished grade) should match the soils exposed at the trench walls to minimize differential frost heaving. The trench backfill should be placed in maximum 300 mm thick loose lifts and compacted to a minimum of 95% of the material's SPMDD.

To reduce long-term lowering of the groundwater level at this site, clay seals should be provided in the service trenches. The seals should be at least 1.5 m long (in the trench direction) and should extend from trench wall to trench wall. The seals should extend from the frost line and fully penetrate the bedding, subbedding and cover material. The barriers should consist of relatively dry and compactable brown silty clay placed in maximum 225 mm thick loose layers and compacted to a minimum of 95% of the SPMDD. The clay seals should be placed at the site boundaries and at strategic locations at no more than 60 m intervals in the service trenches.

6.5 Groundwater Control

Due to the relatively impervious nature of the silty clay materials, it is anticipated that groundwater infiltration into the excavations should be low and controllable using open sumps. A perched groundwater condition may be encountered within the silty sand/sandy silt deposit which may produce significant temporary groundwater infiltration levels. Pumping from open sumps should be sufficient to control the groundwater influx through the sides of shallow excavations.

A temporary MOE permit to take water (PTTW) will be required for this project if more than 50,000 L/day are to be pumped during the construction phase. At least 3 to 4 months should be allowed for completion of the application and issuance of the permit by the MOE.

The contractor should be prepared to direct water away from all bearing surfaces and subgrades, regardless of the source, to prevent disturbance to the founding medium.

6.6 Winter Construction

The subsurface conditions at this site mostly consist of frost susceptible materials. In presence of water and freezing conditions ice could form within the soil mass. Heaving and settlement upon thawing could occur. Precautions should be taken if winter construction is considered for this project.

In the event of construction during below zero temperatures, the founding stratum should be protected from freezing temperatures by the use of straw, propane heaters, tarpaulins or other suitable means. In this regard, the base of the excavations should be insulated from sub-zero temperatures immediately upon exposure and until such time as heat is adequately supplied to the building and the footings are protected with sufficient soil cover to prevent freezing at founding level.

The trench excavations should be constructed in a manner that will avoid the introduction of frozen materials into the trenches. As well, pavement construction is difficult during winter. The subgrade consists of frost susceptible soils which will experience total and differential frost heaving as the work takes place. In addition, the introduction of frost, snow or ice into the pavement materials, which is difficult to avoid, could adversely affect the performance of the pavement structure. Additional information could be provided, if required.

6.7 Landscaping Considerations

Tree Planting Restrictions

In accordance with the City of Ottawa Tree Planting in Sensitive Marine Clay Soils (2017 Guidelines), Paterson completed a soils review of the site to determine applicable tree planting setbacks. Atterberg limits testing was completed for recovered silty clay samples at selected locations throughout the subject site. A shrinkage limit test and sieve analysis testing was also completed on selected soil samples. The shrinkage limit testing indicates a shrinkage limit of 21% with a shrinkage ratio of 1.78. The results of our atterberg limit and sieve testing are presented in Appendix 1.

During our field investigation, it was noted that the silty clay deposit across the site consists of a brown, stiff to very stiff silty clay, which is not considered to be a sensitive marine clay soil. Therefore, the Tree Planting Guidelines not required to be followed for the subject site. **Based on our review of the silty clay deposit, a tree planting setback limit of 4.5 m for small (mature tree height up to 7.5m) and medium size trees (mature tree height 7.5 m to 14 m) is recommended across the subject site provided that the following conditions are met.**

- ❑ The underside of footing (USF) is 2.1 m or greater below the lowest finished grade must be satisfied for footings within 10 m from the tree, as measured from the centre of the tree trunk and verified by means of the Grading Plan as indicated procedural changes below.

- ❑ A small tree must be provided with a minimum of 25 m^3 of available soil volume while a medium tree must be provided with a minimum of 30 m^3 of available soil volume, as determined by the Landscape Architect. The developer is to ensure that the soil is generally un-compacted when backfilling in street tree planting locations.

- ❑ The tree species must be small (mature tree height up to 7.5 m) to medium size (mature tree height 7.5 m to 14 m) as confirmed by the Landscape Architect. The foundation walls are to be reinforced at least nominally (minimum of two upper and two lower 15M bars in the foundation wall).

- ❑ Grading surround the tree must promote drainage to the tree root zone (in such a manner as not to be detrimental to the tree), as noted on the subdivision Grading Plan.

Swimming Pools

The in-situ soils are considered to be acceptable for swimming pools. Above ground swimming pools must be placed at least 4 m away from the residence foundation and neighbouring foundations. Otherwise, pool construction is considered routine, and can be constructed in accordance with the manufacturer`s requirements.

Aboveground Hot Tubs

If consideration is given to construction of an aboveground hot tub, a geotechnical consultant should be retained by the homeowner to review the site conditions. Additional grading around the hot tub should not exceed permissible grade raises. Otherwise, hot tub construction is considered routine, and can be constructed in accordance with the manufacturer's specifications.

Installation of Decks or Additions

If consideration is given to construction of a deck or addition, a geotechnical consultant should be retained by the homeowner to review the site conditions. Additional grading around proposed deck or addition should not exceed permissible grade raises. Otherwise, standard construction practices are considered acceptable.

7.0 Recommendations

It is recommended that the following be completed once the master plan and site development are determined:

- ❑ Review detailed grading plan(s) from a geotechnical perspective.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to placing backfilling materials.
- ❑ Field density tests to ensure that the specified level of compaction has been achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

A report confirming that these works have been conducted in general accordance with Paterson's recommendations could be issued upon request, following the completion of a satisfactory material testing and observation program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations made in this report are in accordance with Paterson's present understanding of the project. Paterson requests permission to review the grading plan once available. Paterson's recommendations should be reviewed when the drawings and specifications are complete.

The client should be aware that any information pertaining to soils and the test hole log are furnished as a matter of general information only. Test hole descriptions or logs are not to be interpreted as descriptive of conditions at locations other than those of the test holes.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests to be notified immediately in order to permit reassessment of the recommendations.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Caivan Communities or their agent(s) is not authorized without review by this firm for the applicability of our recommendations to the altered use of the report.

Paterson Group Inc.

March 12, 2019

Joey R Villeneuve, M.A.Sc, EIT.

David J. Gilbert, P.Eng.

APPENDIX 1

SOIL PROFILE AND TEST DATA SHEET

SYMBOLS AND TERMS

RECORDS OF BOREHOLE BY OTHERS

CONSOLIDATION TEST RESULTS

ATTERBERG LIMITS' TESTING RESULTS

GRAIN SIZE DISTRIBUTION RESULTS

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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 3288 Greenbank Rd.
Ottawa, Ontario

DATUM Ground surface elevations at borehole locations provided by J.D. Barnes Limited.

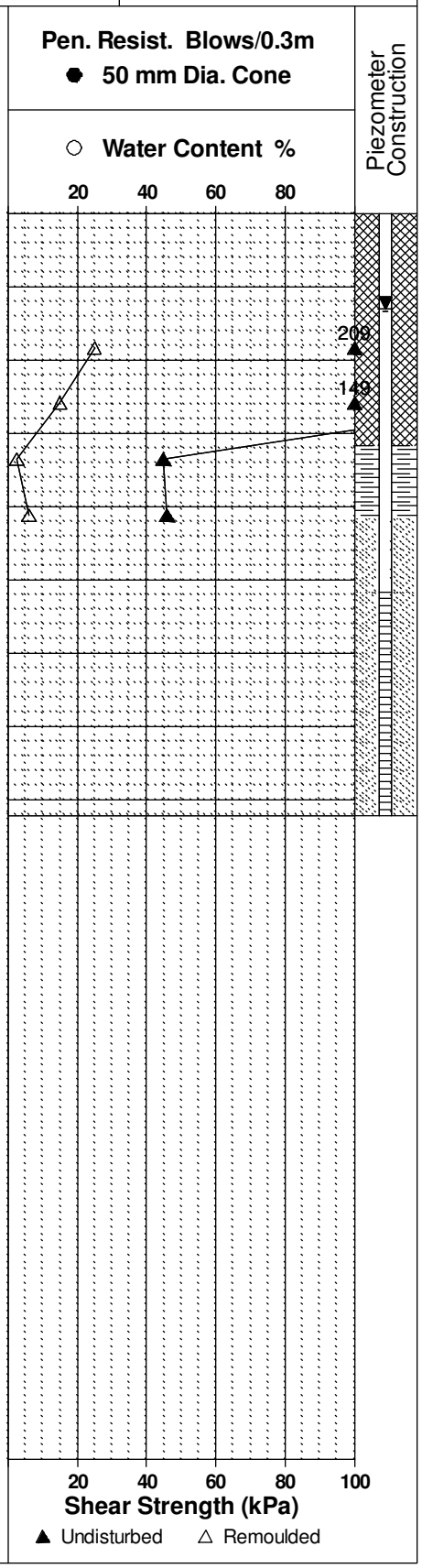
FILE NO. PG2743

REMARKS

HOLE NO. BH 1

BORINGS BY CME 850X Power Auger **DATE** October 15, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.89
TOPSOIL 0.30		AU	1				
		AU	2				
		SS	3	100	10	1	91.89
Hard to very stiff, brown **SILTY CLAY**						2	90.89
- firm by 2.8m depth						3	89.89
4.34						4	88.89
		SS	4	100	4	5	87.89
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	5	12	2	6	86.89
		SS	6	17	2		
		SS	7	100	3	7	85.89
		SS	8	73	50+	8	84.89
8.21							
End of Borehole							
Practical refusal to augering at 8.21m depth							
(GWL @ 1.30m-Nov. 7, 2012)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 3288 Greenbank Rd.
Ottawa, Ontario

DATUM Ground surface elevations at borehole locations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. BH 2

BORINGS BY CME 850X Power Auger **DATE** October 16, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.37
TOPSOIL 0.30		AU	1				
		AU	2				
		SS	3	100	10	1	91.37
Very stiff to stiff, brown **SILTY CLAY**		SS	4	100	5	2	90.37
- firm by 2.8m depth						3	89.37
4.34						4	88.37
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	5	38	50+		
5.26						5	87.37
End of Borehole							
(GWL @ 1.08m-Nov. 7, 2012)							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %

20 40 60 80

Piezometer Construction

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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Geotechnical Investigation
Prop. Residential Development - 3288 Greenbank Rd.
Ottawa, Ontario

DATUM Ground surface elevations at borehole locations provided by J.D. Barnes Limited.

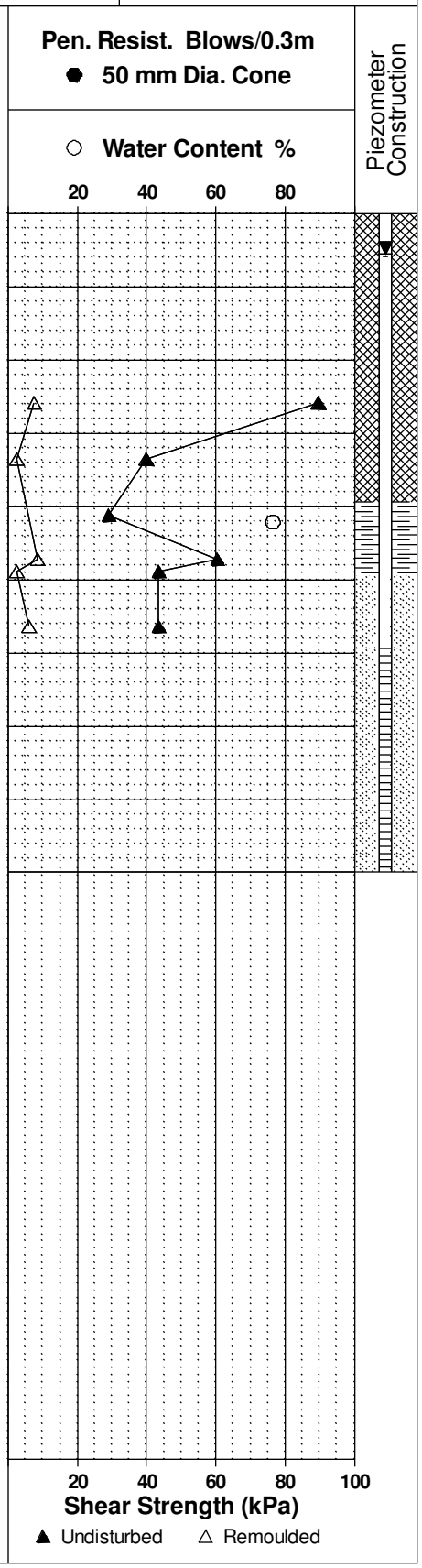
FILE NO. PG2743

REMARKS

HOLE NO. BH 3

BORINGS BY CME 850X Power Auger **DATE** October 16, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.66
TOPSOIL 0.25		AU	1				
		SS	2	100	10	1	91.66
		SS	3	100	4	2	90.66
Very stiff to stiff, brown **SILTY CLAY**						3	89.66
- firm and grey by 2.8m depth		TW	4	100		4	88.66
5.87						5	87.66
		SS	5	0	4	6	86.66
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	6	0	6	7	85.66
		SS	7	83	8	8	84.66
8.99		SS	8	67	38		
End of Borehole							
(GWL @ 0.55m-Nov. 7, 2012)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 3288 Greenbank Rd.
Ottawa, Ontario

DATUM Ground surface elevations at borehole locations provided by J.D. Barnes Limited.

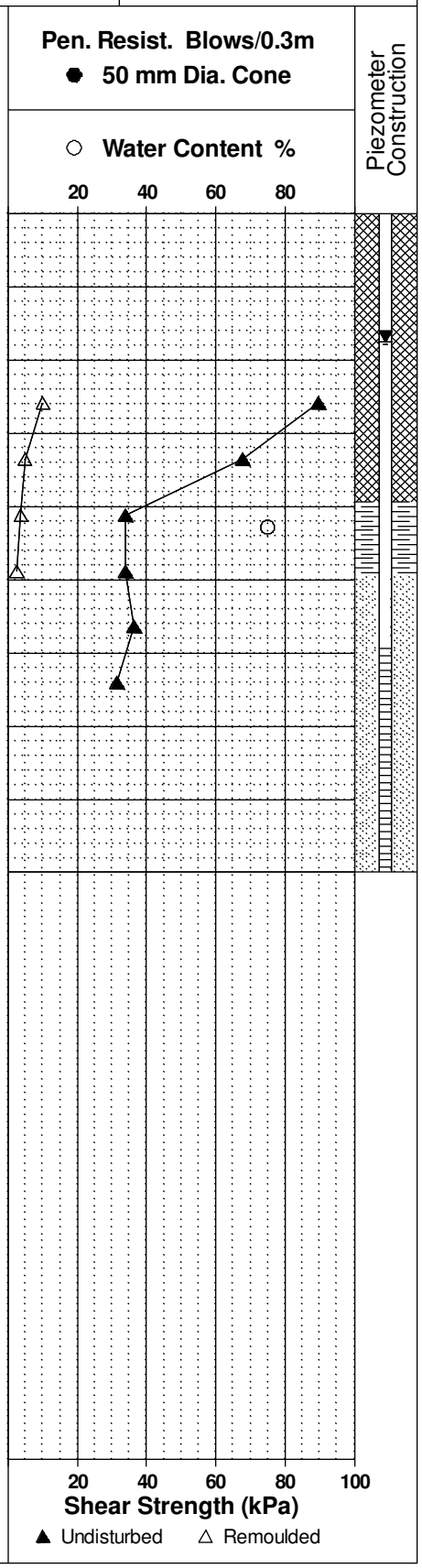
FILE NO. PG2743

REMARKS

HOLE NO. BH 4

BORINGS BY CME 850X Power Auger **DATE** October 16, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.81
TOPSOIL 0.30		AU	1				
		SS	2	100	12	1	91.81
		SS	3	100	4	2	90.81
Very stiff to stiff, brown **SILTY CLAY**						3	89.81
- firm and grey by 3.6m depth		TW	4			4	88.81
						5	87.81
						6	86.81
7.54		TW	5	83		7	85.81
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	6	83	7	8	84.81
8.99		SS	7	67	12		
End of Borehole							
(GWL @ 1.76m-Nov. 7, 2012)							



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154 Colonnade Road South, Ottawa, Ontario K2E 7J5

SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 3288 Greenbank Rd.
Ottawa, Ontario

DATUM Ground surface elevations at borehole locations provided by J.D. Barnes Limited.

FILE NO. PG2743

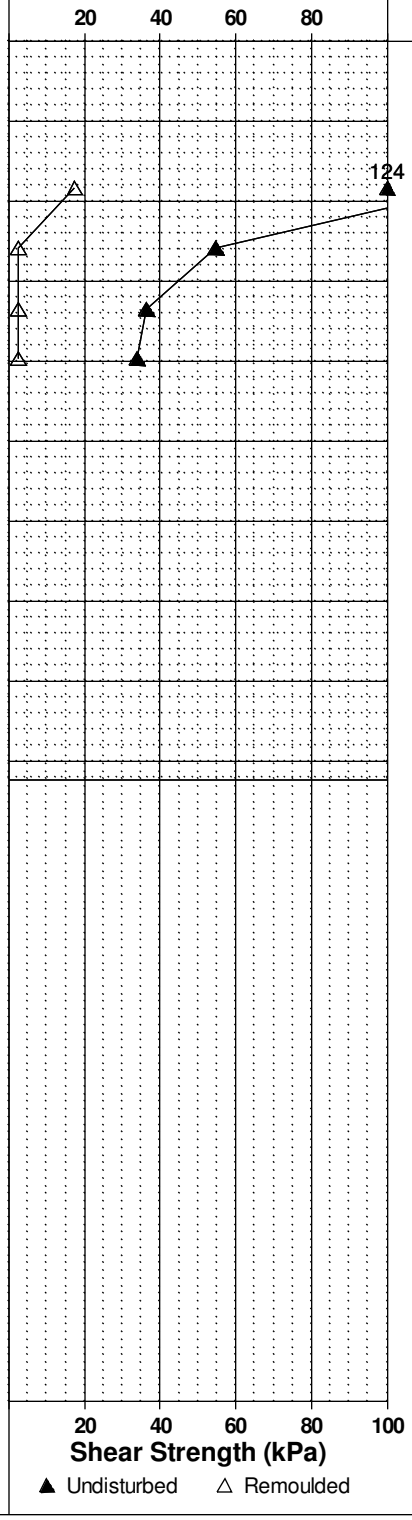
REMARKS

HOLE NO. BH 5

BORINGS BY CME 850X Power Auger **DATE** October 16, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.06
TOPSOIL 0.28		AU	1				
		SS	2		12	1	91.06
Very stiff to stiff, brown **SILTY CLAY**						2	90.06
- firm and grey by 2.8m depth		TW	3	100		3	89.06
4.27		TW	4	46		4	88.06
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	5	50	8	5	87.06
		SS	6	50	3	6	86.06
		SS	7	50	15		
7.16						7	85.06
Loose, grey **SAND**		SS	8	42	9	8	84.06
9.24						9	83.06
End of Borehole							

Pen. Resist. Blows/0.3m
● 50 mm Dia. Cone
○ Water Content %



Piezometer Construction

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
Prop. Residential Development - 3288 Greenbank Rd.
Ottawa, Ontario

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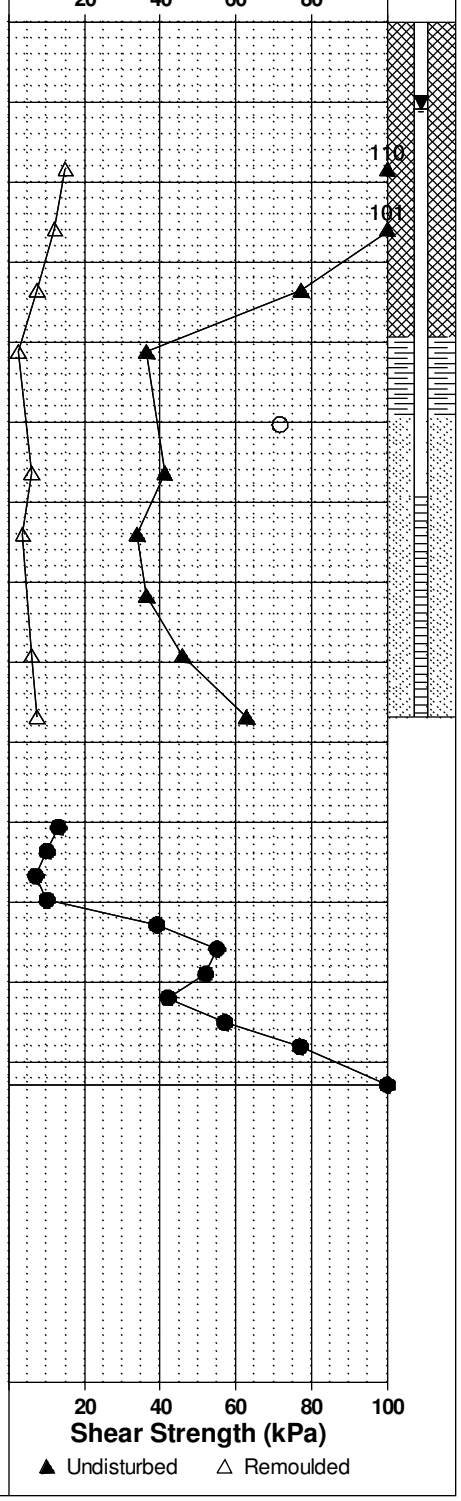
REMARKS

HOLE NO. BH 6

BORINGS BY CME 850X Power Auger **DATE** October 17, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.19
TOPSOIL 0.33		AU	1				
		SS	2	100	9	1	91.19
						2	90.19
Very stiff to stiff, brown **SILTY CLAY**						3	89.19
- firm and grey 3.6m depth						4	88.19
		TW	3	100		5	87.19
						6	86.19
						7	85.19
						8	84.19
8.69						9	83.19
Dynamic Cone Penetration Test commenced at 8.69m depth. Cone pushed to 10.0m depth.						10	82.19
						11	81.19
						12	80.19
13.28						13	79.19
End of Borehole							
Practical cone refusal at 13.28m depth							
(GWL @ 1.08m-Nov. 7, 2012)							



Piezometer Construction

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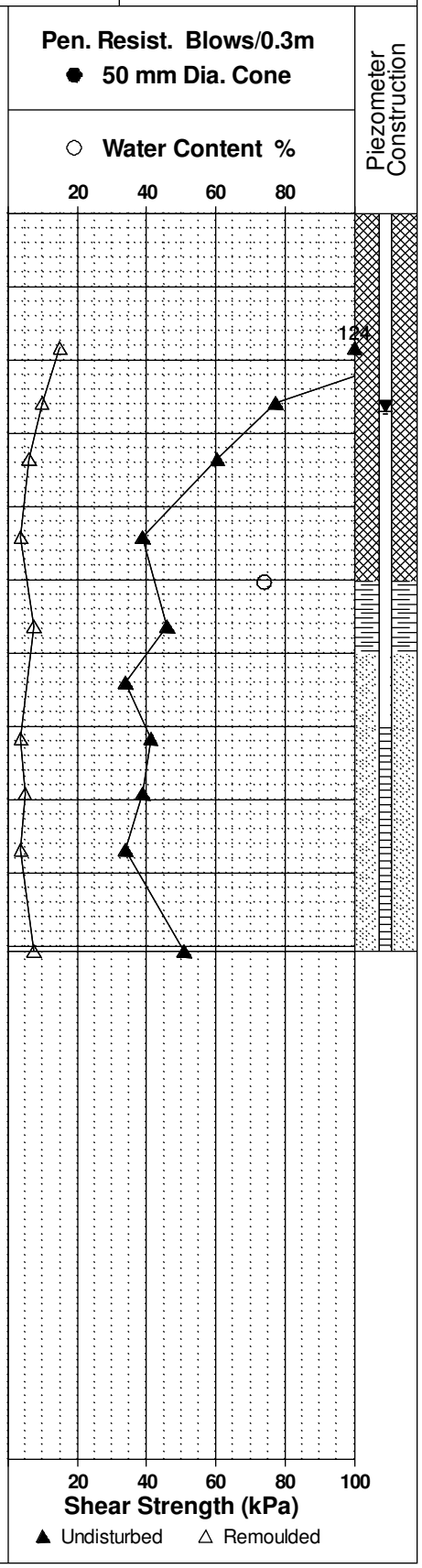
REMARKS

HOLE NO. BH 7

BORINGS BY CME 850X Power Auger **DATE** October 17, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.38
TOPSOIL 0.30		AU	1				
		SS	2	100	8	1	91.38
						2	90.38
Very stiff to stiff, brown **SILTY CLAY**						3	89.38
- firm and grey by 3.6m depth						4	88.38
		TW	3	83		5	87.38
						6	86.38
						7	85.38
						8	84.38
						9	83.38
		TW	4	100		10	82.38
10.06 End of Borehole							
(GWL @ 2.71m-Nov. 7, 2012)							



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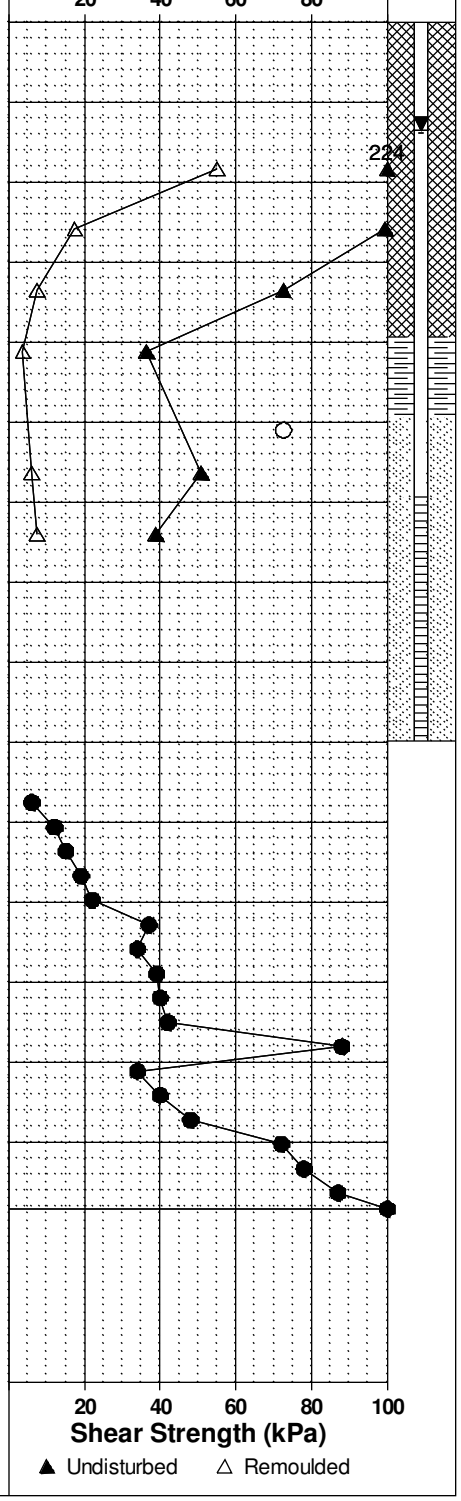
REMARKS

HOLE NO. BH 8

BORINGS BY CME 850X Power Auger **DATE** October 17, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.88
TOPSOIL 0.30		AU	1				
		SS	2	100	10	1	91.88
						2	90.88
Hard to stiff, brown **SILTY CLAY**						3	89.88
- firm and grey by 3.6m depth						4	88.88
		TW	3	100		5	87.88
						6	86.88
7.16		TW	4	58		7	85.88
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	5	42	8	8	84.88
9.00		SS	6	33	6	9	83.88
Dynamic Cone Penetration Test commenced at 9.00m depth.						10	82.88
						11	81.88
						12	80.88
						13	79.88
						14	78.88
14.83							
End of Borehole							
Practical refusal to augering at 14.83m depth.							
(GWL @ 1.35m-Nov. 7, 2012)							



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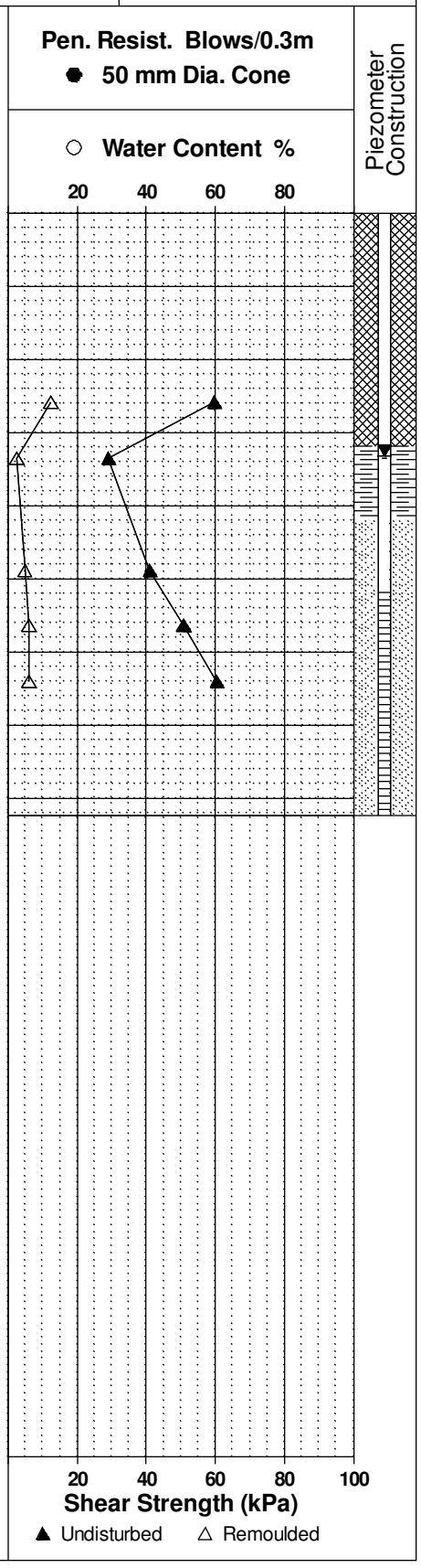
REMARKS

HOLE NO. BH 9

BORINGS BY CME 850X Power Auger **DATE** October 18, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.64
TOPSOIL 0.30		AU	1				
		SS	2	100	13	1	91.64
Very stiff to stiff, brown **SILTY CLAY**		SS	3	100	7	2	90.64
- firm and grey by 2.8m depth		TW	4			3	89.64
		TW	5	100		4	88.64
- stiff and grey-brown by 5.1m depth						5	87.64
6.63						6	86.64
GLACIAL TILL: Grey silty clay with sand, gravel, cobbles, boulders		SS	6	42	50	7	85.64
8.23		SS	7	8	14	8	84.64
End of Borehole							
(GWL @ 3.32m-Nov. 7, 2012)							



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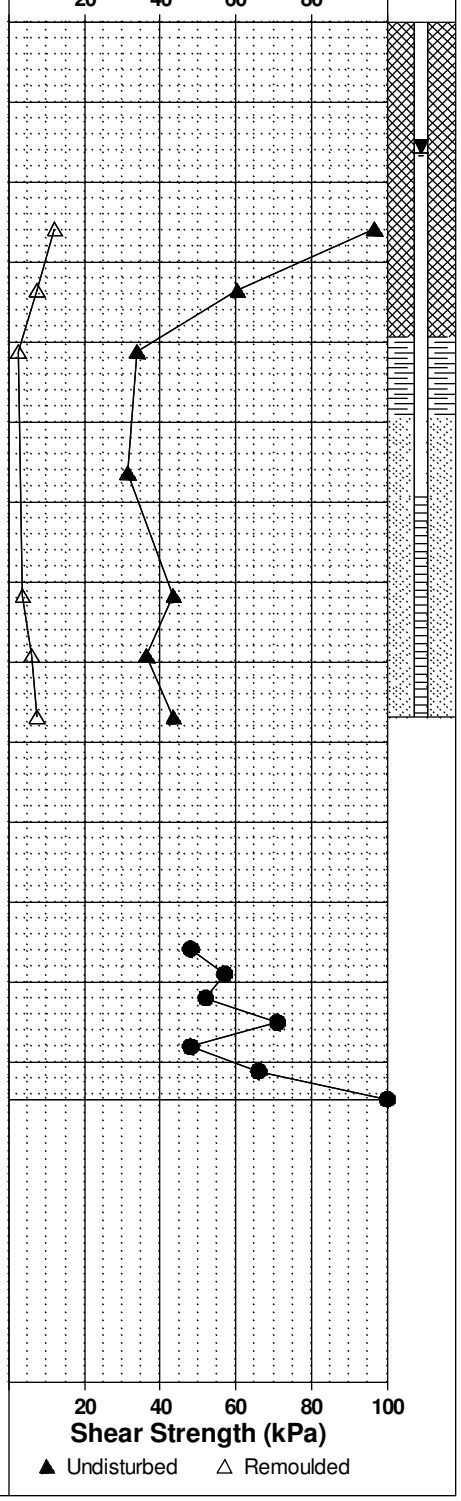
REMARKS

HOLE NO. BH10

BORINGS BY CME 850X Power Auger **DATE** October 18, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)
GROUND SURFACE						0	92.40
TOPSOIL 0.30		AU	1				
		SS	2	100	7	1	91.40
		SS	3	100	3	2	90.40
Stiff, brown **SILTY CLAY**						3	89.40
- firm and grey-brown by 3.6m depth						4	88.40
		TW	4	100		5	87.40
		TW	5	100		6	86.40
						7	85.40
						8	84.40
8.69							
Dynamic Cone Penetration Test commenced at 8.69m depth. Cone pushed to 11.5m depth.						9	83.40
						10	82.40
						11	81.40
						12	80.40
						13	79.40
13.46							
End of Borehole							
Practical cone refusal at 13.46m depth.							
(GWL @ 1.63m-Nov. 7, 2012)							



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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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Ottawa, Ontario

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FILE NO. PG2743

REMARKS

HOLE NO. BH11

BORINGS BY CME 850X Power Auger **DATE** October 18, 2012

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.70		
TOPSOIL 0.30						1	91.70		
Firm, grey **SILTY CLAY**						2	90.70		
		TW	1	100		3	89.70		
4.72						4	88.70		
End of Borehole									

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %

20 40 60 80

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
2388 Greenbank Road
Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. TP 1

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	93.85		
TOPSOIL 0.20									
Brown **SILTY SAND** with clay 0.40									
Stiff, brown **CLAYEY SILT**		G	1			1	92.85		
1.80									
GLACIAL TILL: Brown clayey silt with sand, gravel, cobbles and boulders		G	2			2	91.85		▽
		G	3						
2.60									
End of Test Pit									
(GWL @ 2.0m depth based on field observations)									

Pen. Resist. Blows/0.3m: 20 40 60 80

Water Content %: 20 40 60 80

Shear Strength (kPa): 20 40 60 80 100

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

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2388 Greenbank Road
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DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. TP 2

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.72	20 40 60 80	
TOPSOIL									
0.25									
Very stiff to stiff, brown **SILTY CLAY**		G	1						
- grey by 1.0m depth						1	91.72		▽
		G	2						
						2	90.72		
		G	3						
		G	4						
2.70									
End of Test Pit									
(Groundwater infiltration at 1.5m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. TP 3

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.90	20 40 60 80	
TOPSOIL									
0.30									
Very stiff to stiff, brown **SILTY CLAY**		G	1						
- grey by 1.0m depth						1	91.90		▽
		G	2						
		G	3			2	90.90		
		G	4						
2.50									
End of Test Pit									
(Groundwater infiltration at 1.8m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. TP 4

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.95	20 40 60 80	
TOPSOIL									
0.25									
Very stiff, brown **CLAYEY SILT/SILTY CLAY**									
1.00						1	91.95		
Very stiff, brown **SILTY CLAY**		G	1						▽
		G	2			2	90.95		
		G	3						
2.60									
End of Test Pit									
(Groundwater infiltration at 1.9m depth)									

20 40 60 80 100

Shear Strength (kPa)

▲ Undisturbed △ Remoulded

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SOIL PROFILE AND TEST DATA

Geotechnical Investigation
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Ottawa, Ontario

DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. TP 5

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.40	20 40 60 80	
TOPSOIL									
0.30									
Stiff, brown **SILTY CLAY**		G	1			1	91.40		▽
		G	2			2	90.40		
2.60		G	3						
End of Test Pit									
(Groundwater infiltration at 1.7m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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DATUM Ground surface elevations provided by J.D. Barnes Limited.

FILE NO. PG2743

REMARKS

HOLE NO. TP 6

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.48	20 40 60 80	
TOPSOIL 0.20									
Very stiff, brown **SILTY CLAY** with sand		G	1			1	91.48		
1.40									
Stiff, grey-brown **SILTY CLAY**		G	2						
- grey by 1.7m depth		G	3			2	90.48		
		G	4						
2.60									
End of Test Pit									
(Groundwater infiltration at 1.8m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

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FILE NO. PG2743

REMARKS

HOLE NO. TP 7

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone / ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	92.63		
TOPSOIL									
0.40									
Very stiff, brown **SILTY CLAY** with sand		G	1			1	91.63		
1.00									
Stiff, brown **SILTY CLAY**		G	2			2	90.63		
		G	3						
2.40									
End of Test Pit (Groundwater infiltration at 1.5m depth)									▽

Pen. Resist. Blows/0.3m: ● 50 mm Dia. Cone; ○ Water Content %
20 40 60 80

Shear Strength (kPa)
20 40 60 80 100
▲ Undisturbed △ Remoulded

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FILE NO. PG2743

REMARKS

HOLE NO. TP 8

BORINGS BY Excavator **DATE** February 19, 2019

SOIL DESCRIPTION	STRATA PLOT	SAMPLE TYPE	SAMPLE NUMBER	SAMPLE % RECOVERY	SAMPLE N VALUE or RQD	DEPTH (m)	ELEV. (m)	Pen. Resist. Blows/0.3m ● 50 mm Dia. Cone ○ Water Content %	Piezometer Construction
GROUND SURFACE						0	93.20	20 40 60 80	
TOPSOIL									
0.30									
Very stiff, brown **SILTY CLAY** with sand						1	92.20		▽
1.10									
		G	1						
Very stiff, brown **SILTY CLAY**						2	91.20		
		G	2						
		G	3						
2.60									
End of Test Pit									
(Groundwater infiltration at 1.6m depth)									

20 40 60 80 100
Shear Strength (kPa)
▲ Undisturbed △ Remoulded

SYMBOLS AND TERMS

SOIL DESCRIPTION

Behavioural properties, such as structure and strength, take precedence over particle gradation in describing soils. Terminology describing soil structure are as follows:

Desiccated	-	having visible signs of weathering by oxidation of clay minerals, shrinkage cracks, etc.
Fissured	-	having cracks, and hence a blocky structure.
Varved	-	composed of regular alternating layers of silt and clay.
Stratified	-	composed of alternating layers of different soil types, e.g. silt and sand or silt and clay.
Well-Graded	-	Having wide range in grain sizes and substantial amounts of all intermediate particle sizes (see Grain Size Distribution).
Uniformly-Graded	-	Predominantly of one grain size (see Grain Size Distribution).

The standard terminology to describe the strength of cohesionless soils is the relative density, usually inferred from the results of the Standard Penetration Test (SPT) 'N' value. The SPT N value is the number of blows of a 63.5 kg hammer, falling 760 mm, required to drive a 51 mm O.D. split spoon sampler 300 mm into the soil after an initial penetration of 150 mm.

Relative Density	'N' Value	Relative Density %
Very Loose	<4	<15
Loose	4-10	15-35
Compact	10-30	35-65
Dense	30-50	65-85
Very Dense	>50	>85

The standard terminology to describe the strength of cohesive soils is the consistency, which is based on the undisturbed undrained shear strength as measured by the in situ or laboratory vane tests, penetrometer tests, unconfined compression tests, or occasionally by Standard Penetration Tests.

Consistency	Undrained Shear Strength (kPa)	'N' Value
Very Soft	<12	<2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very Stiff	100-200	15-30
Hard	>200	>30

SYMBOLS AND TERMS (continued)

SOIL DESCRIPTION (continued)

Cohesive soils can also be classified according to their “sensitivity”. The sensitivity is the ratio between the undisturbed undrained shear strength and the remoulded undrained shear strength of the soil.

Terminology used for describing soil strata based upon texture, or the proportion of individual particle sizes present is provided on the Textural Soil Classification Chart at the end of this information package.

ROCK DESCRIPTION

The structural description of the bedrock mass is based on the Rock Quality Designation (RQD).

The RQD classification is based on a modified core recovery percentage in which all pieces of sound core over 100 mm long are counted as recovery. The smaller pieces are considered to be a result of closely-spaced discontinuities (resulting from shearing, jointing, faulting, or weathering) in the rock mass and are not counted. RQD is ideally determined from NXL size core. However, it can be used on smaller core sizes, such as BX, if the bulk of the fractures caused by drilling stresses (called “mechanical breaks”) are easily distinguishable from the normal in situ fractures.

RQD %	ROCK QUALITY
90-100	Excellent, intact, very sound
75-90	Good, massive, moderately jointed or sound
50-75	Fair, blocky and seamy, fractured
25-50	Poor, shattered and very seamy or blocky, severely fractured
0-25	Very poor, crushed, very severely fractured

SAMPLE TYPES

SS	-	Split spoon sample (obtained in conjunction with the performing of the Standard Penetration Test (SPT))
TW	-	Thin wall tube or Shelby tube
PS	-	Piston sample
AU	-	Auger sample or bulk sample
WS	-	Wash sample
RC	-	Rock core sample (Core bit size AXT, BXL, etc.). Rock core samples are obtained with the use of standard diamond drilling bits.

SYMBOLS AND TERMS (continued)

GRAIN SIZE DISTRIBUTION

MC%	-	Natural moisture content or water content of sample, %
LL	-	Liquid Limit, % (water content above which soil behaves as a liquid)
PL	-	Plastic limit, % (water content above which soil behaves plastically)
PI	-	Plasticity index, % (difference between LL and PL)
Dxx	-	Grain size which xx% of the soil, by weight, is of finer grain sizes These grain size descriptions are not used below 0.075 mm grain size
D10	-	Grain size at which 10% of the soil is finer (effective grain size)
D60	-	Grain size at which 60% of the soil is finer
Cc	-	Concavity coefficient = $(D30)^2$ / (D10 x D60)
Cu	-	Uniformity coefficient = D60 / D10

Cc and Cu are used to assess the grading of sands and gravels:
Well-graded gravels have: $1 < Cc < 3$ and $Cu > 4$
Well-graded sands have: $1 < Cc < 3$ and $Cu > 6$
Sands and gravels not meeting the above requirements are poorly-graded or uniformly-graded.
Cc and Cu are not applicable for the description of soils with more than 10% silt and clay
(more than 10% finer than 0.075 mm or the #200 sieve)

CONSOLIDATION TEST

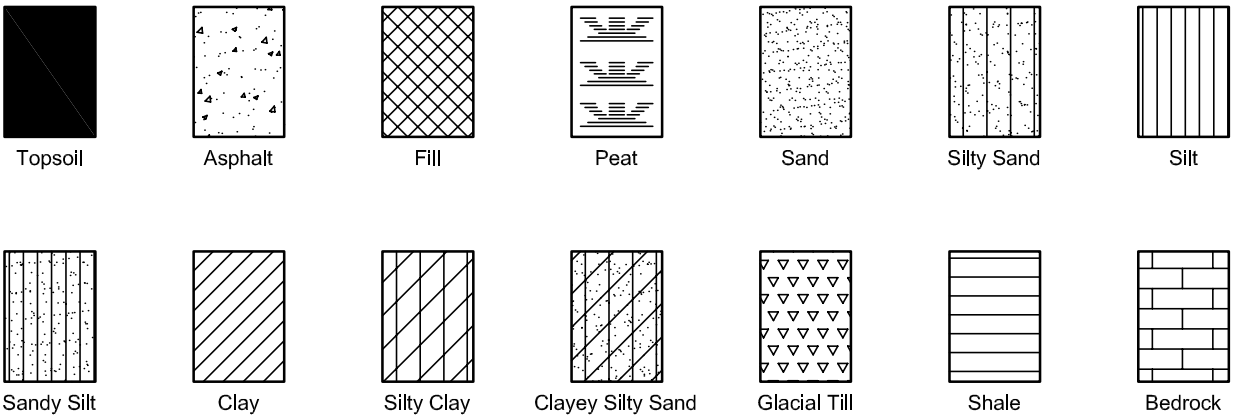
p'_o	-	Present effective overburden pressure at sample depth
p'_c	-	Preconsolidation pressure of (maximum past pressure on) sample
Ccr	-	Recompression index (in effect at pressures below p'_c)
Cc	-	Compression index (in effect at pressures above p'_c)
OC Ratio		Overconsolidaton ratio = p'_c / p'_o
Void Ratio		Initial sample void ratio = volume of voids / volume of solids
Wo	-	Initial water content (at start of consolidation test)

PERMEABILITY TEST

k	-	Coefficient of permeability or hydraulic conductivity is a measure of the ability of water to flow through the sample. The value of k is measured at a specified unit weight for (remoulded) cohesionless soil samples, because its value will vary with the unit weight or density of the sample during the test.

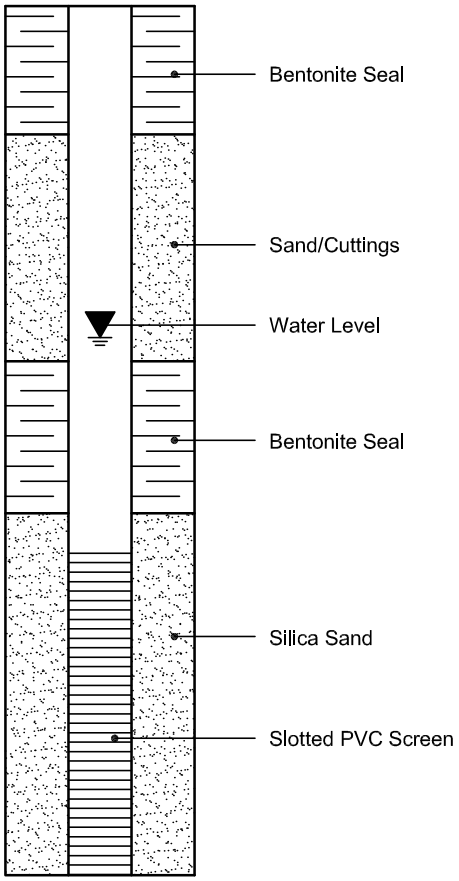
SYMBOLS AND TERMS (continued)

STRATA PLOT

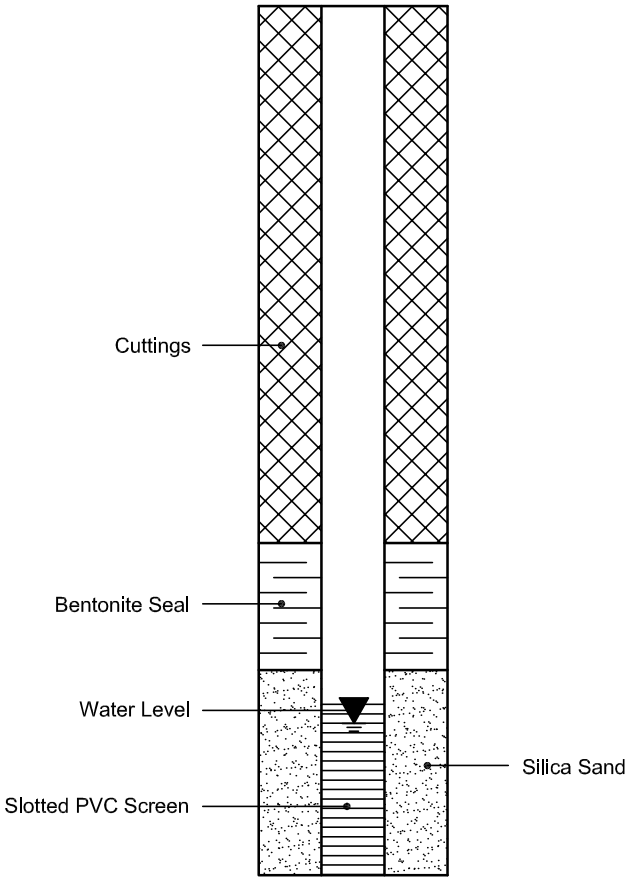


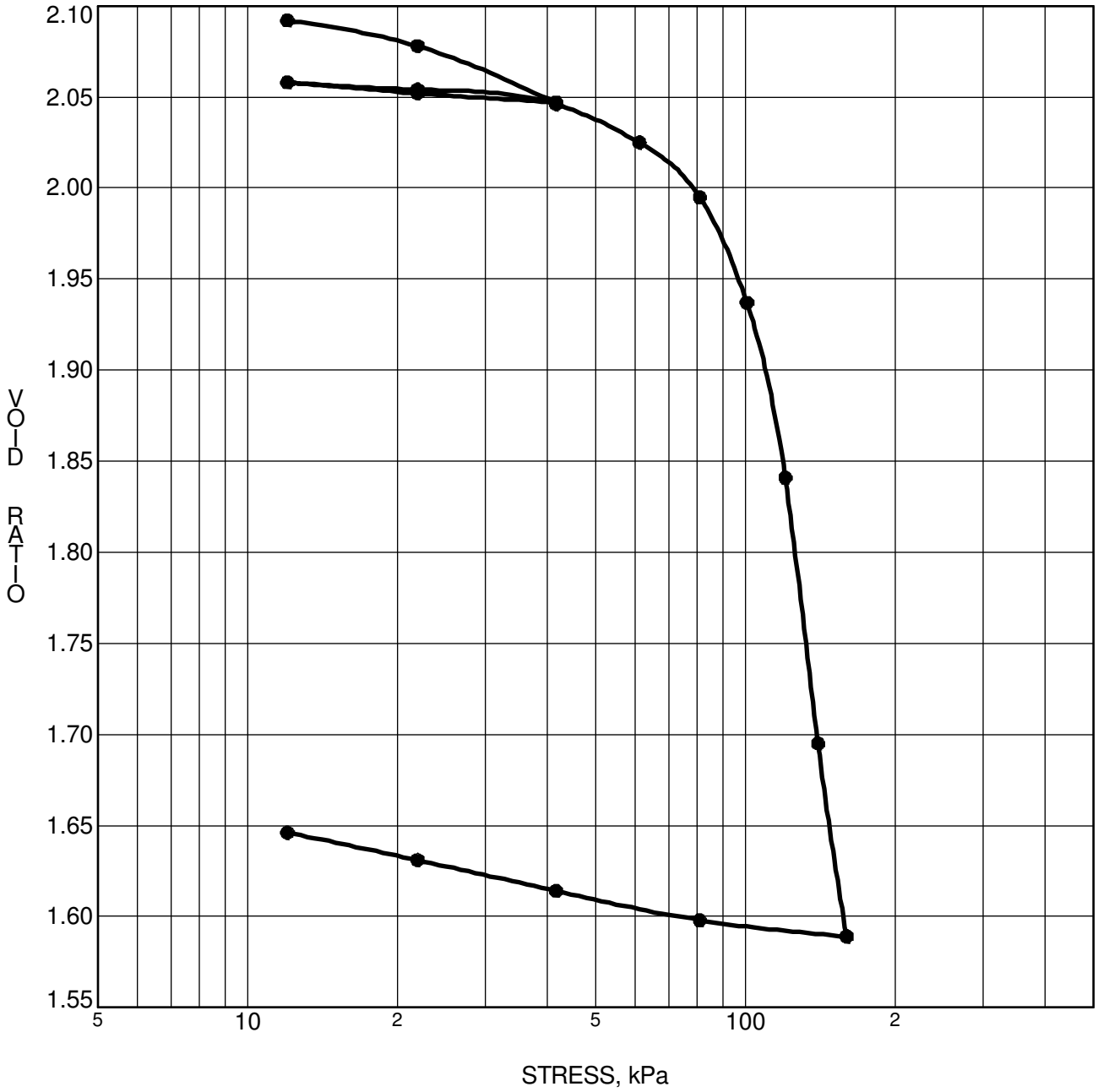
MONITORING WELL AND PIEZOMETER CONSTRUCTION

MONITORING WELL CONSTRUCTION



PIEZOMETER CONSTRUCTION





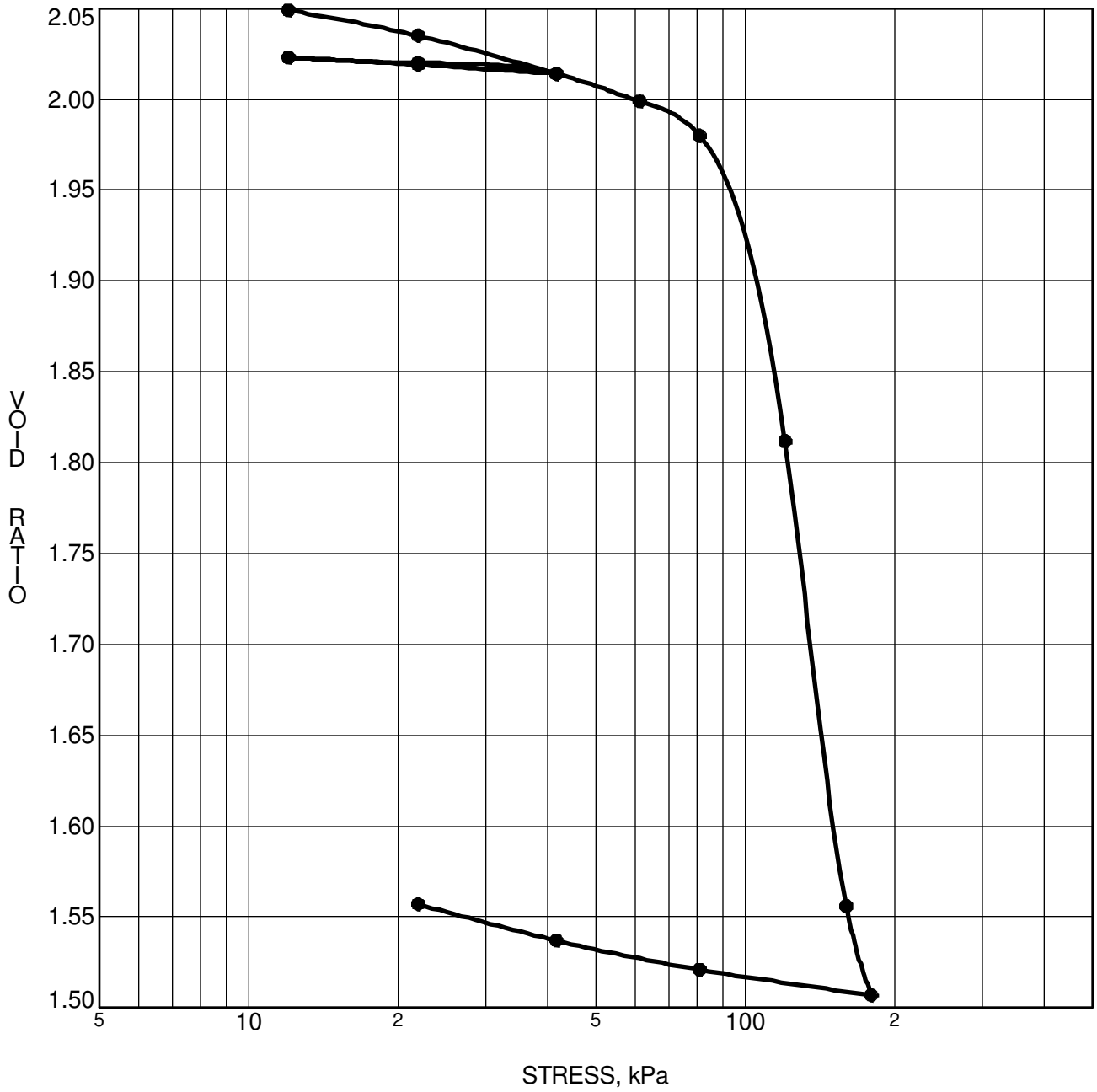
CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 3**	p'_o	**50** kPa	Ccr	**0.021**
Sample No.	**TW 4**	p'_c	**104** kPa	Cc	**2.253**
Sample Depth	**4.21** m	OC Ratio	**2.1**	Wo	**76.5** %
Sample Elev.	**88.45** m	Void Ratio	**2.103**	Unit Wt.	**15.8** kN/m ^{3}

CLIENT **Mattamy Homes** FILE NO. **PG2743**

PROJECT **Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.** DATE **26/10/2012**

patersongroup Consulting Engineers
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 4**	p'_o	**55** kPa	Ccr	**0.019**
Sample No.	**TW 4**	p'_c	**103** kPa	Cc	**2.146**
Sample Depth	**4.28** m	OC Ratio	**1.9**	Wo	**74.9** %
Sample Elev.	**88.53** m	Void Ratio	**2.061**	Unit Wt.	**15.8** kN/m ^{3}

CLIENT **Mattamy Homes** FILE NO. **PG2743**

PROJECT **Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.** DATE **22/10/2012**

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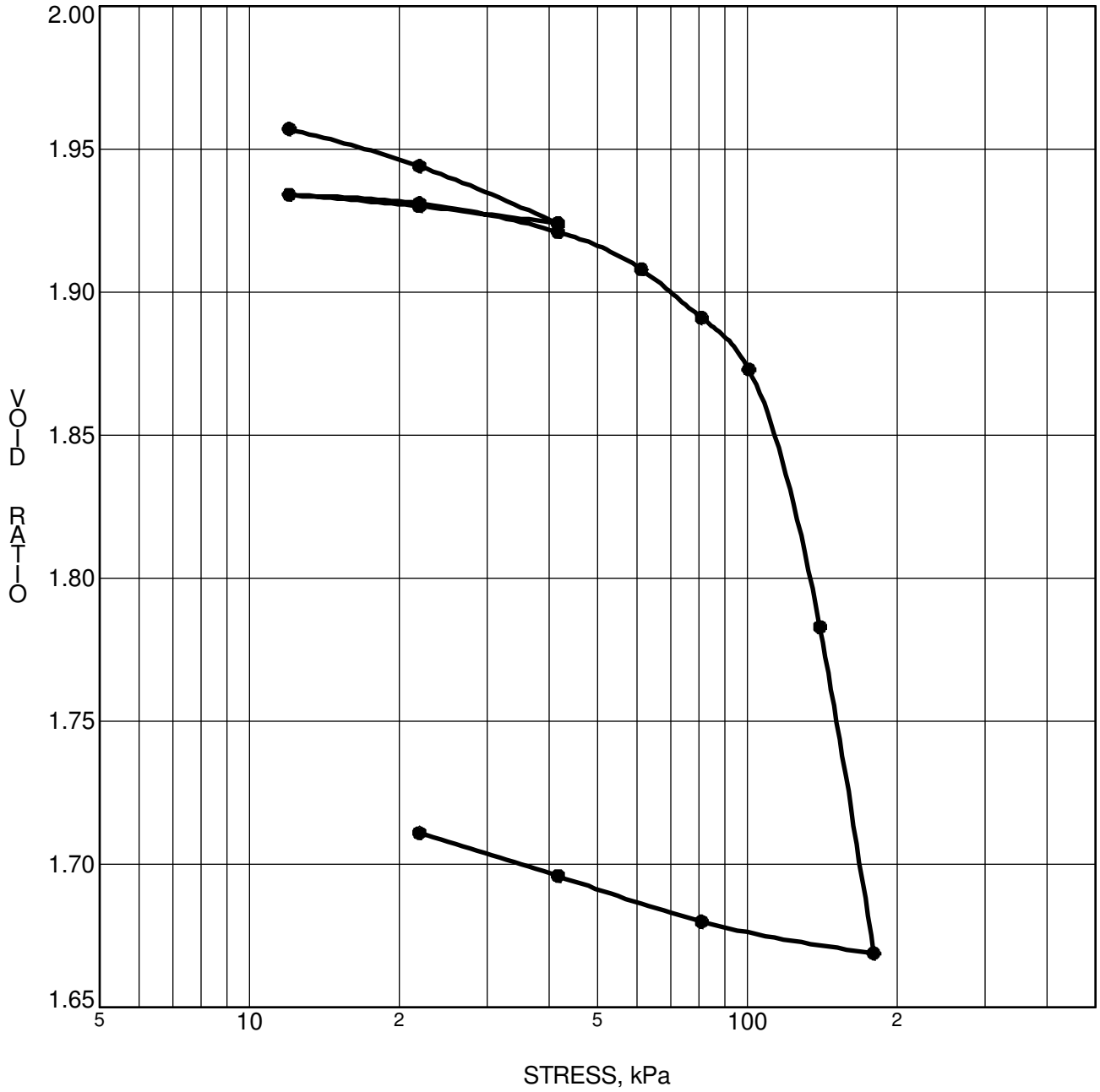
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 6**	p'_o	**63** kPa	Ccr	**0.022**
Sample No.	**TW 3**	p'_c	**119** kPa	Cc	**1.064**
Sample Depth	**5.03** m	OC Ratio	**1.9**	Wo	**71.7** %
Sample Elev.	**87.16** m	Void Ratio	**1.971**	Unit Wt.	**16.0** kN/m ^{3}

CLIENT **Mattamy Homes** FILE NO. **PG2743**

PROJECT **Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.** DATE **22/12/2012**

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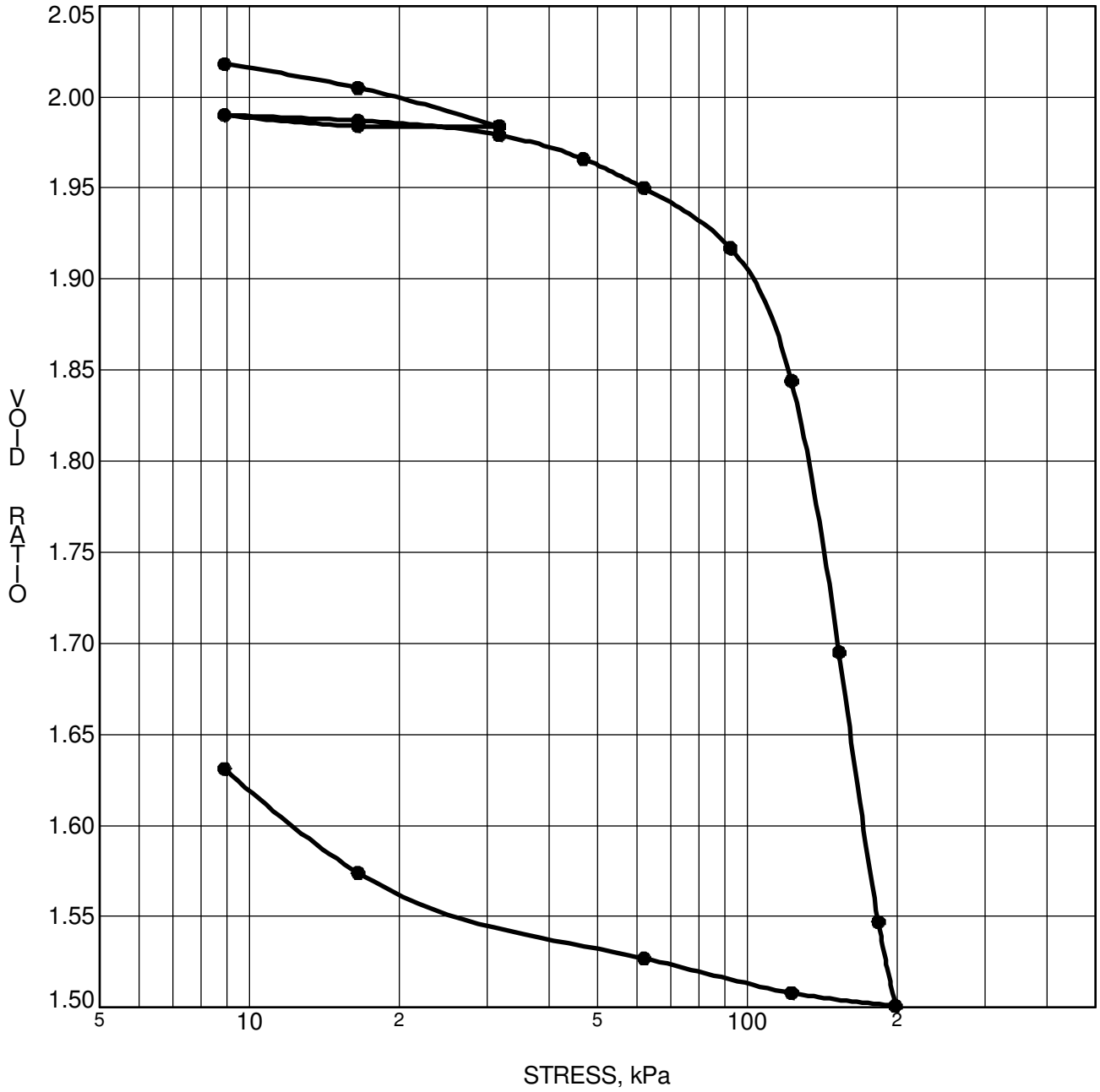
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 7**	p'o	**68** kPa	Ccr	**0.016**
Sample No.	**TW 3**	p'c	**113** kPa	Cc	**1.683**
Sample Depth	**5.03** m	OC Ratio	**1.7**	Wo	**74.0** %
Sample Elev.	**87.35** m	Void Ratio	**2.034**	Unit Wt.	**15.8** kN/m ^{3}

CLIENT	**Mattamy Homes**	FILE NO.	**PG2743**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.**	DATE	**29/10/2012**

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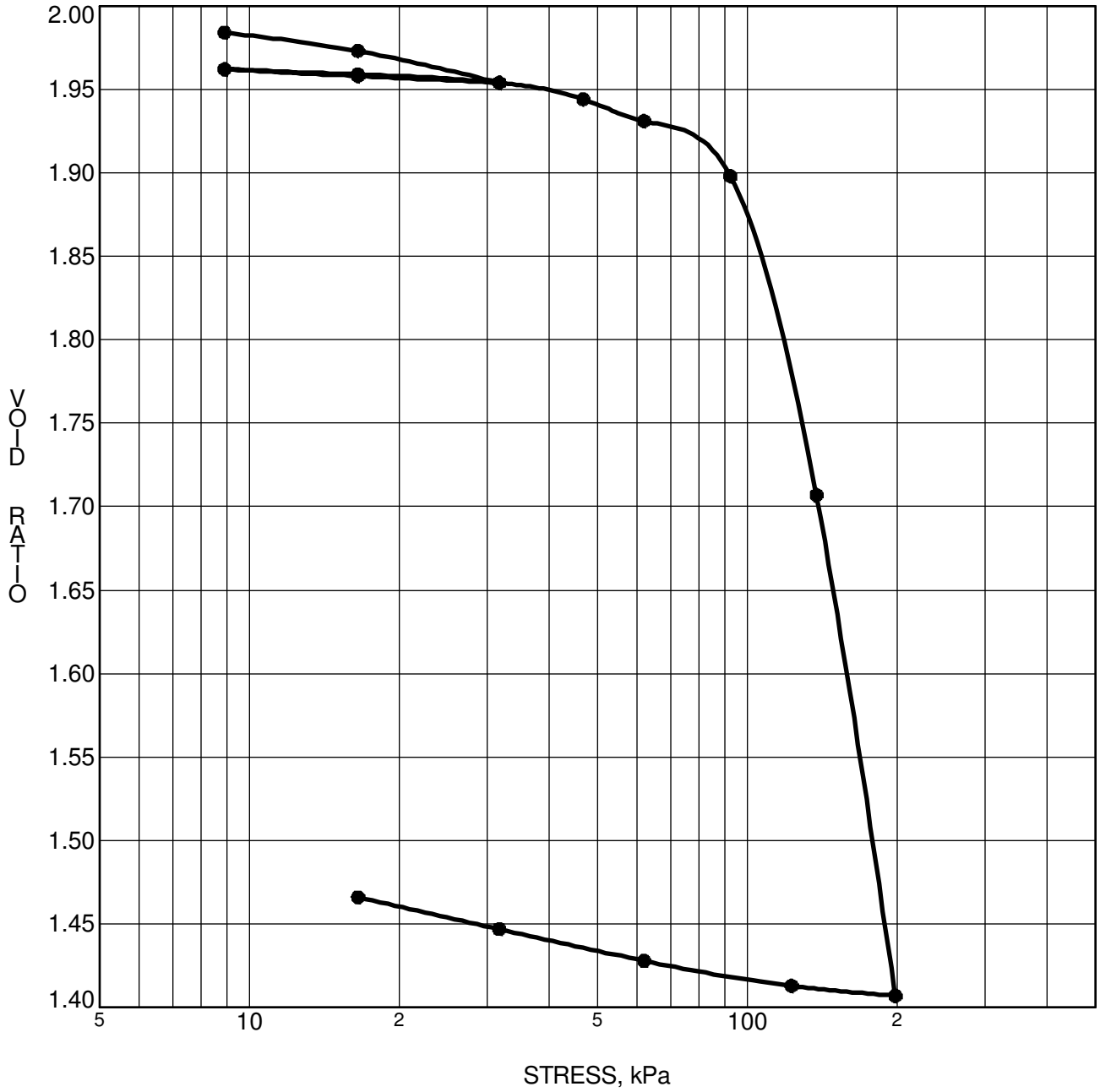
CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 8**	p'o	**62** kPa	Ccr	**0.015**
Sample No.	**TW 3**	p'c	**111** kPa	Cc	**2.000**
Sample Depth	**5.10** m	OC Ratio	**1.8**	Wo	**72.6** %
Sample Elev.	**87.78** m	Void Ratio	**1.996**	Unit Wt.	**15.9** kN/m ^{3}

CLIENT **Mattamy Homes** FILE NO. **PG2743**

PROJECT **Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.** DATE **22/10/2012**

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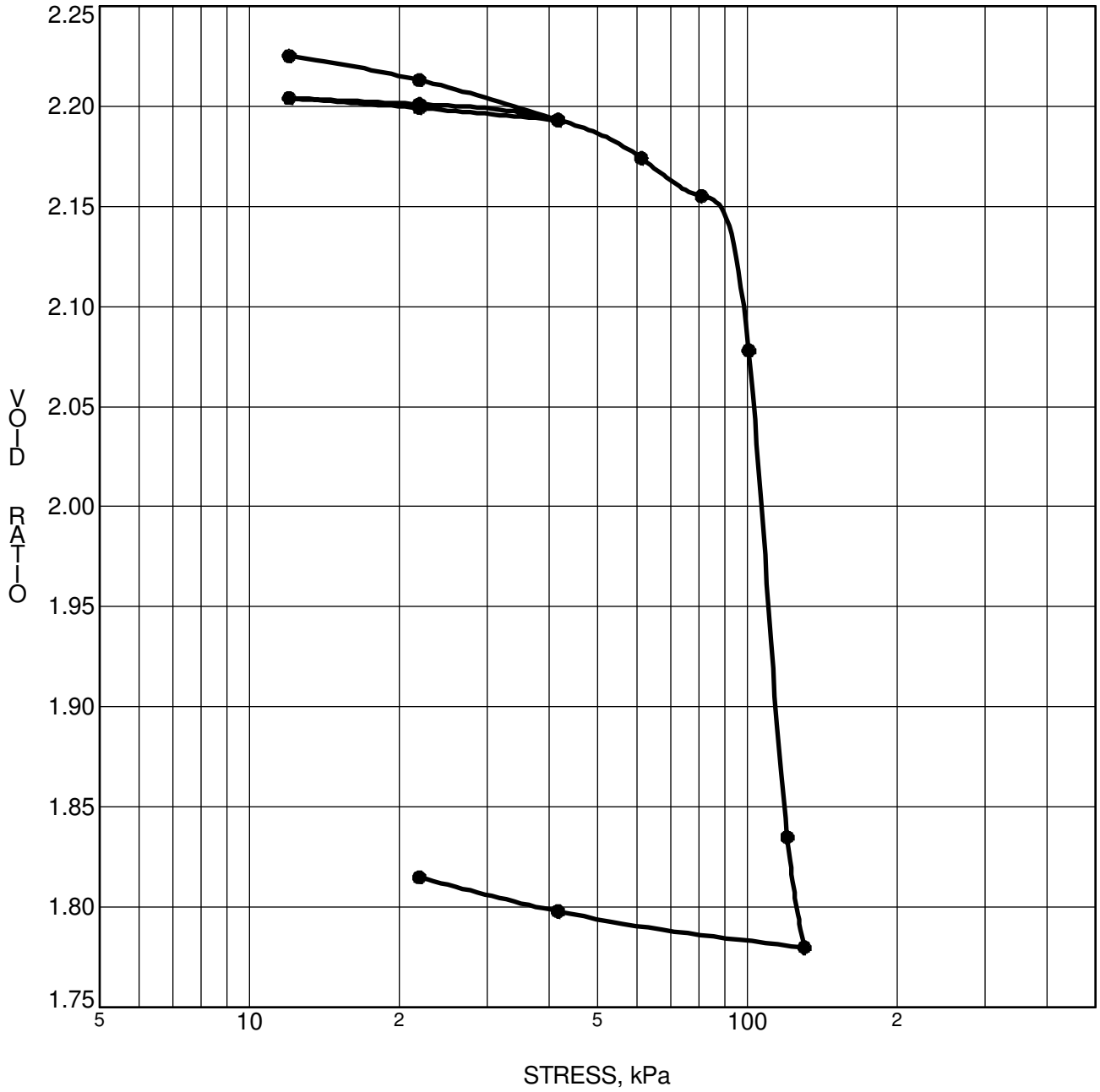
CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH 9**	p'_o	**54** kPa	Ccr	**0.022**
Sample No.	**TW 5**	p'_c	**97** kPa	Cc	**3.224**
Sample Depth	**4.32** m	OC Ratio	**1.8**	Wo	**81.4** %
Sample Elev.	**88.32** m	Void Ratio	**2.237**	Unit Wt.	**15.5** kN/m ^{3}

CLIENT	**Mattamy Homes**	FILE NO.	**PG2743**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.**	DATE	**12/11/2012**

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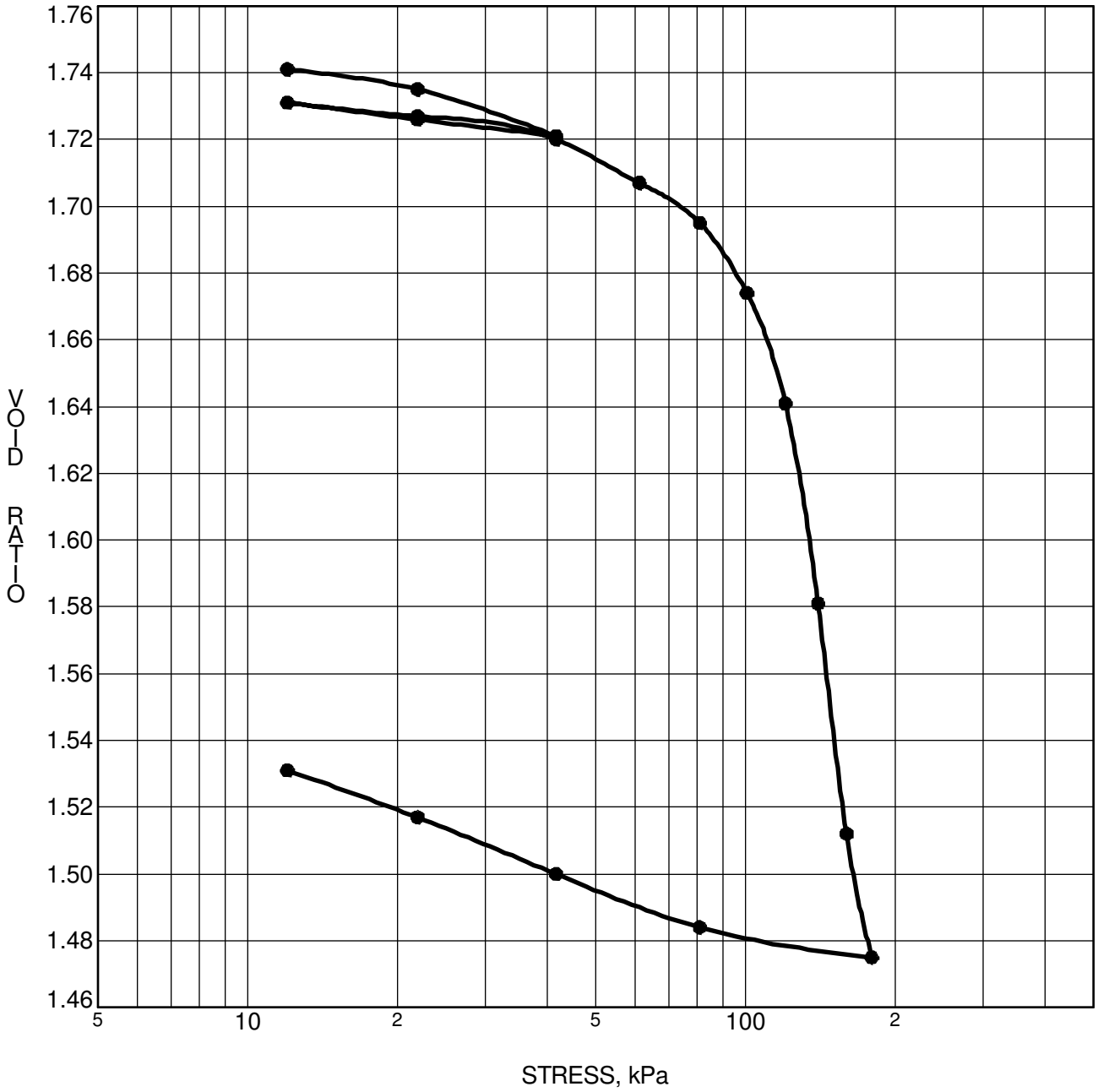
154 Colonnade Road South, Ottawa, Ontario K2E 7J5

CONSOLIDATION TEST



CONSOLIDATION TEST DATA SUMMARY					
Borehole No.	**BH11**	p'_o	**58** kPa	Ccr	**0.014**
Sample No.	**TW 1**	p'_c	**119** kPa	Cc	**1.253**
Sample Depth	**4.29** m	OC Ratio	**2.1**	Wo	**63.7** %
Sample Elev.	**88.41** m	Void Ratio	**1.753**	Unit Wt.	**16.4** kN/m ^{3}

CLIENT	**Mattamy Homes**	FILE NO.	**PG2743**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.**	DATE	**29/10/2012**

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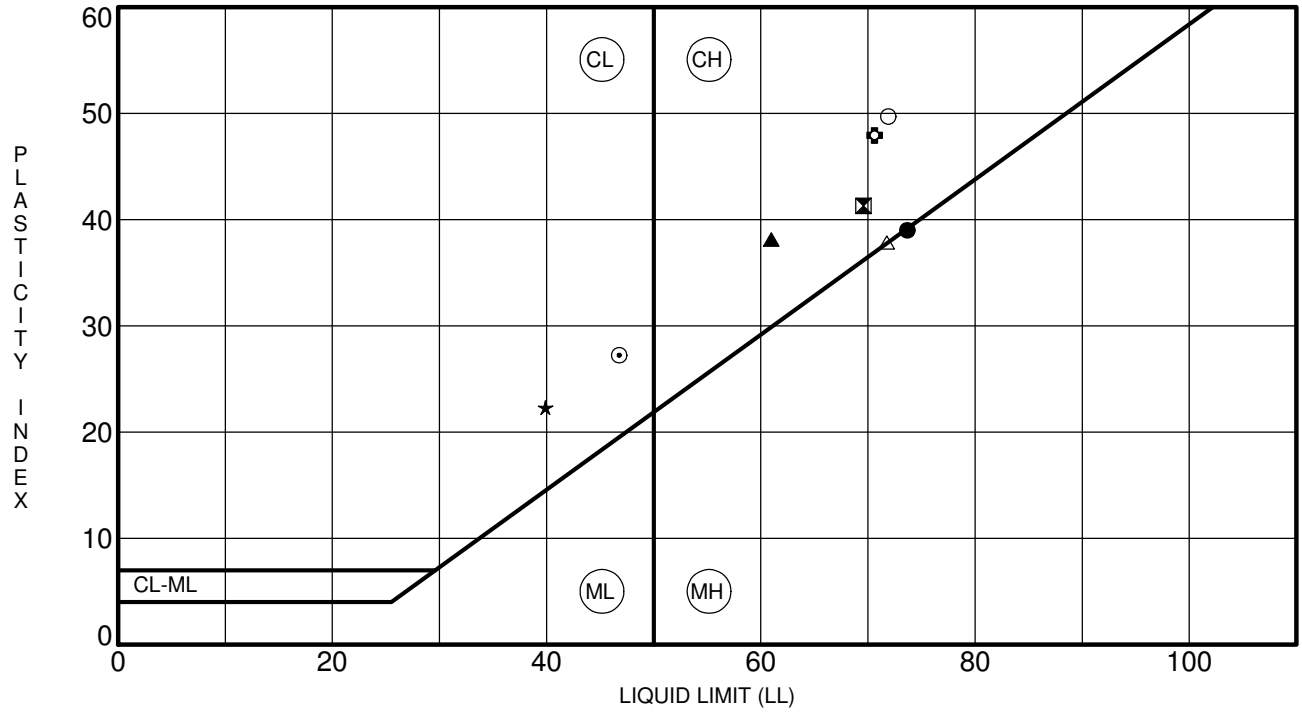
CONSOLIDATION TEST



Specimen Identification			LL	PL	PI	Fines	Classification
●	**TP 1**	**G 1**	**74**	**35**	**39**		**CH - Inorganic clays of high plasticity**
⊠	**TP 2**	**G 3**	**70**	**28**	**41**		**CH - Inorganic clays of high plasticity**
▲	**TP 3**	**G 3**	**61**	**23**	**38**		**CH - Inorganic clays of high plasticity**
★	**TP 4**	**G 2**	**40**	**18**	**22**		**CL - Inorganic clays of low plasticity**
⊙	**TP 5**	**G 2**	**47**	**20**	**27**		**CL - Inorganic clays of low plasticity**
✿	**TP 6**	**G 3**	**71**	**23**	**48**		**CH - Inorganic clays of high plasticity**
○	**TP 7**	**G 3**	**72**	**22**	**50**		**CH - Inorganic clays of high plasticity**
△	**TP 8**	**G 2**	**72**	**34**	**38**		**CH - Inorganic clays of high plasticity**

CLIENT **Caivan Communities** FILE NO. **PG2743**

PROJECT **Geotechnical Investigation - 2388 Greenbank Road** DATE **19 Feb 19**

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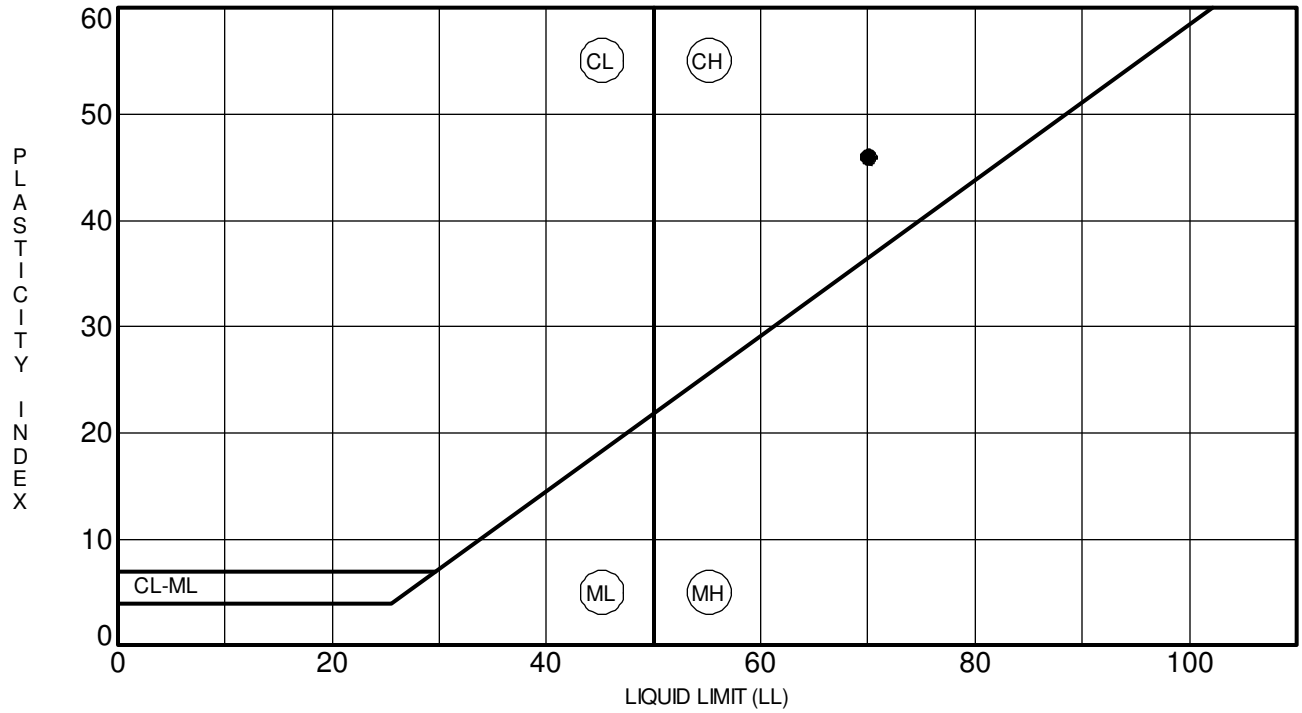
ATTERBERG LIMITS' RESULTS



Specimen Identification	LL	PL	PI	Fines	Classification
● BH 6 TW 3	70	24	46		Inorganic clay of high plasticity

CLIENT	**Mattamy Homes**	FILE NO.	**PG2743**
PROJECT	**Geotechnical Investigation - Prop. Residential Development - 3288 Greenbank Rd.**	DATE	**17 Oct 12**

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ATTERBERG LIMITS' RESULTS

APPENDIX 2

FIGURE 1 - KEY PLAN

DRAWING PG2743-2 - PERMISSIBLE GRADE RAISE AREAS - HOUSING

DRAWING PG2743-3 - PERMISSIBLE GRADE RAISE AREAS - APARTMENT BLDG.

DRAWING PG2743-4 - TEST HOLE LOCATION PLAN

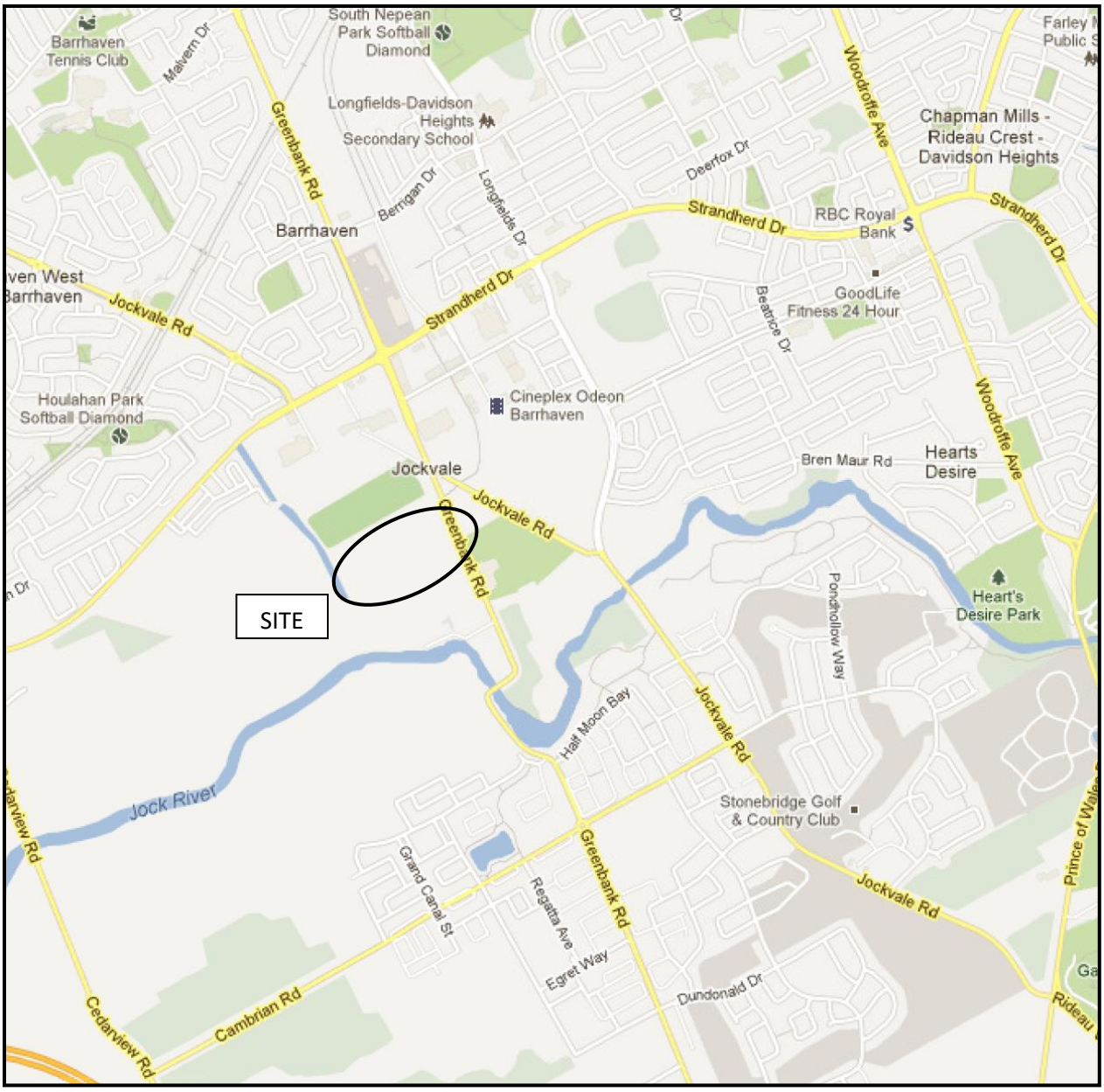
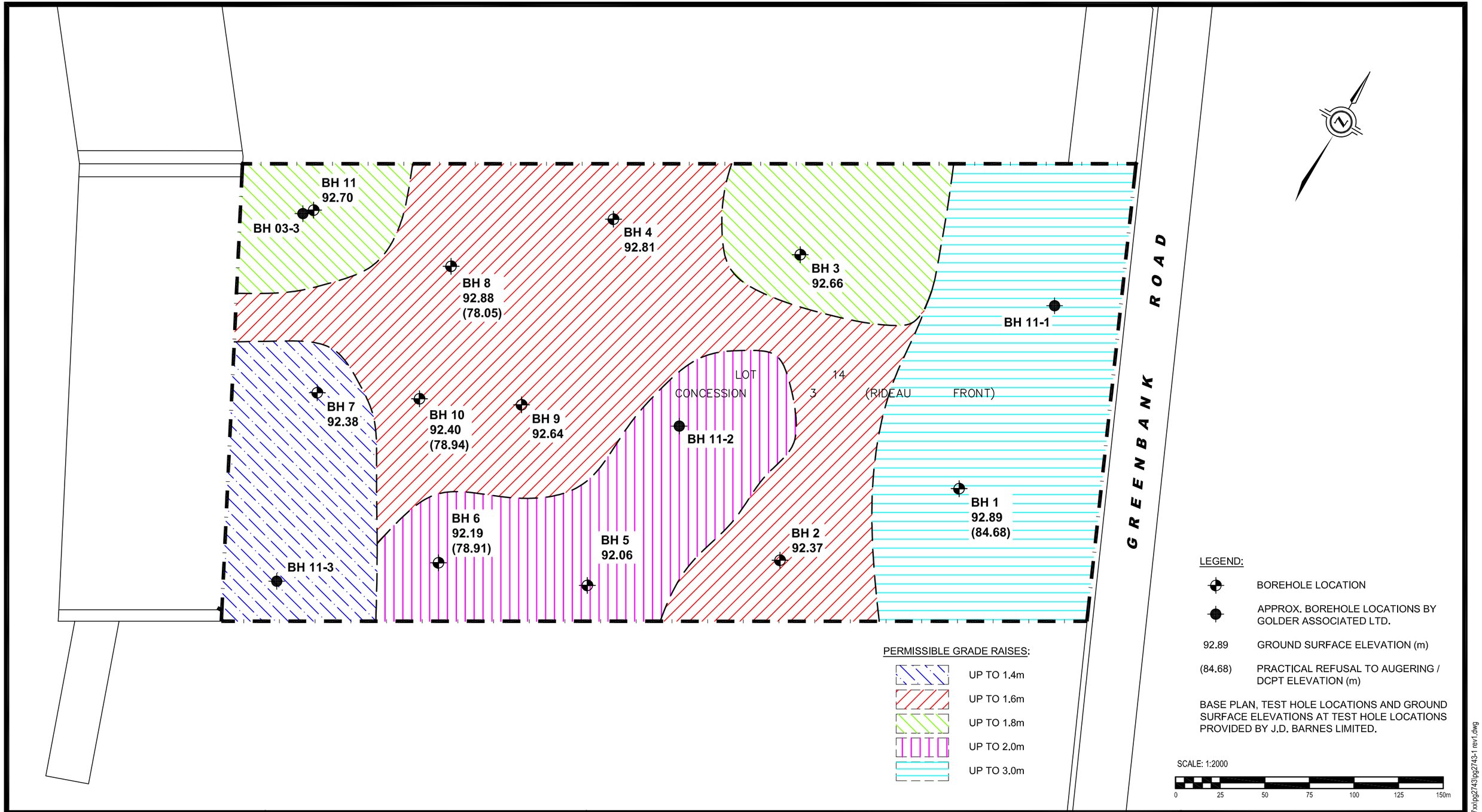


FIGURE 1

KEY PLAN



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consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROP. RESIDENTIAL DEVELOPMENT - 2388 GREENBANK ROAD
OTTAWA, ONTARIO

Title:
PERMISSIBLE GRADE RAISE PLAN - HOUSING

Scale: 1:2000	Date: 11/2012
Drawn by: MPG	Report No.: PG2743-1
Checked by: DJG	PG2743-2
Approved by: DJG	Revision No.:

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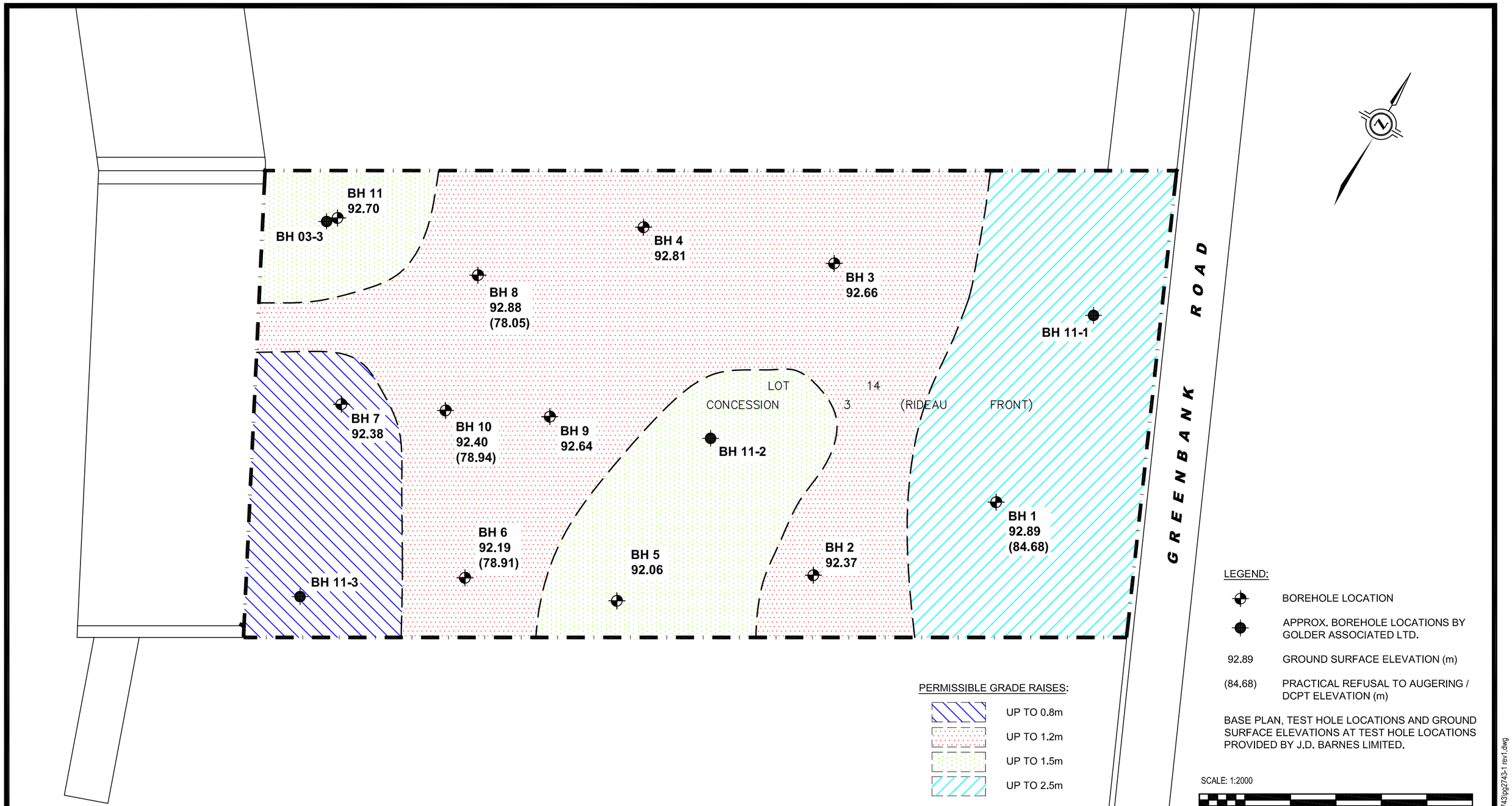

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROP. RESIDENTIAL DEVELOPMENT - 2388 GREENBANK ROAD
OTTAWA, ONTARIO

Title:
PERMISSIBLE GRADE RAISE PLAN - APARTMENT BLDG.

Scale: 1:2000	Date: 11/2012
Drawn by: MPG	Report No.: PG2743-1
Checked by: DJG	PG2743-3
Approved by: DJG	Revision No.:

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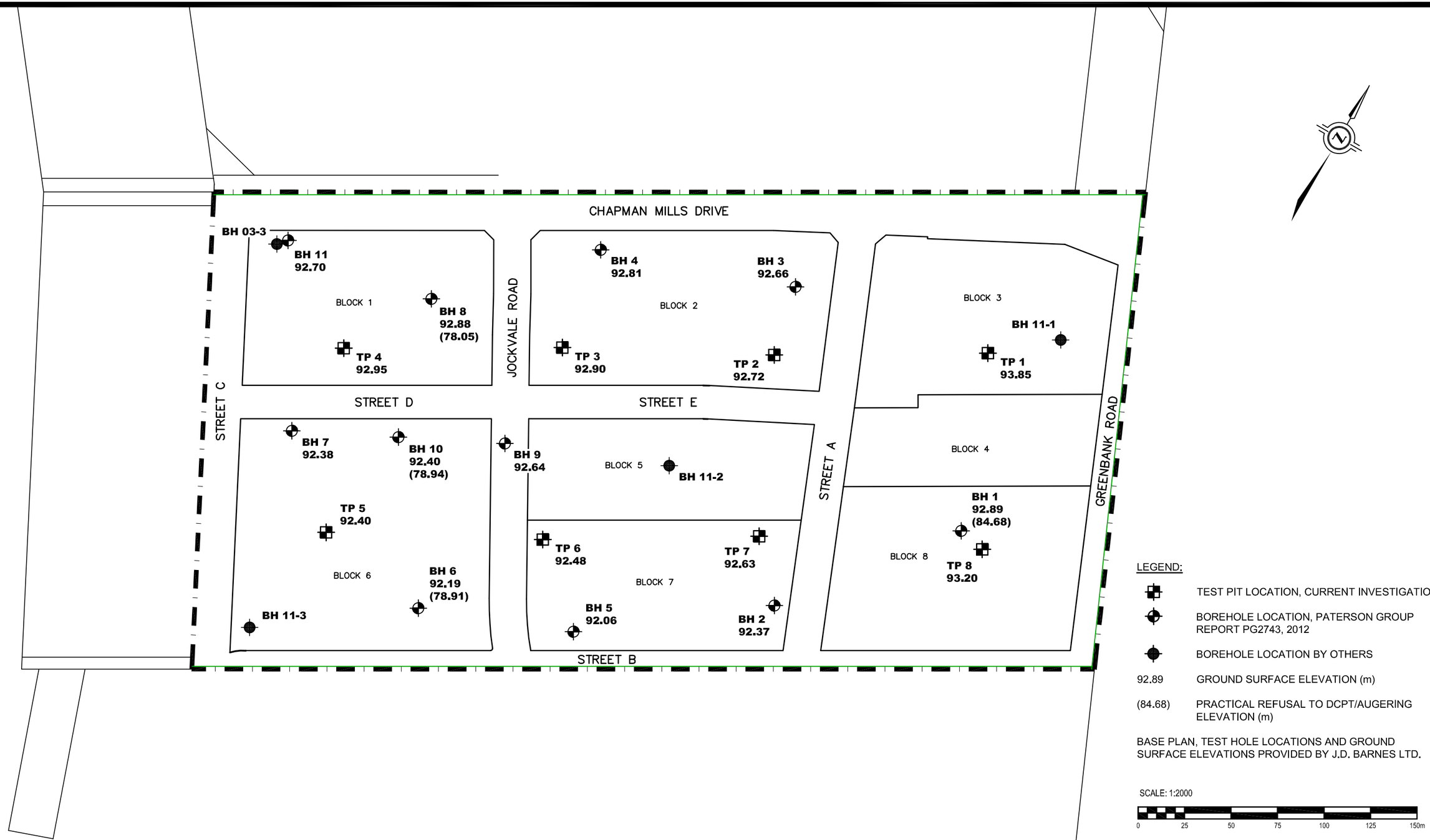

LEGEND:

- TEST PIT LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PATERSON GROUP REPORT PG2743, 2012
- BOREHOLE LOCATION BY OTHERS
- 92.89 GROUND SURFACE ELEVATION (m)
- (84.68) PRACTICAL REFUSAL TO DCPT/AUGERING ELEVATION (m)

BASE PLAN, TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS PROVIDED BY J.D. BARNES LTD.

SCALE: 1:2000

0 25 50 75 100 125 150m

patersongroup
consulting engineers
154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL

CAIVAN COMMUNITIES

GEOTECHNICAL INVESTIGATION
PROP. RESIDENTIAL DEVELOPMENT - 2388 GREENBANK ROAD
OTTAWA, ONTARIO

Title:
TEST HOLE LOCATION PLAN

Scale: 1:2000	Date: 03/2019
Drawn by: MPG	Report No.: PG2743
Checked by: JV	PG2743-4
Approved by: DJG	Revision No.:

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Appendix E : REVIEW COMMENTS AND RESPONSE

CAIVAN COMMUNITIES FOTENN

3288 Greenbank Road - ZBLA & Draft Plan of Subdivision (D07-16-19-0015 & D02-02-19-0047)
Response to First Round Comments
October 31, 2019

No.	Comments	Response
1.0	**Planning and Design**	
	Zoning Amendment	
1.1	I would suggest an MC zone for all the blocks except for the park (Block 7) and the school block (Block 8) as opposed to R4 and R5 zones. The MC zone might need an exception to implement maximum setbacks to the street, minimum building heights, parking locations and building frontage onto a public street and other provisions to obtain goals of the Town Centre.	Noted. Concept plan has been revised.
1.2	The school block (Block 8) should be dual zoned as Institutional / MC, not an exception zone with an additionally permitted use as a school.	Noted. Concept plan has been revised.
1.3	See comments on 'Concept Plan'. I suggest a meeting to discuss overall concept of products, the City's goals for products in the TC, and how they will influence the zoning.	Noted. Met with City staff on August 23, 2019 to present a new concept. Please see enclosed concept which has been revised to address this comment.
	Plan of Subdivision Design	
1.4	Jockvale Road is required to be a minimum 24m in width	Width of Jockvale Road has been widened to 24 metres.
1.5	Street C can be narrowed to accommodate a widened Jockvale Road (as this is a single loaded street)	Noted. Street C is shown as a 14 metre wide right-of-way.
1.6	Can Street C (with a narrowed cross section) support a MUP on the stormpond side?	There will be a multi-use pathway on the west side of the pond (to cross over at Chapman Mills Drive based on plans we have seen) and cycling and pedestrian facilities along Jockvale Road. A further duplication with an additional MUP is not seen as necessary in our opinion, and cannot be accommodated within the 14m cross-section.
1.7	OCDSB has concerns with the size of Block 8 (see OCDSB comments attached)	Noted. School block is 4.0 acres, per the previous CDP/Secondary Plan process.
1.8	Please coordinate the plans with Claridge's subdivision to the south. Some streets don't quite line up (Street C, and the property boundary of Street B)	Plan has been coordinated with Novatech and the Claridge plan of subdivisions to the south.
1.9	Parks wishes to express that you only need to provide parkland that you are owing, it appears you are over dedicating the park. This comment reflects the fact there is no cost sharing agreement and it will be much easier to maintain an even parkland dedication, but focus a cost sharing agreement on the 'development costs' of the park (Jeannette Krabicka will send comments directly to you)	Noted. Park size has been reduced to 5% of the gross area, per the Secondary Plan.
	Concept Plan	
1.10	Concerned with the private through streets and the amount of parking – these should read more as laneways and have more visual interest	Noted. Met with City staff on August 23, 2019 to present a new concept. Please see enclosed concept which has been revised to address this comment.
1.11	Concerned with the amount of surface parking on the plan	Noted. Met with City staff on August 23, 2019 to present a new concept. Please see enclosed concept which has been revised to address this comment.
1.12	I propose we schedule a meeting to discuss the products proposed and the intent of the design of Blocks 1, 2, 4, 5 and 6.	Noted. Met with City staff on August 23, 2019 to present a new concept. Please see enclosed concept which has been revised to address this comment.
1.13	I will leave the following images as precedent images for Town Centre residential development that we can further discuss. They are images from the TC in Markham Ontario, and illustrate products where parking is either concealed in the middle, or accessed from a lane:	Noted. Met with City staff on August 23, 2019 to present a new concept. Please see enclosed concept which has been revised to address this comment.
1.14	Ensure the detailed transportation drawings illustrate safe crossings across Greenbank road with appropriate traffic calming features throughout the subdivision.	Noted.

No.	Comments	Response
2.0	**Parks and Landscaping**	
	Tree Conservation Report	
2.15	A permit is required prior to any tree removal on site; one will be made available upon site plan approval. Please contact the planner associated with the file or Mark Richardson (mark.richardson@ottawa.ca) when a permit is required or for additional information on obtaining a permit.	As per the instruction, a tree clearing permit will be required. Caivan will have to contact the planner associated with the file or Mark Richardson when a permit is required, i.e. when tree clearing is set to begin. Tree clearing cannot begin until prior to site approval as the tree clearing permit will not be issued prior to that time.
2.16	Consult with Parks to see if they are interested in retaining any of the trees within the park block – the Planning Forester does not recommend this	The request can be made but, consistent with the advice of the Planning Forester, the Parks department is generally averse to retaining trees. Parks are usually required to be serviced and fully programmable spaces. Site prep thus generally requires the removal of all site trees. This is especially so in this instance as the only tree located within the park area are directly associated with the Burnett Drain, which is to be removed as part of the site development. Retaining trees set within the banks of this feature, while regrading it, would be unlikely to be successful regardless.
2.17	Sufficient soil volume is fundamental to the success of newly planted trees. Please ensure newly planted trees have an adequate soil volume for their size at maturity. The following is a table of recommended minimum soil volumes:	Noted.
	Parks and Facilities Planning	
2.18	Parkland Dedication: a. Gross Development Area (GDA) of proposed subdivision ..... 12.61 ha b. Parkland dedication calculated for development (5% GDA): ..... 0.630 ha The park block shown on the proposed draft plan is shown as being 1.00 ha in size, and therefore is over-dedicated by 0.37 ha for the proposed development.	Noted. Park size has been reduced to 5% of the gross area (0.63 ha), per the Secondary Plan.
2.19	Estimated Park Development Funding: ▪ The park design and construction budget (Park Development Funding) will be based on the current, at time of Subdivision Registration, Park Development Rate at a minimum, or if greater, as identified in the Secondary Plan.	Noted.
2.20	Landowners' Agreement for Parks: As per OPA 159, a Landowners' Agreement for Parks is required before approval can be given on a Plan of Subdivision. OPA 159: Landowners in the area outside the Greenbelt and in the Rural Area may be required to enter into private agreements to share the costs of the development of local parks, including parkettes, neighbourhood and community parks as indicated in an Area Parks Plan, Modified Area Parks Plan, Community Design Plan or Concept Plan so that the costs shall be distributed fairly among the benefiting landowners. Each agreement shall contain a financial schedule describing the estimated costs of the development of the local parks and associated studies and plans, as well as the proportionate share of the costs for each landowner. Where applicable, the City shall include a condition of draft approval for all plans of subdivision requiring proof that the landowner is party to the agreement and has paid its share of any costs pursuant to the agreement.	Noted. It's expected that this will be a condition of the Subdivision approval.

No.	Comments	Response
2.21	Location and Frontage: The location of park block (Block 7), as shown on the proposed Draft Plan of Subdivision is acceptable to the City of Ottawa, Parks & Facilities Planning. The proposed park has 3 sides of road frontage, as per the Secondary Plan.	Noted.
2.22	Fill and Grading of the Park Block: Please send me a preliminary grading plan for the park block and the surrounding subdivision for comment. As per the Grade Control Plan, 1.6 – 2.0m grade raise is permitted on the park block. Please note, that grading of the park block, to subdivision levels (ensuring positive drainage), is a requirement of the subdivision construction, and not of the park construction. Any desired grading above subdivision level will be within the cost of the park construction (ex: berms, etc). Backfill for the proposed park must be comprised of “earth borrow” (not granular material) and comply with the current (at time of Work) City of Ottawa standards and specifications for Parks, including, but not limited to: ▪ Section 31 22 13 – Rough Grading ▪ Section 31 23 33 01 – Excavating, Trenching and Backfilling Proof of structural stability of the park block backfill will be required.	A preliminary grading plan for the park showing positive drainage will be provided at the detailed design stage.
2.23	Design of the Park Block: To be noted: A preliminary Park Fit Plan is required to be submitted for the proposed park block before the draft plan of subdivision can be approved, and a final, approved Park Fit Plan is required before Registration of the Subdivision can proceed.	Noted.
2.24	A Multi-Use Path (MUP) / sidewalk needs to be considered for the west side of Street C (see below). The subdivision to the south has a 3.0m MUP proposed for the same side as the road continues south; it needs to connect northward. 	There will be a multi-use pathway on the west side of the pond (to cross over at Chapman Mills Drive based on plans we have seen) and cycling and pedestrian facilities along Jockvale Road. A further duplication with an additional MUP is not seen as necessary in our opinion, and cannot be accommodated within the 14m cross-section.

No.	Comments	Response
2.25	Storm Water and Subdivision Drainage: The Storm Sewer Plan shows a 0.30 runoff coefficient is used to calculate the storm contributions of the park to the system. However, the Secondary Plan asks for the parks in the South Nepean Town Center to have an emphasis on hard surfacing and seating areas (no sports fields). Therefore, the runoff coefficient should be revised to reflect this. It is noted that the Serviceability Study assumes on-site storage for the park for storms up to the 100-year storm; please provide more information on the storage requirements (ex: volume of storage space required (m3); release rate on the ICD; etc)	The plan and storm calculations have been revised to assume the park will have a runoff coefficient of 0.60. The minor system capture rate for the park is shown on a table on Drawing STM-1 and outlined in the text of the servicing report. Further details on the on-site storage required to contain the 100-year storm will be provided during the detailed design stage.
2.26	Sanitary Sewer Plan: There is 0 population estimated for the park block on the Sanitary Sewer Plan, but a sanitary connection is required. Therefore, the subdivision servicing plan needs to estimate some level of future use / contribution to the sewer system in case a park washroom (or other) amenity is provided.	Park block drainage area revised to allow for inflows to the sanitary sewer at the assumed average institutional flow rate per the OSDG.
2.27	Service Locations within the park block: Please forward a plan showing the proposed park services to the City for comment and approval. Servicing requirements: ▪ A 300mm diameter storm sewer and CB/MH at 2m inside the park property line. ▪ A 50mm diameter water line complete with standpost at 2m inside the park property line. A city standard park water vault chamber, standard detail W31.1 latest version, must also be installed as part of parks water works. ▪ 150mm diameter sanitary sewer and MH at 2m inside the park property line. ▪ A 120/240 volt, 200 amperes single phase hydro service at 2m inside the park property line.	The proposed park services will be shown on the plans at the detailed design stage.
2.28	Development of the Park Block Please note, that as per the most recently approved Draft Plan of Subdivision Conditions, the Owner and the General Manager of Recreation, Culture & Facility Services may, if it is mutually beneficial to both parties, enter into an agreement whereby the Owner will provide funding to the City for the design and the construction of the park block. The City will proceed with the design and construction of the park as per the typical city-build park process as described in the Parks Development Manual.	Noted.
2.29	Planning Rationale Section 4.8: “The proposed parkland will serve more than just the subdivision that is proposed in this application; therefore, other developments will pay into the CILP fund in order to cover some of the costs associated with introducing a park for the community.” ▪ Please note: the City is not committing to specific expenditures of any Cash-in-lieu-of-Parkland (CILP) funding in the South Nepean Town Centre at this time.	Noted.
3.0	**Transportation**	
	Development Review - Transportation Engineering Services	
3.30	Note/clarify and state in the report if this is a subdivision application or site plan application.	The application is a ZBA and Plan of Subdivision. Please refer to the Planning Rationale for additional information.
3.31	Please confirm if any/all of the proposed building will be built as part of this subdivision application, or if any/all will come as separate site plan applications. Please include this in the report.	See above. The buildings are shown on a concept plan and each block will be subject to future site plan approval applications.
3.32	Transportation Impact Assessment Table of Contents lists Appendix L, however there is no App L.	Noted and revised.
3.33	All drawings to show the Chapman Mills EA fictional design integrated into all submissions. Contact Jabbar Siddique for the CAD files of the function drawing.	Noted and revised.
3.34	Draft Plan – Show width of Chapman Mills, Greenbank and Street B ROW dedications.	Noted. See revised plan.

No.	Comments	Response
3.35	As per CDP the following ROW are required: i. Greenbank Rd (south of CMD) 41.5m ii. Chapman Mills Drive 41.5m	Noted. Required widths are shown on the plan.
3.36	As noted at the pre-consult, the 20m ROW for Jockvale does not sufficiently accommodate the City's current preferred road cross section for collector roads to be able to accommodate cycling, pedestrian, parking and transit. The City is currently working on and recommends new collectors cross-sections. Please contact to discuss	Noted. The right-of-way width for Jockvale has been widened to 24 metres and the draft Designing Neighbourhood Collector Streets will be used as a reference.
3.37	A pedestrian and traffic calming concept plan will be required prior to the submission of the Geometric Road Design Drawing.	Please see figure 16 in the revised report for the Concept Pedestrian and Cycling plan. Section 8.2 of the report has been revised to include a Concept Traffic Calming Plan.
3.38	OC Transpo has identified Street B as future transit street (as part of the 3370 Greenbank Development) and is to be constructed to Transportation Association of Canada standards.	Noted.
3.39	In the new street networks section, refer to the Chapman Mills Drive Environmental Assessment for the design cross-section.	Section 8.2 has been revised.
3.40	The future Greenbank Road boundary BLOS does not meet the target. Please correct the text in section 9.	Section 9 has been revised.
3.41	Please provide the design details for all accesses (grade, width, clear throat, location of parking gates, etc.) to the development boundary, as well as for the apartment building entrance from street.	Noted. The private approaches will be consistent with the City Standards for access design. Detailed design will occur during future site plan control applications.
3.42	Chapman Mills Drive at Jockvale Road is a future signalized full-movement intersection, and should be analyzed for MMLOS using the EA.	The MMLOS for this intersection has been provided based on the EA recommendations.
3.43	Figure 6 shows a 400 m buffer; the site is completely encompassed in the 600 m buffer. Please correct this.	Noted. Section 2.2.5 has been updated for the existing 600m radius and notes that that 600m radius provides coverage of half the site.
3.44	Previous comment regarding vehicle volumes on Jockvale Road between Strandherd Drive and Chapman Mills Drive is unresolved.	Road network has been revised, updating Section 3.1 and intersection analysis.
3.45	Previous comments regarding 2% background growth rate and the demand rationalization is unresolved.	Previous applications have applied a generic 2 3% background growth rate to the area, normalizing highly variable historic growth rates. This would result approximately a 30 50% increase on existing volumes by 2030. To refine the growth, given the recent increase in development applications, this study has explicitly considered adjacent developments along with a baseline growth rate over the development horizons. The overall growth applied to the network will be in the range of 3.5% along Greenbank Road due to the applied background growth and area developments. If the generic 2-3% is applied, the growth would be at or exceed 5%. From a process standpoint, we are moving from the application of high level growth rates that encompass the entire area and are refining these numbers with discrete developments as more data becomes available.
3.46	Propose an implementation plan for post occupancy TDM program measures that addresses planning and coordination and who will be responsible for funding, human resources and monitoring requirements.	Please see Section 11. A post occupancy plan will be developed once Draft Conditions are provided.
3.47	In the New Street Networks Section, consider including cycling facility in your cross-section on both sides - a split 2m sidewalk and 1.8m cycle lane on both sides.	See above comment 3.36 and revised Section 8.2 in the report.
	Traffic Signal Operations	
3.48	Existing Traffic Management Measures in Section 2.2.6 are missing a school zone speed limit of 40 km/hr on Greenbank Road during school hours.	Section 2.2.6 has been revised.

No.	Comments	Response
3.49	Page 14 says beyond the 2031 affordable network horizon Chapman Mills Drive BRT will be extended from Greenbank Road to Borrisokane Road, should it be analyzed that it will not be available to the subdivision until after the date of 2031?	The BRT was not assumed to have been extended to Borrisokane Road during the analysis horizons.
3.50	Discussion about Greenbank Road realignment south of Chapman Mills Drive with median bus lanes connecting to Cambrian Road is mentioned. If this were to proceed, the intersection of Street B and Greenbank Road could no longer function as stop control. Would the entrance change to a right in / right out, or would it be signalized aligning with a proposed road between Jockvale Road and Greenbank Road as suggested in 3333 Greenbank Road TIA from June 2019 and Greenbank Road EA from 2006?	The intersection needs to be signalized due to operational concerns or once the BRT corridor is extended to the south, consistent with the Greenbank Road EA.
3.51	Discrepancy between Section 2.1 and Section 5.1 regarding the number of mid-rise apartments.	Noted. The unit counts have been revised.
3.52	The Trip Generation Splits are based on a BRT area (5.1) expecting a 20% uptake in transit usage. Confirm if these results were experienced on other sections of Chapman Mills Drive - perhaps looking to those intersections for transit uptake could provide a more reflective modal split.	The BRT area modal shares are based on the proximity of the Southwest Transitway stations. The addition of Chapman Mills Drive would help support the existing facilities and projected modal shares in the future. The currently completed Chapman Mills BRT sections are not connected to the Southwest Transitway and act like a local route. Beyond the lack of continuous connectivity of the facility, the historic ridership information on Chapman Mills Drive (if available) would need to account for the piecemeal construction, new park and rides and the opening of the Earl Armstrong Bridge. This analysis would be extensive and may not conclude with any reliable results. Stepping back to the 20% uptick of transit modals shares, this is a misnomer as it is based on all of the South Nepean area. During past consultation events, including development proposals and the Chapman Mills EA, comments have been received that the local service is indirect and has long travel times limiting the use of transit. A common refrain was it is easier to drop kids off at the Towncentre and return home than have them take the bus, or drive into the park and ride to significantly reduce total commute times. This development will be in close proximity to existing Southwest Transitway Stations and will improve service as it is extended along Greenbank Road and Chapman Mills Drive.
3.53	Due to proposed future bus stop at Greenbank Road and St. Joseph High School, would there not be an increase in pedestrian volumes at the traffic signals in the corridor with pedestrians crossing. There are no pedestrian volumes coded in any synchro files yet 10% of users are non-auto and as suggested, 35% will be using bus service - likely accessed by walking.	Noted. Nominal pedestrian calls have been applied to the signal timing and analysis.
3.54	If Chapman Mills Drive is extended, is the bus facility going to be built in tandem with the roadway or will it be staggered as in previous phases?	The BRT is a City facility and has not been considered in the analysis or planning due to the impracticality of guessing the City's budgeting and construction, especially within Barrhaven.

No.	Comments	Response
3.55	In section 6.1 it is outlined that Chapman Mills Drive will become an alternative for commuters instead of travelling to Greenbank Road and Strandherd Drive. Has this been observed on the other leg of Chapman Mills Drive and Longfields Drive with vehicles moving away from the intersection of Strandherd Drive and Longfields Drive once given an alternative?	There is currently no alternative to the west bound travel from Longfields Drive. Once Chapman Mills Drive is constructed, the distance will be shorter along Chapman Mills Drive than travelling to Strandherd Drive. This will likely trigger alternate routing, naturally or through GPS programs. In addition to this, when looking at a map, the cut across Chapman Mills Drive looks to be more direct than travelling up to Strandherd Drive. This is typical of new roadways and existing ones in the area, such as Jockvale Road (between Cedarview and Standherd),Crestway Drive, Longfields Drive or Spratt Road.
3.56	Why are the 2025 analysis not comparing the same roadway configurations? Does the background traffic not consider the site as a potential destination?	The 2025 background and total conditions do assess different road configurations, as the background conditions do not include the proposed site. For example, who would build Chapman Mills Drive west of Greenbank Road if this development doesn't proceed? It would remain a field until an adjacent land owner developed and built it as a collector road. The site produces trips to/from during the peak hours, inferring there will be destinations travelled to within the site. A residential site does not produce pass by trips from adjacent developments or commuter trips (e.g. existing trips along Greenbank Road).
3.57	If Chapman Mills Drive is not at Greenbank Road by 2025, would the intersection of Jockvale Road and Greenbank Road still be decommissioned?	Chapman Mills is identified to be constructed by 2025 within the TMP and was therefore included by that horizon. While it is a collector road, it is assumed that other developments will proceed to the east, subject to the changes to the South Nepean Town Centre CDP. The intention of this configuration is to identify the ultimate configuration and ensure that is accepted. Once this is complete and the various stages proceed, interim staging may need to occur with the pace of development east of Greenbank Road to avoid conflicts with closely spaced intersections.
3.58	Would the intersections of Chapman Mills Drive and Greenbank Road and "New Collector" and Greenbank Road be built out to Final Greenbank Road Alignment or would it be an interim design?	It is understood that the DC funding for these intersections is passed on ultimate cross sections and not an interim configuration.
3.59	Section 8.1 highlights needs for pedestrian actuations at the signals in the synchro modelling.	Noted.
3.60	Section 12.2 does not commit to an approximate date for BRT but analysis is driven by it.	Noted.
3.61	Section 13.2.1 Level of Service should not be based on Delay, please follow TIA and MMLOS guidelines.	Level of service is provided as per HCM analysis and MMLOS is based on v/c.
3.62	Please explain how Street B will work with Greenbank Road, if not realigned. The Greenbank Road EA shows signalization at that location.	The analysis provided does not include the realigned Greenbank Road.

No.	Comments	Response
3.63	Synchro Comments: a. Signal at Strandherd Drive and Barrhaven Town Centre is not included in analysis. b. Flashing “don't walk” interval is not correct at Strandherd Drive and Greenbank Road.The notes in the timing provided for the intersection of Strandherd Drive and Greenbank Road show recalls that are not captured in the analysis provided. d. Signal cycle length at Jockvale Road and Strandherd Drive is noted to be incorrect but understood as to why it is coded as such. e. Flashing “don't walk” interval is not correct at Greenbank Road and Jockvale Road as per the timing provided. f. SBL red time is not correct at the intersection of Jockvale Road and in FB 2025. g. Confirm if the median bus lanes were captured in the clearance intervals at the new intersections. h. Minimum times at the new intersections are incorrect and do not follow the TIA guidelines. i. Please confirm if any of the cycling facilities are going to be bi-directional. Would need to consider protected intersections if that is to be the case. j. The synchro analysis is a part of the TIA process and is the responsibility of the consultant providing the report to complete and ensure accuracy.	a. Noted. Please see revised Section 3.1 for study area intersections and exclusions. b. Noted. Timings have been revised. c. Noted. Timings have been revised. d. Noted. Previous direction was to remove time from next phase if current phase minimums extend beyond the base phase length to maintain overall cycle length. e. Noted. Timings have been revised. f. Noted. Timings and intersections have been revised. g. No BRT lanes were assumed at the intersection. Buses were assumed to operate in mixed flow at Greenbank Road if BRT was extended from Longfields Drive to Southwest Transitway. h. Noted. Timings have been revised. i. As per the Chapman Mills EA, the cycle tracks are unidirectional. Similarly, the revised Jockvale Road cross section will also be unidirectional and it is anticipated that the City’s design on Greenbank Road will also include unidirectional cycle tracks in the future. The Chapman Mills EA assumes protected intersections, although it was early on in the process of the City exploring these options and will need to be revised during the detailed design. j. Noted. Refined data (e.g. synchro file format) from the City should be looked into as an opportunity to streamline the process and improve the quality of product both received from and delivered to the City.
	Traffic Signal Design	
3.64	No comments to this TIA for this circulation. Traffic Signal Design and Specification reserves the right to make future comments based on subsequent submissions.	Noted.
3.65	Future considerations: a. If there are any proposed changes in the existing roadway geometry for the purpose of construction of a new TCS(s) or modifications to existing TCS(s), or a construction of a new TCS(s) with new roadway, the City of Ottawa Traffic Signal Design and Specification Unit is required to complete a review for traffic signal plant design and provide the actual design.	Noted.
3.66	If the proposed traffic signals are warranted/approved for installation or modifications to existing TCS are approved, and RMA approved, please forward an approved geometry detail design drawings (dwg digital format in NAD 83 coordinates) including base mapping, existing and new underground utilities/sewers, new/existing catch basins locations, Turn-Radius Modeling for specified vehicles and approved pavement markings drawings in separate files for detail traffic plant design lay out. Please send all digital (CADD) design files to Peter.Grajcar@ottawa.ca 613-580-2424 ext. 23035.	Noted.
	Street Lighting	
3.67	No comments with TIA strategy for this circulation. Street Lighting reserves the right to make future comments based on subsequent submissions.	Noted.
3.68	Due to the proposed changes in the existing roadway geometry the City of Ottawa Street Lighting Asset Management Group is required to provide a full street light design. Please send final design hard copy and digital drawings so that we may proceed with the detailed street light design to City of Ottawa, Street Light Unit, 185 Slidell Street, Ottawa, Ontario, K1Y 3B5, attention Barrie Forrester. Be advised that the applicant will be 100% responsible for all associated street lighting costs.	Noted.
	Transit Services	

No.	Comments	Response
3.69	OC Transpo acknowledges the information and conclusions put forth in this TIA. A future BRT corridor will be implemented on Champan Mills Drive but may not concur with the completion of this neighbourhood. Service may likely be adjusted in an interim measure to accommodate growth if needed.	Noted.

No.	Comments	Response
4.0	**Infrastructure**	
	Water	
4.70	Specify the off-site watermains required to provide capacity and redundancy to this development. Drawing WTR-1 shows connections to future watermains without any information on timing.	Report and drawings revised to further identify required mains. Mains shown as future/ultimate within drawing WTR-1 are not anticipated to be required for capacity/redundancy for the development. Timing of the ultimate Greenbank watermain and Chapman Mills mains are TBD.
4.71	The master servicing for the KB areas shows a 305 mm watermain on Jockvale within the subject site (refer to Appendix A).	The drawing has been revised accordingly.
4.72	A 305 mm and 610 mm watermains are planned for Greenbank Road (refer to Appendix A).	Drawings revised to note ultimate 600mm watermain within Greenbank
4.73	It is expected that two of the following three watermains will be in operation to support this application (see below). Please specify. a. 305 mm Jockvale watermain extended north to Strandherd. b. 305 mm Greenbank watermain c. 305 mm Jockvale watermain extended south to Greenbank through Claridge's subdivision.	Items b and c are assumed to be in operation to support the application. It is assumed that the Greenbank watermain will be required as a condition of Claridge's development for looping - should this not be the case, the 300mm watermain extension will be installed for the proposed development.
	Stormwater	
4.74	Show the ultimate major system flow location to the KB Pond. The location will be forwarded to the consultant firm undertaking the KB Pond retrofit.	Due to the proposed road layout and grading restrictions, major flows from the majority of the site will be directed south to Claridge's subdivision. Major flows from the western portion of the site will be directed south to Street B and offsite to the KB Pond outlet ditch as per Novatech's design for Claridge's subdivision. Major flow direction and outlets are shown on Drawing STM-1.
4.75	A more thorough review of modelling assumptions and results will beundertaken during detailed design.	Noted.
4.76	The submission has been circulated to stormwater operations for their review. There may be additional comments forthcoming	Noted.
	Municipal Drain	
4.77	The status of the municipal drain and works to redirect the drain to a new outlet under an interim condition must be discussed with the Municipal Drainage Unit.	All necessary approvals will be in place prior to proceeding with any works impacting the drain. Approvals shall include a permit from the RVCA for alteration of a watercourse if required when development of the subdivision proceeds. The detailed design of the subdivision will ensure that interim works will maintain a drainage outlet for upstream lands.
	Drainage Act Requirements for Burnett Municipal Drain	
4.78	Please comment on the timing of the application to abandon the Burnett Municipal Drain	It is expected that development of the Claridge lands south of the proposed plan of subdivision will proceed in advance of these lands. Timing of the application to abandon the drain is to be determined.
	General Development Review Comments	
4.79	The south property line shared with Claridge is shown to straddle the centre line of Street B on the proposed plans. However, the plans included for reference for the Claridge design show the property line on the north side of Street B. As street B approaches Greenbank Road, the Claridge plans show Street B shifting slightly north, whereas the Caivan Plans (other than the Draft Plan) do not. Also, Street C does not line up with Claridge's subdivision.	Noted. Please see revised draft plan which has been coordinated with the draft plan approval to the south.
	Grading Plans	
4.80	The proposed grades shown for Chapman Mills Drive and Future Greenbank Road appear to match the Functional Design profile grades for the respective Roads. Please include in the report discussion that the Functional Designs as per the EA's for the 2 Roads are being met.	Report revised to include discussion as requested.

No.	Comments	Response
4.81	There appears to be some discrepancies between the major overland flow routes shown on the Overall Grade Control Plan and the Overall Storm Sewer System Plan for the subject lands. The Overall Grade Control Plan shows the major overland flow along Street B flowing continuously west whereas the Overall Storm Sewer System Plan (and the Claridge Plans) show more of a saw tooth design on the Claridge Site and shows the major overland flow going south through the subdivision. Please review and Revise.	Overland flow arrows adjusted to be consistent with overall grading within the Claridge development.
	Phase I and II ESA	
4.82	As per the City's Official Plan, submission of Phase I/II ESA reports, in compliance with O.Reg. 153/04, are required for approval of Plan of Subdivisions. We believe, the Phase I ESA report prepared by Paterson dated March 11 2019, has deficiencies compared to O.Reg. 153/04. Specifically, important "Environmental Source Information" are missing (e.g. Ecolog ERIS report, HLUI). The conclusion of the Phase I ESA report is partially based on some inquiries that had not been responded at the time the Phase I ESA report was issued. The "First Developed Use Determination" is not completed pre-1976, and the report is relying on Paterson's previous environmental and geotechnical investigations in the immediate vicinity of the subject site without providing any specific reference or further information in this regard. Based on the above, in my opinion, further information is required to be included in the Phase I ESA to comply with the O.Reg. 153/04.	Please see enclosed response letter prepared by Paterson Group.
5.0	**RVCA - Rideau Valley Conservation Authority**	
5.83	The subject lands are affected by a remnant tributary (Burnett Municipal Drain) to the Jock River. Downstream of the subject site, this stream is to be disconnected from the Fraser Clark creek. While the RVCA accepts that this tributary is to be diverted, a permit is required for the alteration of the watercourse. This can be included as a condition to Draft Approval.	Noted.
5.84	Floodplain: Please note that while the subject lands are not located within the Floodplain associated with the Jock River, the site is adjacent to it. The regulated 1:100 year flood event in this area is 91.58 m geodetic. This being noted elevate groundwater impacts during flood events are of concern and therefore standard floodproofing best management practices of dwellings in areas in proximity to floodplains are encouraged.	Noted.
5.85	The South Nepean Town Centre (SNTC) – Functional Servicing Report provides the following design criteria: • Provide and Enhanced level of water quality treatment (80% TSS removal). • No quantity control storage is required for flood control purposes. • No erosion control storage is required to maintain pre-development in-stream erosion condition (for outlets discharging directly to the Jock River). • All stormwater management facility outlets are to be designed to augment low flows to the extent possible. These design criteria are accepted.	Noted.
5.86	It is noted that the quality control, through use of a Hydrodynamic Separator intended to be connected through the adjacent lands to the south (under separate ownership). Please clarify the timing of the installation of the Hydrodynamic Separator. Quality control devices for this development must ensure that there is a suitable mechanism for there inclusion, prior to development occurring.	The hydrodynamic Separator will be installed as part of the Claridge Subdivision prior to construction of the proposed development.
5.87	Further, it is noted that the design standards for overland flow routes on proposed roads is no greater than 0.3m, which is more restrictive than the City's 0.35m. This is intended to maintain safe access allowance. It is noted however the RVCA measures from centerline depth versus the city's measurement at curbside. Please confirm that the proposed depth at centerline of road allowance does not exceed 3.0 metres.	Total flow depths on all proposed streets will be estimated during the detailed design stage to ensure that the total flow depth (measured from centre line) is less than 0.3 m.
5.88	The RVCA has no objections to the proposed Zoning By-law Amendment application.	Noted

No.	Comments	Response
6.0	**Phase 1 Noise Control Feasibility Study Requirements**	
6.89	Please clarify whether this is a feasibility study or detailed design study in the report.	The report is intended to be a detailed assessment, as indicated in Section 1, and has been revised to reflect this in the title and throughout.
6.90	Please clarify if the proposed buildings are to be built as one subdivision or various site plans. For site plans, individual noise study pertaining to the specific site plan is required. Noise contour map is recommended.	The current applications are for a Zoning By-law Amendment and a Plan of Subdivision. Future site plan control applications will be brought forward for development blocks at which time additional studies will be provided.
6.91	The report recommends a barrier height of 2.7m. The minimum acceptable barrier wall height is 2.2m and should not exceed 2.5m in height.	The report has been revised to recommend a barrier height of 2.2 m.
6.92	Provide the noise barrier height for the apartment buildings in section 4.2.2.	The report has been revised to include this information.
7.0	**Ottawa-Carleton District School Board**	
7.93	Continued support of the site location identified for an OCDSB elementary school block (per originally approved CDP in June 2006). The Planning Rationale (dated April 29/19) in support of the Caivan applications suggests that due to an abundance of school within the community, the OCDSB may deem this site surplus. Area schools are boasting utilization factors of near or over 100% capacity (see attached chart). With continued area growth, the additional need for school accomodation is very possible. In accordance with Official Plan Design & Compatibility criteria, a school provides a necessary benefit to a community by way of offering education services to a growing population as well as functional community amenity spaces and in this location would be in sync with City of Ottawa intensification goals.	Noted.
7.94	Do not support the proposed reduction of site size down to 2.92 acres (1.18 ha). The original CDP negotiated a size of 4.0 acres (1.63 hectares), which is already a reduction from the standard area requirements of 7.0 acres. A minimum 4 acres site is required.	Noted. The school block has been revised to 4.0 acres.
7.95	Do not support proposed change of zoning to "Residential" as main use and "Institutional/School" as an exception requirement. Standard and recent development practices employ a dual-use zone of Institutional/R4 which provides the necessary requirements for future possible use for both parties, while recognizing the designated school use, per historic CDP and Nepean TC Secondary Plan.	Noted. A dual Institutional/Residential zone is now proposed for this block.
8.0	**Ottawa Catholic School Board**	
8.96	The Ottawa Catholic School Board has no objection to the proposed plan of subdivision for 3288 Greenbank Road (File #D07-16-19-0015) and Zoning By-Law Amendment (#D02-02-19-0047) nor do we wish to submit a draft plan condition. However, since new residential developments have an impact on enrolment, transportation routes and attendance boundaries, we would like to be notified of all decisions pertaining to this application, including notice of public meetings, draft approval status, street name dedications and final registration.	Noted.
9.0	**Bell Canada**	
9.97	The following paragraph is to be included as a condition of approval: “The Owner shall indicate in the Agreement, in words satisfactory to Bell Canada, that it will grant to Bell Canada any easements that may be required, which may include a blanket easement, for communication/telecommunication infrastructure. In the event of any conflict with existing Bell Canada facilities or easements, the Owner shall be responsible for the relocation of such facilities or easements”.	Noted

No.	Comments	Response
9.98	We hereby advise the Developer to contact Bell Canada during detailed design to confirm the provision of communication/telecommunication infrastructure needed to service the development. As you may be aware, Bell Canada is Ontario's principal telecommunications infrastructure provider, developing and maintaining an essential public service. It is incumbent upon the Municipality and the Developer to ensure that the development is serviced with communication/telecommunication infrastructure. In fact, the 2014 Provincial Policy Statement (PPS) requires the development of coordinated, efficient and cost-effective infrastructure, including telecommunications systems (Section 1.6.1).	Noted
9.99	The Developer is hereby advised that prior to commencing any work, the Developer must confirm that sufficient wire-line communication/telecommunication infrastructure is available. In the event that such infrastructure is unavailable, the Developer shall be required to pay for the connection to and/or extension of the existing communication/telecommunication infrastructure. If the Developer elects not to pay for the above noted connection, then the Developer will be required to demonstrate to the satisfaction of the Municipality that sufficient alternative communication/telecommunication will be provided to enable, at a minimum, the effective delivery of communication/telecommunication services for emergency management services (i.e., 911 Emergency Services).	Noted
10.0	**Enbridge Gas Inc.**	
10.100	Enbridge Gas Inc. does not object to the proposed application(s). This response does not constitute a pipe locate or clearance for construction. The applicant shall contact Enbridge Gas Inc.'s Customer Connections department by emailing SalesArea60@Enbridge.com for service and meter installation details and to ensure all gas piping is installed prior to the commencement of site landscaping (including, but not limited to: tree planting, silva cells, and/or soil trenches) and/or asphalt paving. If the gas main needs to be relocated as a result of changes in the alignment or grade of the future road allowances or for temporary gas pipe installations pertaining to phase construction, all costs are the responsibility of the applicant. In the event that easement(s) are required to service this development, the applicant will provide the easement(s) to Enbridge Gas Inc. at no cost. The inhibiting order will not be lifted until the application has met all of Enbridge Gas Inc.'s requirements. The applicant will grade all road allowances to as close to final elevation as possible, provide necessary field survey information and all approved municipal road cross sections, identifying all utility locations prior to the installation of the gas piping. Enbridge Gas Inc. reserves the right to amend or remove development conditions.	Noted
11.0	**Rogers Communications Canada Inc.**	
11.101	That the owner shall transfer such new easements and maintenance agreements as are deemed necessary by Rogers Communications Canada Inc. to service this subdivision, to our satisfaction and that of the appropriate authority and at no cost to us. The owner is also to ensure that these easement documents are registered on title immediately following registration of the final plan, and the affected agencies duly notified.	Noted

No.	Comments	Response
11.102	That the application be required, in the Subdivision Agreement, to coordinate the preparation of an overall utility distribution plan. This plan would be showing the locations (shared or otherwise) and the installation timing and phasing of all required utilities (on-ground, below ground) through liaison with the appropriate electrical, gas, water, telephone and cablevision authority. This includes on-site drainage facilities. Such location plan being to the satisfaction of all affected authorities.	Noted
11.103	That the owner agrees with Rogers Communications Canada Inc. to arrange for and pay the cost of the relocation of any existing services which is made necessary because of this subdivision, to the satisfaction of the authority having jurisdiction.	Noted

Appendix F: DRAWINGS