The Odan/Detech Group Inc.
P: (905) 632-3811
F: (905) 632-3363
5230, SOUTH SERVICE ROAD, UNIT 107
BURLINGTON, ONTARIO, L7L 5K2
www.odandetech.com

PROPOSED MIXED-USE DEVELOPMENT
53-71 PLAINS ROAD EAST
CITY OF BURLINGTON, ON

PROJECT No. : 17249

FUNCTIONAL SERVICING & STORMWATER MANAGEMENT REPORT

Prepared For:

BROOKLYN CONTRACTING INC.

Prepared By:

The Odan/Detech Group Inc.

Original: December 13th, 2017

TABLE OF CONTENTS

DESCRIPTION page

1.0 INTRODUCTION....1
2.0 SCOPE OF WORK: 1
3.0 SANITARY SEWERS....2
4.0 WATER DISTRIBUTION....10
5.0 STORM WATER MANAGEMENT 16
i) Existing Infrastructure 16
ii) Design Criteria 18
iii) Pre-Development & Allowable Discharge Flow Rate....18
iv) Post Development Flow Analysis....20
v) Water Quality 21
vi) Storm Sewer Realignment 21
6.0 CONCLUSIONS....22
7.0 REFERENCES....23

LIST OF FIGURES

Figure 1 - Pre-Development Visual OTTHYMO Model (Showing 5-Year Storm flow)....19
Figure 2 - Post-Development Visual OTTHYMO Model (Showing flows in 100-year storm) 20

LIST OF TABLES

TABLE 1 – Proposed Sanitary Flows....3
TABLE 2 – Total Water Demand 10
TABLE 3 - Catchment Characteristics for the Pre-Development Site....19
TABLE 4 - Summary of Pre-Development (Allowable) Flows from Site 19
TABLE 5 - Catchment Characteristics for the Post-Developed Site....20
TABLE 6 - Summary of Post-Development Flows from Site 21
TABLE 7 - Summary 22

APPENDIX A

Existing Site — Aerial view of Site and surrounding area
Site Plan — by SRM Architects Inc.

APPENDIX B

Pre-Development Visual OTTHYMO Model Output (5-Year Storm)
Post-Development Visual OTTHYMO Model Output (5- and 100-Year Storms)

APPENDIX C

Functional Servicing Plan
Functional Grading Plan

1.0 INTRODUCTION

The property under study is a 1.086 ha (2.68 acre) site located at 53-71 Plains Road East in Burlington. The site presently comprises a one-storey commercial building with associated paved parking areas to the north and south of the existing building. There are landscaped areas on the east and north sides of the site. Refer to the Key Plan in Appendix A for satellite photography of the existing site and surrounding areas.

The site is bound by Plains Road East to the south, Cooke Boulevard to the west, Clearview Avenue to the north, an existing industrial development to the northwest and an existing detached house lot to the northeast.

For detailed topography of the existing site conditions as of August 26, 2016, refer to the boundary and topographic survey prepared by A.T. McLaren Limited.

It is proposed to construct two residential towers on the development (Tower 'A' and Tower 'B'), sharing a common two-level below-grade parking garage. The proposed towers are 12-storeys and 10-storeys in height. Commercial retail space is proposed at ground level. The proposed below-grade parking structure is proposed to extend to all of the site's boundaries with the exception of a storm sewer easement bordering the site's north property line. Refer to the Site Plan by SRM Architects Inc. in Appendix A for further details regarding the proposed development's layout.

Driving access for the proposed site will be from driveways from both Cooke Boulevard and Clearview Avenue.

The development will be under a single ownership entity in the future (residential apartment) and will be serviced commensurately.

This report evaluates the serviceability of the site with respect to sanitary waste water, water and storm water management (SWM) and will implement the design criteria set forth by City staff.

2.0 SCOPE OF WORK:

THE ODAN/DETECH GROUP INC. was retained by **Brooklyn Contracting Inc.** to review the Site, collect data, evaluate the Site for the proposed development and present the findings in a Functional Servicing and Storm Water Management Report in support of a Rezoning Application. The scope of work in brief involves the following:

a) Collecting existing servicing drawings from the CITY in order to establish availability and feasibility of Site servicing;
b) Meetings/conversations with CITY Engineers and Design Team.
c) Evaluation of the data and presentation of the findings in a FSR and Storm Water Management Design Brief in support of the Rezoning Application.

3.0 SANITARY SEWERS

i) Existing Infrastructure

The following separated sanitary sewers presently exist beneath the streets bordering the subject site. Refer to the Functional Servicing Plan.

1) Cooke Boulevard 300mm Vit. Clay pipe sewer
    a. Flows southerly beneath Cook Boulevard; discharges into the following 250mm sanitary sewer beneath Plains Rd. E.
    b. There is an existing 150mm sanitary service connection with control manhole installed connecting to this sewer near the site's northwest corner. Refer to the Functional Servicing Plan. It was evidently assumed in the design of Cooke Boulevard that the subject site would drain to this sewer, however the connection appears never to have been used.
2) Plains Road 250mm sewer (north side)
    a. Flows westerly beneath Plains Road and discharges into a 675mm sanitary sewer flowing southerly beneath Waterdown Road, which is assumed to be the trunk sewer.
    b. This sewer commences at a high point at the intersection of Plains Road East and Clearview Avenue, adjacent to the site's southeast corner. The following Clearview Avenue sewer does not drain into this sewer; it drains into the Plains Road sanitary sewer flowing easterly.
3) Clearview Avenue 200mm sewer
    a. Flows southerly beneath Clearview Avenue and discharges into the 250mm sanitary sewer beneath Plains Road which flows easterly away from the subject site.
4) Plains Road 250mm sewer (south side)
    a. Flows westerly beneath Plains Road and discharges into the foregoing 675mm sanitary sewer flowing southerly beneath Waterdown Road.

ii) Proposed Sanitary Servicing

It is proposed to service the subject development with a new sanitary service connection to the existing 250mm sanitary sewer beneath Plains Road.

It is not feasible to retain the existing 150mm sewer lateral that was installed in the construction of Cooke Boulevard for this proposed development because it is in conflict with the proposed realignment of the existing 1050mm storm sewer within the site and it is unlikely sufficiently sized (if not by municipal design criteria, then by OBC criteria) for this development.

The sanitary sewer design criteria and unit flow is provided in the Regional Municipality of Halton's *Water and Wastewater Linear Design Manual* (April 2015), as follows. The following information is provided in Tables 3-1 and 3-2 of the foregoing manual.

- Unit flow: q = average daily residential per capita dry weather unit flow = 0.275 m^3/cap/day
- I/I = Unit of peak inflow/infiltration = 0. 286 L/s/ha
- Apartment (over 6-storey): 285 p/Ha and 0.275 m^3/p/day or 0.003183 x 10^{-3} m^3/p/s
- Light Commercial Areas: 90 p/Ha or 24.750 m^3/Ha/day or 0.28646 x 10^{-3} m^3/Ha/s
- Light Industrial Areas: 125 p/Ha or 34.375 m^3/Ha/day or 0.3183 x 10^{-3} m^3/Ha/s

The subject development produces the following sanitary flow based on municipal criteria. The development area statistics are provided in Appendix A.

TABLE 1 – Proposed Sanitary Flows

Component	Population (P)	Average Flow (l/s)	Peak Factor	Peak Sanitary (l/s)	Inflow & Infiltration (l/s)	Total Flow (l/s)
Residential – 1.09 Ha (Site Area)	310	0.99	4.07	4.01	**0.31**	**4.44**
Commercial – 0.09 Ha (Floor Area)	11	0.03	3.53	0.12		

The peak sanitary flow rate of 4.44 L/s will be conveyed to the receiving 250mm sanitary sewer beneath Plains Road by a 200mm at 2.0% sanitary service connection (having a capacity of 46 L/s).

The detailed sanitary flow calculation is as follows.

SANITARY & WATER FLOW CALCULATIONS

SCENARIO: PROPOSED DEVELOPMENT

This program calculates the sanitary discharge from various land use

FILL IN COLOURED CELLS AS REQUIRED

COMMERCIAL SITE AREA (ha) =

RESIDENTIAL SITE AREA (ha) = 1.086

TOTAL SITE AREA (ha) = 1.086

NOTE:

LAND USE	NUMBER OF UNITS	SITE AREA, (ha)	GROSS FLOOR AREA, m2	TOTAL POPULATION	TOTAL DAILY FLOW (LITERS)	AVERAGE DAILY FLOW l/sec	PEAKING FACTOR, M	TOTAL FLOW FROM LAND USE, l/sec
RESIDENTIAL Detached, using 55 person/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Semi Houses, using 100 persons/site area				0	0	0.00	4.50	0.00
RESIDENTIAL Apartments, using 285 persons/site area		1.09		310	85115	0.99	4.07	4.01
RESIDENTIAL Density 3, using 2.7 persons/unit				0	0	0.00	4.50	0.00
COMMERCIAL, Using 90 persons/ha (Floor Ha)		0.12		11	2995	0.03	3.53	0.12
COMMERCIAL, Using 0.60 L/sec per ha				0	0	0.00	2.50	0.00

TOTAL

V1= 88110

Q1= 4.01
Q2= 0.12
Qinfil 0.31
Qtot 4.44

Q = (MqP/86400) + A * I (L/sec)

Q1= total flow from Residential Land Use (L/sec)
Q2= total flow from Commercial Land Use (L/sec)
Qinfil = total flow from infiltration (L/sec)
Qtot = total flow (Land use + infiltration)

V1= Total Volume from Land Use in liters

where : P is population
q = 0.275 m3/d/p = 0.004 L/sec/person for residential and
q = 0.60 L/sec/ha for commercial and offices
A = gross site area
i = 0.286 L/sec/ha (infiltration rate)

Peaking Factor M = 1 + [14 / (4 + (P/1000,1/2)) (for residential)
Peaking Factor M = 0.8* {1 + [14 / (4 + (P/1000,1/2))]} (for Commercial)

iii) Receiving Sanitary Sewer Capacity

It is shown by the following original downstream sanitary sewer analysis that the receiving Region of Halton sanitary sewers have capacity for the proposed development and no downstream sanitary sewer infrastructure improvements are necessary to accommodate the proposed development.

The receiving sanitary sewer is a 250mm sewer which commences at a high point at the intersection of Plains Road East and Clearview Avenue (EX MH11A). Refer to the Sanitary Drainage Area Plan on the following page for the extents of the upstream tributary branches and catchment areas.

The 250mm Plains Road East sewer flows easterly beneath Plains Road before discharging into a 675mm sewer, which is assumed to be a trunk sewer, flowing southerly beneath Waterdown Road. The downstream outlet is at EX MH9A.

The tributary statistics (population density, tributary catchment areas) in the following analysis are provided on the Sanitary Drainage Area Plan on the following page. The tributary statistics were determined in-part by an original survey of the tributary catchment areas by The Odan/Detech Group, and partly in reference to the existing Region sanitary drainage plans where available.

The existing sewers are analyzed in the following sanitary sewer design sheets – in pre- and post-development conditions - on pages 8 and 9.

The following assumptions were made in the downstream sanitary sewer catchment plan and design sheets.

1) Unit sanitary flow is as given by the Regional Municipality of Halton's *Water and Wastewater Linear Design Manual* (April 2015)
    a. Unit population and flow is calculated as reported in Tables 3-1 and 3-2 of that manual, except as follows.
    b. There is an irregularity in the Unit Sewage Flow for Light Industrial Areas as compared to Light Commercial Areas in Table 3-2 in the Region manual.
        i. Table 3-2 states that the equivalent population for Commercial Areas is 90 P/Ha whereas it is 125 P/Ha for Industrial Area
        ii. The unit sewage flow for Industrial Areas, on the other hand, is 0.003183×10^{-3} m^3/Ha/s whereas for commercial areas it is stated as 0.28646×10^{-3} m^3/Ha/s – the manual states that the commercial unit flow is nearly 100 times greater than the industrial unit flow
        iii. It was therefore assumed in the following analysis that the unit flow for industrial areas was intended to be 0.3183×10^{-3} m^3/Ha/s, not 0.003183×10^{-3} m^3/Ha/s

2) There is an inlet to EX MH11A from Clearview Avenue – the eastern outlet from EX MH11A is lower than the western outlet by 0.21m (almost the diameter of the outlet pipe), therefore it is assumed that the sanitary flows from Clearview Avenue flow easterly from EX MH11A and do not enter the subject sewer-shed.

3) Population density in the leg of sanitary sewer beneath Cooke Boulevard was assumed to be light industrial as per Region Sanitary Drainage Area Plan drawing B-06455.

4) Inverts and pipe diameters of the receiving sewers were taken from Region of Halton Plan Profile drawing no. B-03598 and B-03599. The length of some pipe segments was taken based on the as-built location of the manholes from the topographic survey and the slopes were calculated based on the Region drawing as-built inverts and surveyed manhole locations where available.

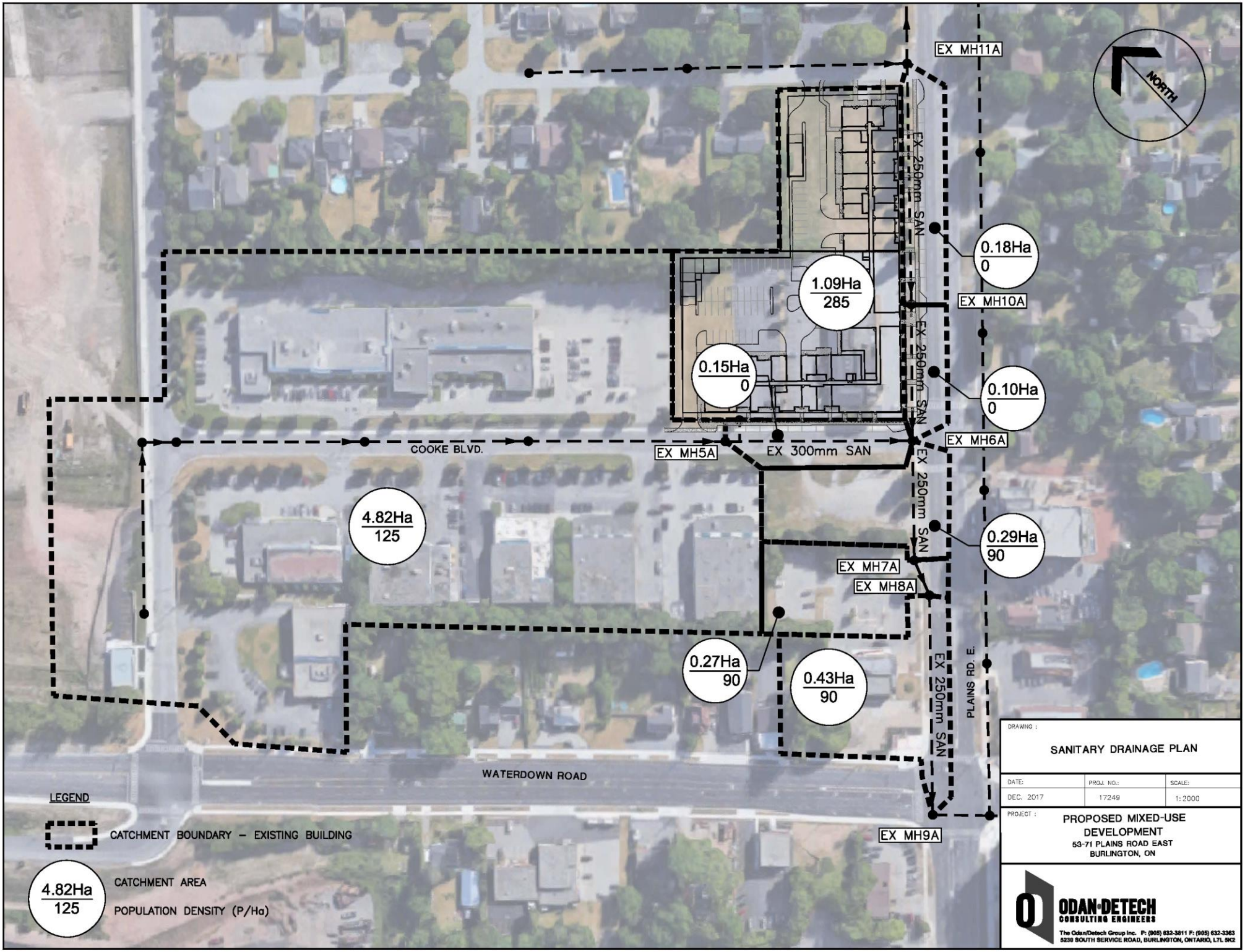
Refer to the downstream sanitary sewer analysis sheet in the pre-development scenario on page 8 and in the post-development scenario on page 9.

The following discussion and conclusions are drawn from the following sanitary sewer design sheets.

1) In pre-development conditions, no downstream pipes are flowing at more than more than 16.0% of their respective full-flow capacity.

2) In post-development conditions, with the additional flow from the proposed development, no downstream pipes are flowing at more than 23.9% of their respective capacity.

3) ***The receiving sanitary sewers have capacity for the proposed development, therefore no improvements are necessary to existing sanitary sewer infrastructure to accommodate the proposed development.***



DRAWING :

SANITARY DRAINAGE PLAN

DATE:	PROJ. NO.:	SCALE:
DEC. 2017	17249	1:2000

PROJECT :

PROPOSED MIXED-USE DEVELOPMENT
53-71 PLAINS ROAD EAST
BURLINGTON, ON

ODAN-DETECH
CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

SANITARY SEWER DESIGN SHEET - Existing Plains Rd. E. Sewer - Pre-Development Scenario

Site location: 53-71 Plains Road East, Burlington

Ref# PN 17249

ODAN·DETECH CONSULTING ENGINEERS

Location				Inlet Flow																Pipe						
				Industrial/Commercial					Residential Population			Inflow/ Infiltration	Industrial & Commercial P/F	Peak Industrial & Commercial Flow	Residential P/F	Peak Residential Sanitary Flow	Unit Inflow/ Infiltration	Segment Inflow/ Infiltration	Accumulative Inflow/ Infiltration	Accumulative Sanitary Flow	Length	Size	Slope	Shape	Full Flow Capacity	Full Flow Velocity	% Full
	Street Name	US Node	DS Node	Industrial (ha)	Commercial (ha)	Acc've Area (ha)	Population (Person)	Acc've Pop'n (Person)	Apartments (Ha)	Population (Person)	Acc've Pop'n (Person)	Area (ha)	M	Q(p) (L/s)	M	Q(p) (275 L/c/d) (L/s)	I/I (0.28 L/Sec/ha)	Q(i) (L/s)	Q(i) (L/s)	Q(d) (L/s)	L (m)	D (mm)	S (%)		Qcap (L/s)	V (m/s)	Q(d)/Qcap
	Plains Rd. E.	EX MH11A	EX MH10A	-		-	-	-	-	-	-	0.18	3.60	-	4.50	-	0.280	0.05	0.05	0.05	103.31	250	0.43	circle	39.00	0.79	0.13%
	Plains Rd. E.	EX MH10A	EX MH6A	-	1.090	1.09	98.10	98.10	-	-	-	1.19	3.40	1.06	4.50	-	0.280	0.33	0.38	1.44	58.40	250	0.34	circle	34.68	0.71	4.16%
	Plains Rd. E.	EX MH6A	EX MH7A	4.82	0.290	6.20	628.60	726.70	-	-	-	5.26	3.11	2.76	4.50	-	0.280	1.47	1.86	4.62	51.24	250	0.33	circle	34.16	0.70	13.52%
	Plains Rd. E.	EX MH7A	EX MH 8A	-	0.270	6.47	24.30	751.00	-	-	-	0.27	3.10	3.00	4.50	-	1.280	0.35	2.20	5.20	16.32	250	0.80	circle	53.19	1.08	9.78%
	Plains Rd. E.	EX MH8A	EX MH9A	-	0.430	6.90	38.70	789.70	-	-	-	0.43	3.09	3.38	4.50	-	2.280	0.98	3.18	6.56	94.09	250	0.47	circle	40.77	0.83	16.09%

Flow Calculation Criteria
(Unit Flowfrom Table 3-1 and 3-2, Regional Municipality of Halton, Water and Wastewater Linear Design Manual, April 2015)
q = average daily residential per capita dry weather unit flow = 0.275 m3/cap/d
q = average daily commercial dry weather unit flow = 24.750m3/ha/d or 0.28646 L/ha/s
q = average daily industrial dry weather unit flow = 34.375m3/ha/d or 0.3183 L/ha/s
I/I = Unit of peak inflow/infiltration allowance = 0.286 (L/s/ha)
Q(p) = peak population flow (L/s)
Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)

Mannings Equation:

Qcap=(D/1000)^2.667*(S/100)^0.5/(3.211*n)*1000(L/s)
D: pipe size (mm)
S: slope (grade) of pipe (%)
n = Manning roughness coefficient = 0.013

(Unit Population from Table 3-1 and 3-2, Regional Municipality of Halton, Water and Wastewater Linear Design Manual, April 2015)

Single Family Population Density	55 P/ha
Semi-detached/duplex/4-plex	100 P/ha
Townhouse, Maisonette	135 P/ha
Apartment (Over 6 Stories High)	285 P/ha
Commercial	90 P/ha
Industrial	125 P/ha

(Peaking Factor from Section 3.2.3., Regional Municipality of Halton, Water and Wastewater Linear Design Manual, April 2015)

PEAKING FACTOR (Residential)	M =1 + 14/(4+(P/1000^0.5))
PEAKING FACTOR (Commercial)	M =0.8[1 + 14/(4+(P/1000^0.5))]
PEAK DESIGN FLOW,	Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS,	n = 0.013 For Manning's Equation

Vmin. = 0.6m/s and Vmax. = 3m/s

SANITARY SEWER DESIGN SHEET - Existing Plains Rd. E. Sewer - Post-Development Scenario

Site location: 53-71 Plains Road East, Burlington

Ref# PN 17249

ODAN·DETECH CONSULTING ENGINEERS

Location				Inlet Flow: Industrial/Commercial					Residential Population			Inflow/ Infiltration	Industrial & Commercial P/F	Peak Industrial & Commercial Flow	Residential P/F	Peak Residential Sanitary Flow	Unit Inflow/ Infiltration	Segment Inflow/ Infiltration	Accumulative Inflow/ Infiltration	Accumulative Sanitary Flow	Pipe						
	Street Name	US Node	DS Node	Industrial (ha)	Commercial (ha)	Acc've Area (ha)	Population (Person)	Acc've Pop'n (Person)	Apartments (Ha)	Population (Person)	Acc've Pop'n (Person)	Area (ha)	M	Q(p) (L/s)	M	Q(p) (275 L/c/d) (L/s)	I/I (0.28 L/Sec/ha)	Q(i) (L/s)	Q(i) (L/s)	Q(d) (L/s)	Length L (m)	Size D (mm)	Slope S (%)	Shape	Full Flow Capacity Qcap (L/s)	Full Flow Velocity V (m/s)	% Full Q(d)/Qcap
	Plains Rd. E.	EX MH11A	EX MH10A	-		-	-	-	-	-	-	0.18	3.60	-	4.50	-	0.280	0.05	0.05	0.05	103.31	250	0.43	circle	39.00	0.79	0.13%
	Plains Rd. E.	EX MH10A	EX MH6A	-	0.120	0.12	10.80	10.80	1.090	310.65	310.65	1.19	3.53	0.12	4.07	4.03	0.280	0.33	0.38	4.53	58.40	250	0.34	circle	34.68	0.71	13.07%
	Plains Rd. E.	EX MH6A	EX MH7A	4.82	0.290	5.23	628.60	639.40	-	-	310.65	5.26	3.13	1.90	4.07	4.03	0.280	1.47	1.86	7.78	51.24	250	0.33	circle	34.16	0.70	22.79%
	Plains Rd. E.	EX MH7A	EX MH 8A	-	0.270	5.50	24.30	663.70	-	-	310.65	0.27	3.13	2.14	4.07	4.03	1.280	0.35	2.20	8.37	16.32	250	0.80	circle	53.19	1.08	15.74%
	Plains Rd. E.	EX MH8A	EX MH9A	-	0.430	5.93	38.70	702.40	-	-	310.65	0.43	3.11	2.52	4.07	4.03	2.280	0.98	3.18	9.73	94.09	250	0.47	circle	40.77	0.83	23.87%

Flow Calculation Criteria
(Unit Flowfrom Table 3-1 and 3-2, Regional Municipality of Halton, Water and Wastewater Linear Design Manual, April 2015)
q = average daily residential per capita dry weather unit flow = 0.275 m3/cap/d
q = average daily commercial dry weather unit flow = 24.750m3/ha/d or 0.28646 L/ha/s
q = average daily industrial dry weather unit flow = 34.375m3/ha/d or 0.3183 L/ha/s
I/I = Unit of peak inflow/infiltration allowance = 0.286 (L/s/ha)
Q(p) = peak population flow (L/s)
Q(I) = peak extraneous flow (L/s)
Q(d) = peak design flow (L/s)

Mannings Equation:

Qcap=(D/1000)^2.667*(S/100)^0.5/(3.211*n)*1000(L/s)
D: pipe size (mm)
S: slope (grade) of pipe (%)
n = Manning roughness coefficient = 0.013

(Unit Population from Table 3-1 and 3-2, Regional Municipality of Halton, Water and Wastewater Linear Design Manual, April 2015)

Single Family Population Density	55 P/ha
Semi-detached/duplex/4-plex	100 P/ha
Townhouse, Maisonette	135 P/ha
Apartment (Over 6 Stories High)	285 P/ha
Commercial	90 P/ha
Industrial	125 P/ha

(Peaking Factor from Section 3.2.3., Regional Municipality of Halton, Water and Wastewater Linear Design Manual, April 2015)

PEAKING FACTOR (Residential)	M =1 + 14/(4+(P/1000^0.5))
PEAKING FACTOR (Commercial)	M =0.8[1 + 14/(4+(P/1000^0.5))]
PEAK DESIGN FLOW,	Q(d) = Q(p) + Q(i) L / Sec.
PIPE ROUGHGNESS,	n = 0.013 For Manning's Equation

Vmin. = 0.6m/s and Vmax. = 3m/s

4.0 WATER DISTRIBUTION

Design Considerations

The following watermains presently exist beneath the streets bordering the subject site. Refer to the Functional Servicing Plan for the layout of the watermains bordering the site.

- Plains Road East
  - 300mm Cast Iron watermain (north side of street; adjacent to site)
  - 600mm watermain (centre of street)
  - 400mm DI watermain (south side of street)
- Cooke Boulevard
  - 300mm PVC watermain – It is not possible to connect the subject site to this watermain and provide 1.80m of cover because the water connection would have to cross the 1200mm storm sewer, which has less than 2.0m of cover presently.
- Clearview Avenue
  - 150mm watermain

It is proposed to service the subject site from the existing 300mm cast iron watermain beneath the north boulevard of Plains Road. It is proposed to provide a 200mm fire service connection for the proposed building and a 150mm domestic water service connection.

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the City Design Manual Standards. The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the Ontario Building Code 2006. The minimal residual pressure under fire conditions is 140 kpa. (or 20.3 psi).

The water demand is calculated as follows.

a) Average Day domestic demand (Table 1) - 1.0 L/sec

b) Peak hour demand - 2.25 x daily demand 2.3 L/sec

c) Fire flow demand as per FUS 1999 manual 167 L/sec

TABLE 2 – Total Water Demand

	L/sec	USGM
Peak Day Demand	2.3	36
Fire Flow Demand (Tower A) - critical	167	2642
Fire Flow Demand (Tower B)	117	1849
Total Water Demand	169	2678
Available Flow at 20 PSI	196	3108

The fire flow demand is calculated on the following page. The following assumptions were made in the following FUS calculation.

- The building is of fire-resistive (concrete) construction
- The building's contents are non-combustible (residences)
- The building will be sprinklered according to the NFPA 13 sprinkler standard and the sprinklers will be fully supervised

A hydrant flow test has been prepared on which basis the following conclusions regarding the watermains adequacy have been drawn. The flow test report is provided on the following page.

Based on the NFPA Section 4.10.1.2 calculation, as follows, there is a flow rate of ***3108 USGM*** available at a residual pressure of 20 psi.

$$Q_R = Q_F * \frac{h_r^{0.54}}{h_f^{0.54}}$$

Where:

Q_R = Flow at 20 psi
Q_F = Total flow measured during test = 1286 USGM
h_r = Pressure drop to 20 psi = 61-20 = 40
h_f = Pressure drop measured during test = 61-53 = 8

The available flow in the 300mm watermain beneath Plains Road (3108 USGM) is greater than the flow demand for both Tower A (2678 USGM development water demand) and Tower B, therefore it follows that the existing watermain infrastructure is sufficient to service the proposed development.

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

F = 220 x C x √ A
Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

LOCATION: 53-71 Plains Road East - Tower 'A'
PROJECT: Proposed Mixed-Use Development
OBC OCCUPANCY: Residential + Commercial
PROJECT No:17249
BUILDING FOOT PRINT (m2): 2850
OF STOREYS: 12

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

CONSTRUCTION CLASS: Fire Resistive

AUTOMATED SPRINKLER PROTECTION

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

CONTENTS FACTOR: Non-Combustible — CHARGE: -20%

EXPOSURE 1 (south) Ex Residential	Distance to Exposure Building (m)	>45	0%
	Length - Height		
EXPOSURE 2 (east) Prop Tower	Distance to Exposure Building (m)	4	20%
	Length - Height		
EXPOSURE 3 (west) Ex Office	Distance to Exposure Building (m)	45	5%
	Length - Height		
EXPOSURE 4 (north) Ex Industrial	Distance to Exposure Building (m)	>45	0%
	Length - Height		
		Total:	25%

no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%

ARE BUILDINGS CONTIGUOUS: No

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) h: No

CALCULATIONS

	C =	0.6		Fire Resistive
	A =	15460	m2	(2 largest floor + 50% of 8 above floors)
	F =	16413	L/min	
Round to Nearest 1000 L/min	F =	16000	L/min	must be > 2000 L/min

STOREY AREAS m2	
2850	1st Floo
2522	2nd Floor
2522	3rd Floor
2522	4th Floor
2522	5th Floor
2522	6th Floor
2522	7th Floor
2522	8th Floor
2522	9th Floor
2522	10th Floor

CORRECTION FACTORS:

OCCUPANCY	-3200	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	12800	L/min
REDUCTION FOR SPRINKLER	-6400	L/min
EXPOSURE CHARGE	3200	L/min

REQUIRED FIRE FLOW

	F =	9600	L/min	
Round to Nearest 1000 L/min	**F =**	10000	L/min	2642 usgm
	F =	167	L/sec	

WATER SUPPLY FOR PUBLIC FIRE PROTECTION , FIRE UNDERWRITERS SURVEY
GUIDE FOR DETERMINATION OF REQUIRED FIRE FLOWS

F = 220 x C x √ A
Where:
F = required fire flow in liters per minute
C= Coefficient related to the type of construction
A = the total floor area in square meters (excluding basements) in the building considered

Coefficient related to type of construction	
1.5	Wood Frame
1	Ordinary
0.8	Non combustible
0.6	Fire Resistive

LOCATION: 53-71 Plains Road East - Tower 'B'
PROJECT: Proposed Mixed-Use Development
OBC OCCUPANCY: Residential + Commercial
PROJECT No 17249
BUILDING FOOT PRINT (m2): 4464
OF STOREYS: 12

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

CONSTRUCTION CLASS: Fire Resistive

AUTOMATED SPRINKLER PROTECTION

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

CONTENTS FACTOR: Non-Combustible CHARGE: -20%

EXPOSURE 1 (south) Ex Residential	Distance to Exposure Building (m)	>45	0%
	Length - Height		
EXPOSURE 2 (east) Ex Commercial	Distance to Exposure Building (m)	>45	0%
	Length - Height		
EXPOSURE 3 (west) Prop Tower	Distance to Exposure Building (m)	4	20%
	Length - Height		
EXPOSURE 4 (north) Ex House	Distance to Exposure Building (m)	32	5%
	Length - Height		
		Total:	25%

no more than 75%

Separation	Charge
0-3 m	25%
3.1 -10 m	20%
10.1 - 20 m	15%
20.1 - 30 m	10%
30.1 - 45	5%
> 45 m	0%

ARE BUILDINGS CONTIGUOUS: No

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) h: No

CALCULATIONS

	C =	0.6		Fire Resistive
	A =	8148	m2	(2 largest floor + 50% of 8 above floors)
	F =	11915	L/min	
Round to Nearest 1000 L/min	F =	12000	L/min	must be > 2000 L/min

STOREY AREAS m2	
1358	1st Floo
1358	2nd Floor
1358	3rd Floor
1358	4th Floor
1358	5th Floor
1358	6th Floor
1358	7th Floor
1358	8th Floor
1358	9th Floor
1358	10th Floor

CORRECTION FACTORS:

OCCUPANCY	-2400	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	9600	L/min
REDUCTION FOR SPRINKLER	-4800	L/min
EXPOSURE CHARGE	2400	L/min

REQUIRED FIRE FLOW	**F =**	7200	L/min		
Round to Nearest 1000 L/min	**F =**	7000	L/min	1849	usgm
	F =	117	L/sec		

J&S
Fire Sprinkler Design and Consulting
BCIN: 30398
55 WOODROW STREET
ST. CATHARINES, ON
L2P 2A4
Phone : 905-988-9840
Fax : 905-988-9248
E-mail: jsfire@sympatico.ca

WATER SUPPLY TEST

Name of risk: ..... File No: .....
Address: 71 PLAINS RD. EAST Test By: GLOBAL FIRE
Municipality: BURLINGTON, ONTARIO Date: NOV. 6, 2017

SYSTEM DATA:

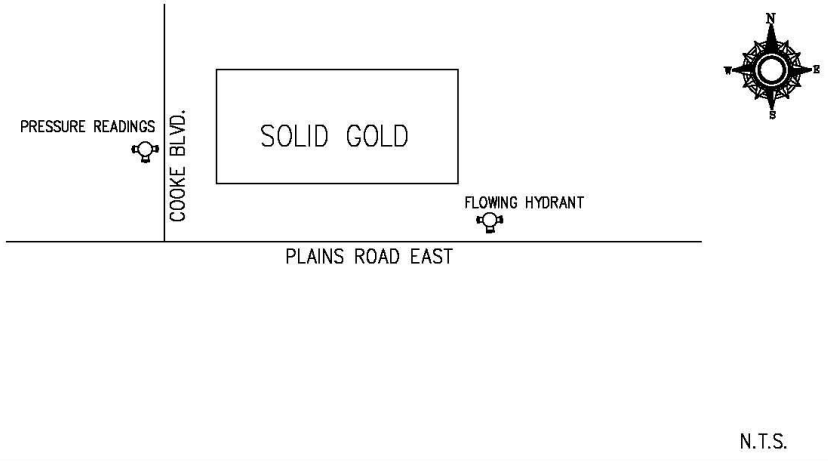
Size of Main: 12" Dead End: ..... Two Ways: ..... Loop: .....
Source Reliable: YES If not explain: .....
Comments: .....

TEST DATA:

Location of test hydrants: .....
Flow: .....

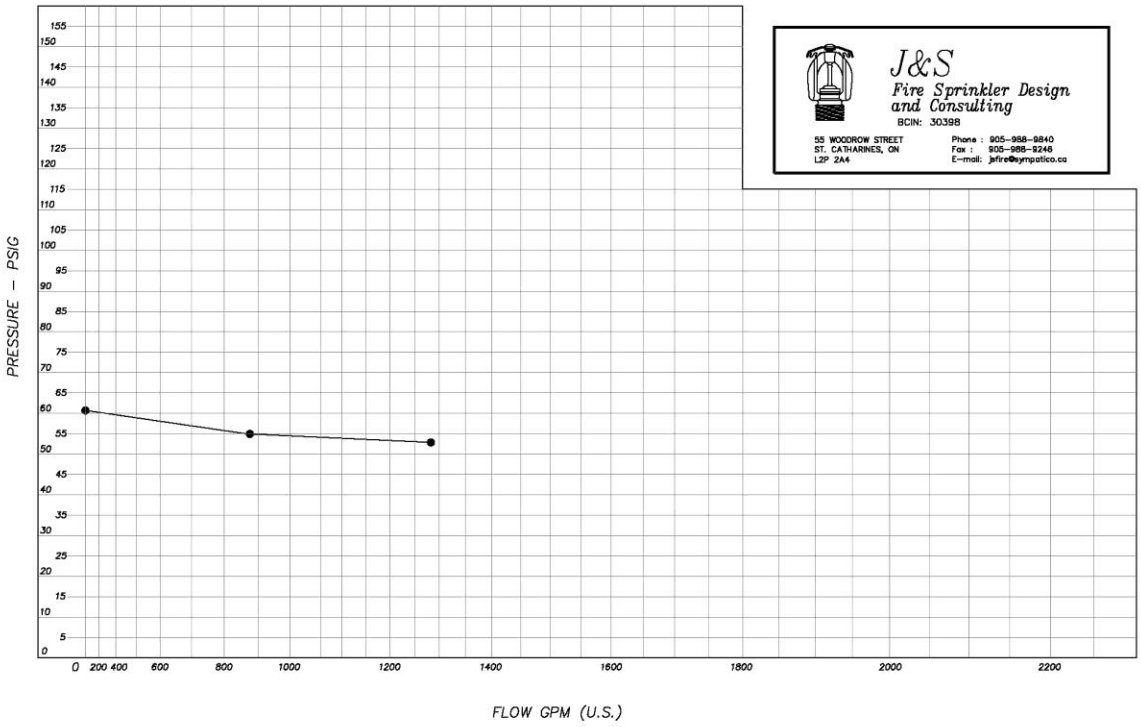
Static: 61 psi. Time: 9:00 A.M. ..... P.M.

TEST No.	No. OF OUTLETS	ORIFICE SIZE (in.)	PITOT READING (psi)	EQUIVALENT FLOW gpm (U.S.)	TOTAL FLOW gpm (U.S.)	RESIDUAL PRESSURE (psi)	COMMENTS
1	1	2.1/2	28	878	878	55	flows taken from 2.1/2" hydrant conn. C = 0.89
2	2	2.1/2	15/15	643/643	1286	53	



MAKE OF RISK: _____ FILE No. : _____
STREET: 71 PLAINS RD. EAST
CITY: BURLINGTON, ONTARIO

DATE: NOV. 6, 2017 TIME: 9:00 am TEST BY: GLOBAL FIRE PROTECTION



J&S
Fire Sprinkler Design and Consulting
BCIN: 30398
55 WOODROW STREET
ST. CATHARINES, ON
L2P 2A4
Phone : 905-988-9840
Fax : 905-988-9248
E-mail: jsfire@sympatico.ca

5.0 STORM WATER MANAGEMENT

i) Existing Infrastructure

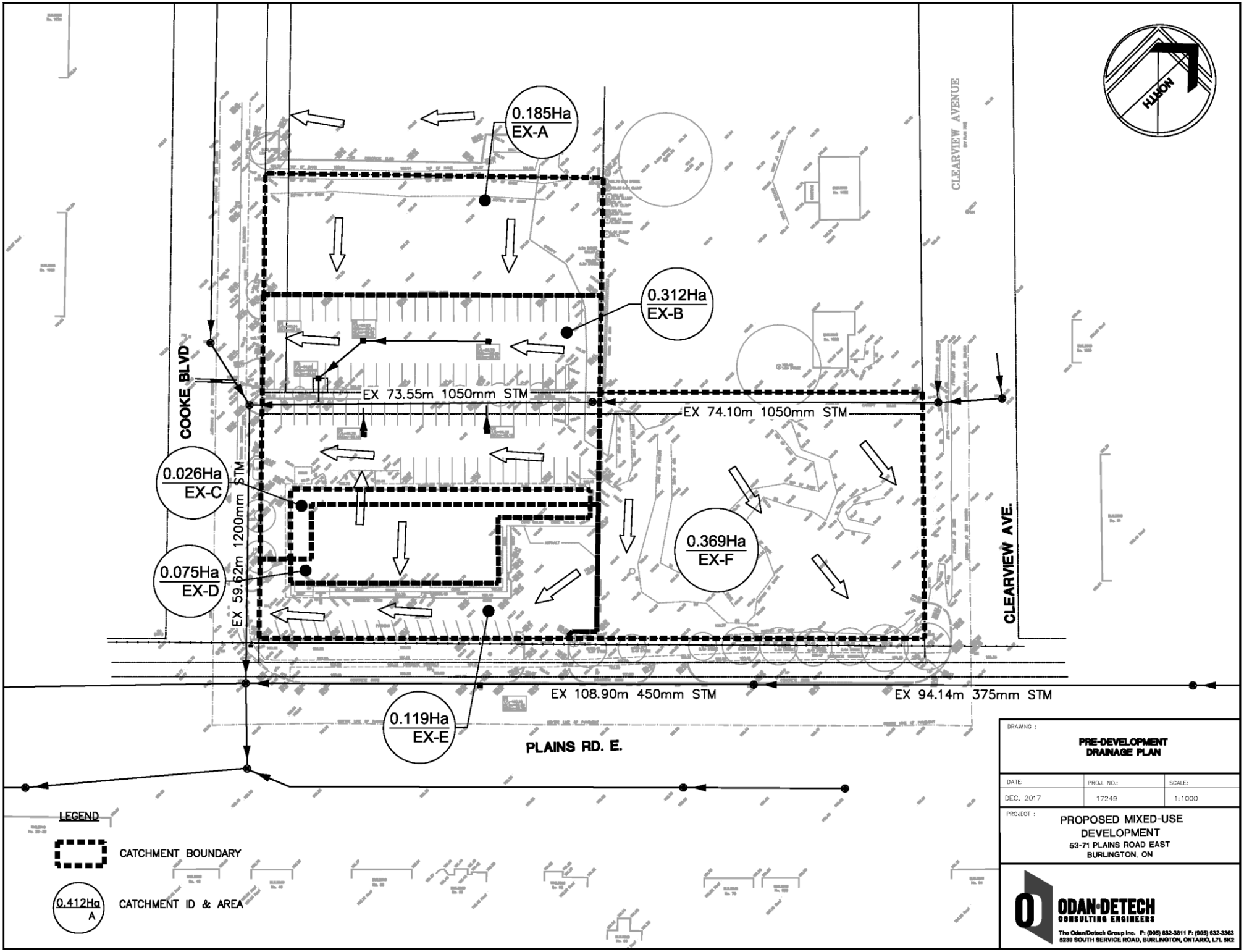
The following separated storm sewers presently exist beneath the streets bordering the subject site and within it. Refer to the Pre-Development Drainage Plan on the following page for the existing storm sewers, drainage patterns and conveyances.

1) Clearview Avenue
    a. A 1050mm storm sewer flows westerly beneath Clearview Avenue, into an easement within the subject site. This sewer conveys runoff from two inlets from the roadside ditches flowing southerly on either side of Clearview Avenue as well as an upstream storm sewer east of Clearview Avenue

2) Within subject site
    a. The foregoing 1050mm storm sewer flows westerly in an easement within the subject site.
    b. City drawings indicate that the 1050mm storm sewer continues southerly in easement within the subject site as a 1200mm storm sewer, however the portion of the sewer which flows southerly was in fact constructed within the Cooke Boulevard Right of Way, as shown on the Functional Servicing Plan.
    c. There are existing catchbasins within the subject site which appear to drain into the 1050mm storm sewer in easement.

3) Cooke Boulevard
    a. The foregoing 1050mm sewer becomes 1200mm in diameter and flows southerly beneath Cooke Boulevard, receives flows from the Plains Road storm sewers, and crosses to the south side of Plains Road.

4) Plains Road
    a. The foregoing 1200mm storm sewer crosses to the south side of Plains Road and flows westerly.
    b. There are local 300mm and 450mm storm sewers beneath the north side of Plains Road which discharge into the foregoing 1200mm storm sewer.



DRAWING :

PRE-DEVELOPMENT DRAINAGE PLAN

DATE:	PROJ. NO.:	SCALE:
DEC. 2017	17249	1:1000

PROJECT :

PROPOSED MIXED-USE DEVELOPMENT
53-71 PLAINS ROAD EAST
BURLINGTON, ON

ODAN·DETECH
CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

ii) Design Criteria

City staff have identified the following criteria for stormwater management controls for this development.

1) Quantity Control: Control 100-year post-development storm events to 5-year pre-development storm events.
2) Quality Control: 80% TSS Removal; OGS and/or other BMP may be required pending pre-consultation.

Design storm data for the City of Burlington 5- and 100-year storms are shown below.

$$I_5 = 697.4 / (5 + t)^{0.764}$$
$$I_{100} = 1114.1 / (5 + t)^{0.761}$$

When time of concentration, *t*, is 10 minutes, the 5- and 100-year rainfall intensities are as follows.

$$I_5 = 88.1 \text{ mm/hr}$$
$$I_{100} = 141.9 \text{ mm/hr}$$

iii) Pre-Development & Allowable Discharge Flow Rate

The pre-development 5-year storm runoff rate for this site is calculated as follows so as to satisfy the City criteria for quantity control.

The pre-development flow in the 5-year storm is calculated using Visual OTTHYMO 2.3.2 to model the site's pre-development hydrology. For drainage areas with significant imperviousness the calculation of effective rainfall in Visual OTTHYMO is accomplished using the "Standhyd" method. This method is used in urban watersheds to simulate runoff by combining two parallel standard unit hydrographs resulting from the effective rainfall intensity over the pervious and impervious surfaces. For pervious surfaces, losses are calculated using the SCS modified CN method.

The following table summarizes the parameters used in Visual OTTHYMO to characterize the pre-development catchment areas. Refer to the Pre-Development Drainage Plan on the foregoing page for the pre-development catchment areas.

TABLE 3 - Catchment Characteristics for the Pre-Development Site

Area I.D.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious (mm)	Time to peak (T_p)
EX-A & EX-F – Sod Areas	0.554	NashHyd	-	-	SCS	80	5	0.11
EX-B & EX-E – Paved Areas	0.431	StandHyd	90	90	SCS	80	1	-
EX-C & EX-D – Building Roof	0.101	StandHyd	99	99	SCS	80	1	-

The Visual OTTHYMO Model is as. Refer to Appendix B for the Visual OTTHYMO output.

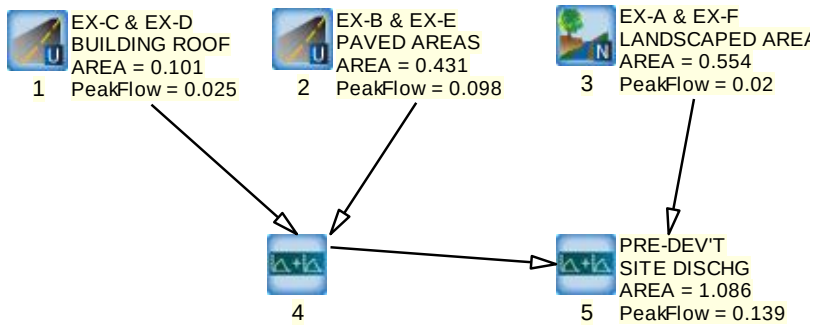


Figure 1 - Pre-Development Visual OTTHYMO Model (Showing 5-Year Storm flow)

The pre-development runoff from the subject site is therefore 139 L/s. The site's post-development 100-year storm allowable release rate is ***139 L/s***.

TABLE 4 - Summary of Pre-Development (Allowable) Flows from Site

Storm	**Peak Discharge** (L/s)
5-Year	139

iv) Post Development Flow Analysis

Stormwater management quantity controls will control the post-development discharge rate to the foregoing allowable release rate – 139 L/s.

The proposed development comprises a below-grade parking garage structure which extends to all of the site's boundaries (except the storm sewer in easement at the north property line). Runoff from all surfaces, including the driveway and parking areas at ground level, roof drains, landscaped areas will drain by area drains in the roof of the structure, to mechanical storm drains within the structure. There are no storm sewers proposed within this development – all internal conveyances will be mechanical storm drains.

The mechanical storm drains will drain uncontrolled into a storm tank located at the P1 level. Discharge from the storm tank will be attenuated by an orifice plate, which will be designed at the SPA stage to control runoff to no more than 139 L/s. The outlet from the storm tank, via the orifice plate, will be into the storm control manhole.

Controlled storm flows will drain from the storm control manhole via a proposed 300mm at 3.0% (capacity 167 L/s) storm service connection pipe to the existing 1200mm storm sewer flowing southerly beneath Cooke Boulevard. Refer to the Functional Servicing Plan for the location of the proposed storm service connection.

The site is modelled in the post-development condition as follows to quantify the required stormwater storage volume in the design 100-year storm event for which quantity controls are to be provided. The development is conservatively assumed to have typically 90% imperviousness for this functional design. Detailed stormwater calculations including the different surfaces will be developed at the SPA stage.

TABLE 5 - Catchment Characteristics for the Post-Developed Site

Area I.D.	Area (ha)	Hydrograph Method	% impervious	imperviousness directly connected %	Loss Method for Pervious Area	CN for Pervious Area	Initial Abstraction for Pervious (mm)	Time to peak (T_p)
Entire Proposed Development	1.09	StandHyd	90	90	SCS	80	1	-

The Visual OTTHYMO Output, showing flows in a 100-year storm, is as follows for the post-development condition. Refer to the detailed Visual OTTHYMO output in Appendix B.

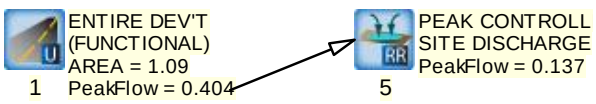


Figure 2 - Post-Development Visual OTTHYMO Model (Showing flows in 100-year storm)

As shown above, the peak post-development discharge in a 100-year storm is preliminarily 137 L/s. The peak controlled discharge from the site is summarized as follows. Refer to the Visual

OTTHYMO output in Appendix C for detailed calculations. Based on a controlled discharge rate of 137 L/s, 267m^3 of stormwater storage is required in the 100-year storm. The stormwater storage tank, which will be formed into the below-grade parking structure, will be designed at the SPA stage with the orifice Pipe.

TABLE 6 - Summary of Post-Development Flows from Site

Storm	**Allowable Discharge** (L/s)	**Proposed Discharge** (L/s)	**Required Stormwater Storage** (m^3)
5-Year	139	83	162
100-Year	139	137	267

It is therefore evident that there are existing municipal storm sewers which are available to service the proposed development. Further, it is feasible to control stormwater discharge from the subject site in accordance with City criteria and stormwater storage volume can be provided in a stormwater storage tank located in the proposed below-grade parking structure.

v) Water Quality

City staff have stated that the criteria applying to this development is to provide 80% Total Suspended Solids Removal (TSSR) for runoff leaving the site. This can be accomplished by provision of an Oil/Grit Separator (OGS) which will be designed at the SPA stage. Runoff entering the mechanical area drains serving the parking area will drain first into the OGS before draining into the 100-year storm tank.

The OGS and treatment design will be prepared at the SPA stage.

vi) Storm Sewer Realignment

There is an existing 1050mm concrete storm sewer which presently passes through the subject site from east to west in an existing 4.50m easement. The surveyed easement width is 4.5m as shown on the Functional Servicing Plan, however it is assumed to have been a 5.0m easement. Refer to the Functional Servicing Plan.

It is proposed to realign the existing 1050mm storm sewer in the western segment within the site, from EX STM MH1 to EX STM MH8 such that it is adjacent to the site's north property line. Refer to the Functional Servicing Plan for the proposed alignment.

It is proposed to provide an easement in favour of the City of Burlington to accommodate the proposed storm sewer, as shown on the Functional Servicing Plan.

6.0 CONCLUSIONS

From the foregoing investigation, the site is serviceable utilizing existing sanitary, storm and watermain infrastructure within and adjacent to the site. Storm water management can be accommodated with on-site storage as described in this report.

The following table summarizes the SWM and Servicing components of the proposed development.

TABLE 7 - Summary

	Proposed Development
Peak Sanitary Discharge (L/s)	4.44
Proposed Sanitary Service	200mm at 2.00%
Receiving Sanitary Sewer	Plains Road East – Existing 250mm
Development Water Demand (Fire + Domestic)	2678 USGM
Available Flow	3108 USGM (Plains Road 300mm WM)
Proposed Fire Service	Proposed 200mm Service (Plains Road 300mm WM)
Proposed Domestic Service	Proposed 150mm Service (Plains Road 300mm WM)
Allowable release rate from site (L/s) (100 year storm)	139
Proposed release rate from site (L/s) (100 year storm)	137
Stormwater Storage (m^3) (100 year storm)	267
Stormwater Quality	OGS – to be designed at SPA
Quantity Control	Orifice – to be designed at SPA

7.0 REFERENCES

1. Regional Municipality of Halton's *Water and Wastewater Linear Design Manual* (April 2015)

2. Storm water Management Planning and Design Manual, Ontario Ministry of the Environment, March 2003.

3. New Jersey Storm Water Best Management Practices Manual, April 2004.

4. Visual OTTHYMO v2.0 Reference Manual, July 2002

Respectfully Submitted;
The Odan Detech Group Inc.



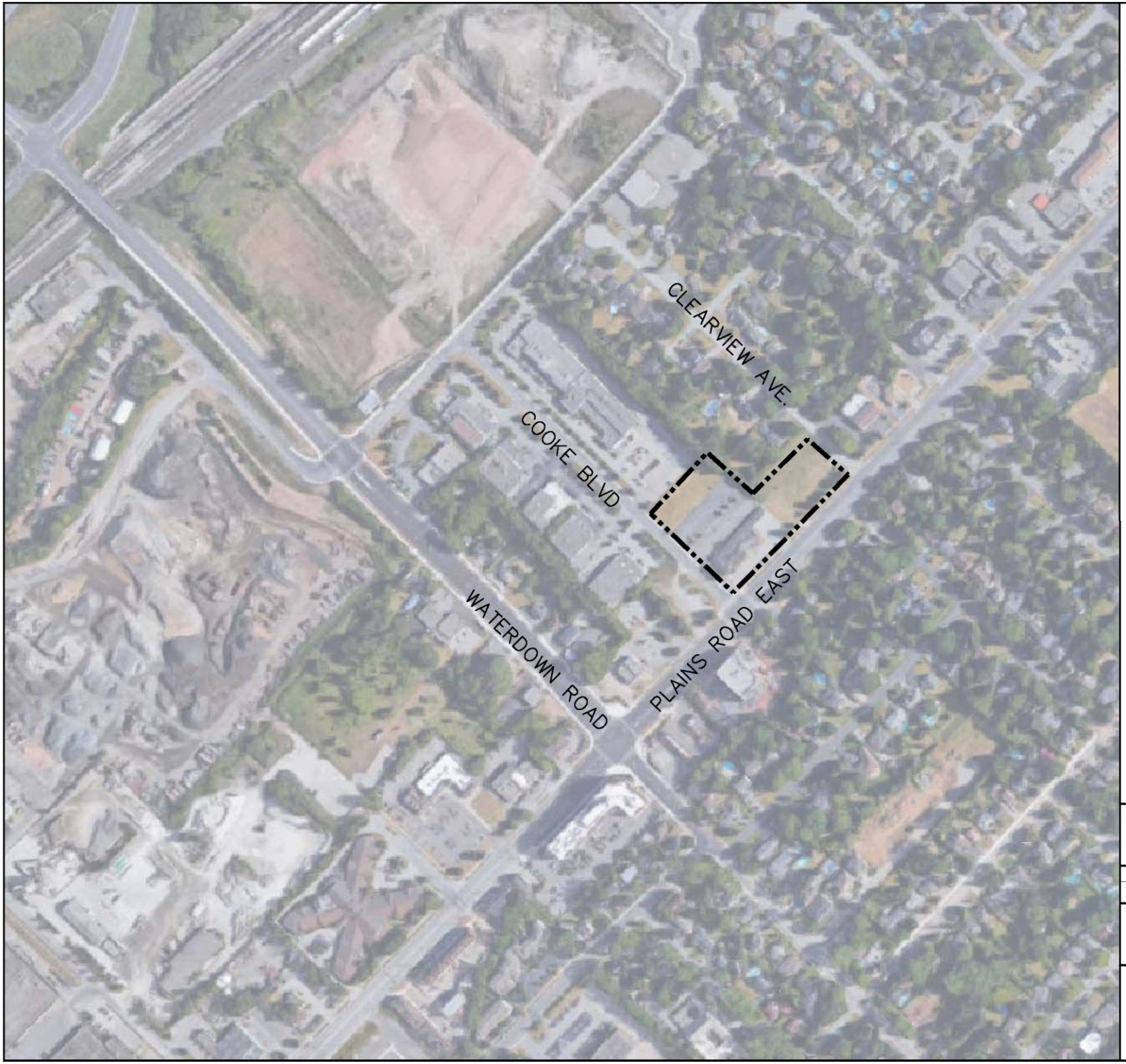
Daniel Bancroft, P.Eng.



Paul Hecimovic, P.Eng.

APPENDIX A

Existing Site	Aerial view of Site and surrounding area
Site Plan	by SRM Architects Inc.



LEGEND

PROPERTY LINE

DRAWING :

KEY PLAN

DATE:	PROJ. NO.:	SCALE:
DEC. 2017	17249	N.T.S.

PROJECT :

PROPOSED MIXED-USE DEVELOPMENT
53-71 PLAINS ROAD EAST
BURLINGTON, ON

ODAN·DETECH
CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3383
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

SITE DATA

Address: 71 Plains Rd E, Burlington, Ontario

DATA		REQUIRED	PROVIDED
ZONING		ZONING -	ZONING -
LOT AREA (m²)		XX (m²)	116,853 ft² (10,856 m²)
SETBACKS	FRONT YARD (PLAINS RD.)	XX (m)	2.0m SOUTH
	INTERIOR SIDE YARD	XX (m)	12.7m NORTH
	EXTERIOR SIDE YARD (CROOKE ST)	XX (m)	3.0m WEST
	EXTERIOR SIDE YARD (CLEARVIEW AVE.)	XX (m)	8.0m EAST
U/G SETBACKS	FRONT YARD (PLAINS RD.)	XX (m)	0m SOUTH
	INTERIOR SIDE YARD	XX (m)	3.0m NORTH
	EXTERIOR SIDE YARD (CROOKE ST)	XX (m)	1.0m WEST
	EXTERIOR SIDE YARD (CLEARVIEW AVE.)	XX (m)	1.8m EAST
ACCESSORY BUILDINGS OR STRUCTURES SETBACK FROM SIDE OR REAR LOT LINE			RAMP STRUCTURE 3.0m

BUILDING 'A' DATA

DATA	REQUIRED	PROVIDED
TOTAL DENSITY (# of units)	XX (units)	300 (UNITS)
		1 BR = 14 (4.67%)
		1 BR + DEN = 146 (9.59%)
		2 BR = 121 (40.33%)
		TOWN = 19 (6.33%)
BUILDING AREA (m²)	XX (m²)	30,672 ft² (2,850 m²)
GROSS FLOOR AREA (m²)	XX (m²)	282,571 ft² (26,252 m²)
NUMBER OF STOREYS	--	BUILDING 'A' = 12 STOREYS
BUILDING HEIGHT (m)	XX (m) MAX.	40.1m + MECH. PENTHOUSE
COMMERCIAL/RETAIL AREA (m²)	XX (m²)	8,092 ft² (752 m²)
INDOOR AMENITY AREA (m²)	XX (m²)	3,406 ft² (316 m²)
OUTDOOR AMENITY AREA (m²)	XX (m²)	3,839 ft² (357 m²)

BUILDING 'B' DATA

DATA	REQUIRED	PROVIDED
TOTAL DENSITY (# of units)	XX (units)	150 (UNITS)
		STUDIO = 6 (4.0%)
		1 BR = 25 (16.67%)
		1 BR + DEN = 51 (34.0%)
		2 BR = 64 (42.67%)
		TOWN = 4 (2.67%)
BUILDING AREA (m²)	XX (m²)	14,614 ft² (1,358 m²)
GROSS FLOOR AREA (m²)	XX (m²)	135,288 ft² (12,569 m²)
NUMBER OF STOREYS	--	BUILDING 'B' = 10 STOREYS
BUILDING HEIGHT (m)	XX (m) MAX.	34.0m + MECH. PENTHOUSE
COMMERCIAL/RETAIL AREA (m²)	XX (m²)	4,904 ft² (456 m²)
INDOOR AMENITY AREA (m²)	XX (m²)	1,018 ft² (95 m²)

TOTAL COMBINED BUILDING DATA

COMBINED DENSITY (# of units)	XX (m²)	450 (UNITS)
COMBINED BUILDING AREA (m²)	XX (m²)	45,286 ft² (4,207 m²)
COMBINED GROSS AREA (m²)	XX (m²)	417,859 ft² (38,820 m²)
TOTAL CONSTRUCTION AREA (m²)	XX (m²)	631,981 ft² (58,713 m²) INCLUDING U/G
COMBINED AMENITY (m²)	XX (m²)	4,424 ft² (411 m²)
COMBINED RETAIL (m²)	XX (m²)	12,996 ft² (1,207 m²)



2 KEY MAP
N.T.S.

TOTAL COMBINED UNIT BREAKDOWN

DATA	REQUIRED	PROVIDED
STUDIO	XX (m²)	6 UNITS (1.33%)
1 BEDROOM	XX (m²)	39 UNITS (8.67%)
1 BEDROOM + DEN	XX (m²)	197 (43.78%)
2 BEDROOM	XX (m²)	185 (41.11%)
TOWN	XX (m²)	23 (5.11%)

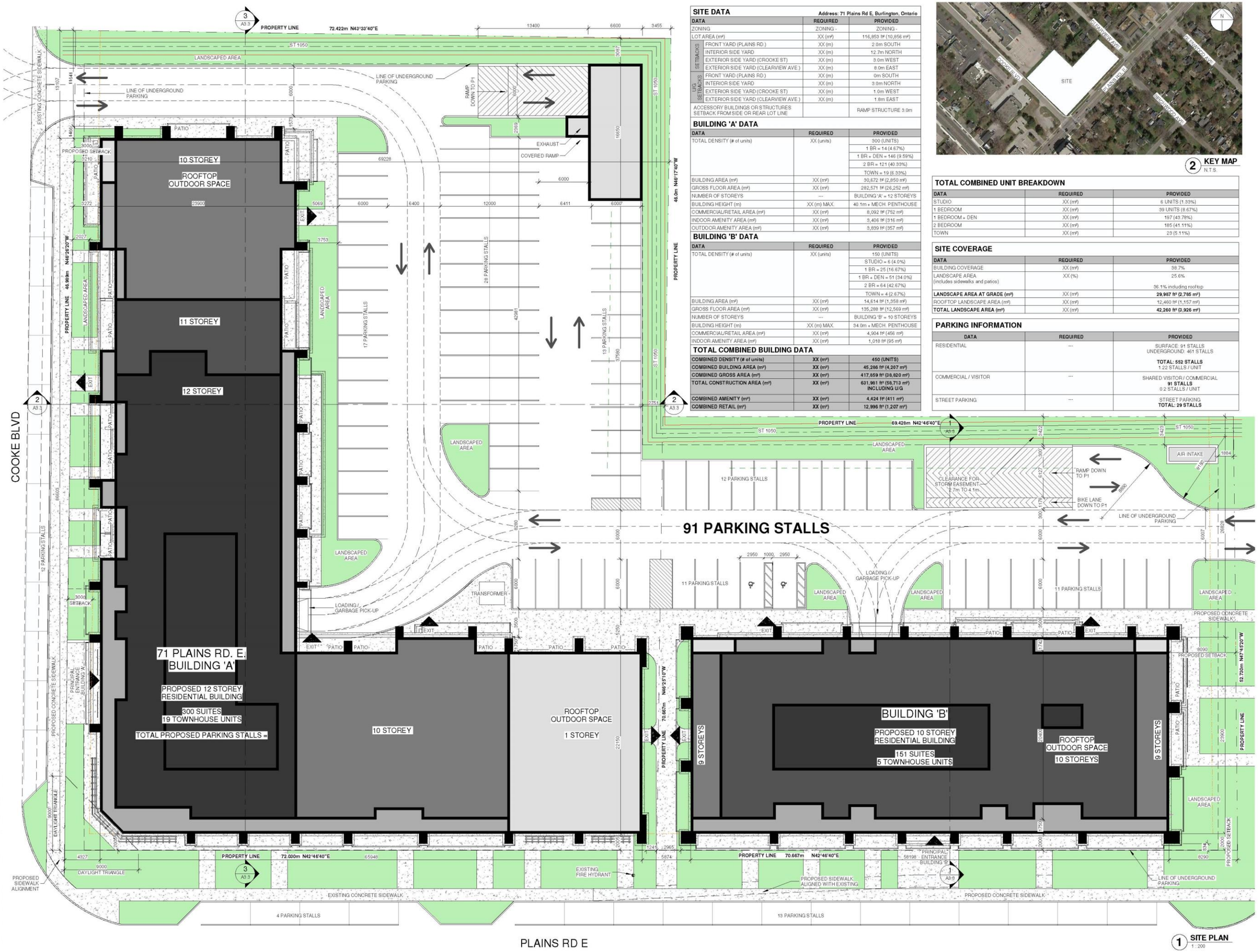
SITE COVERAGE

DATA	REQUIRED	PROVIDED
BUILDING COVERAGE	XX (m²)	38.7%
LANDSCAPE AREA (includes sidewalks and patios)	XX (%)	25.6% 36.1% including rooftop
LANDSCAPE AREA AT GRADE (m²)	XX (m²)	29,987 ft² (2,785 m²)
ROOFTOP LANDSCAPE AREA (m²)	XX (m²)	12,460 ft² (1,157 m²)
TOTAL LANDSCAPE AREA (m²)	XX (m²)	42,260 ft² (3,926 m²)

PARKING INFORMATION

DATA	REQUIRED	PROVIDED
RESIDENTIAL	---	SURFACE: 91 STALLS UNDERGROUND: 461 STALLS TOTAL: 552 STALLS 1.22 STALLS / UNIT
COMMERCIAL / VISITOR	---	SHARED VISITOR / COMMERCIAL 91 STALLS 0.2 STALLS / UNIT
STREET PARKING	---	STREET PARKING TOTAL: 29 STALLS

Do not scale drawings. Contractors must check and verify all dimensions and report any discrepancies to the Architect before proceeding with the work. All documents remain the property of the Architect. Unauthorized use, modification, and/or reproduction of these documents is prohibited without written permission. This Contract Documents were prepared by the Consultant for the account of the Owner. The Consultant accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this Contract Documents. The material contained herein reflects the Consultant's best judgement in light of the information available to him at the time of preparation. Any use which a third party makes of this Contract Documents, or any reliance thereon or decisions to be made based on them, are the responsibility of such third parties. The Consultant accepts no responsibility for damages suffered by any third party as a result of decisions made or actions based on this Contract Documents.
C:\Users\wcosta\Documents\17092_71 Plains Rd E_V11_WCosta.rvt



SITE DATA

Address: 71 Plains Rd E, Burlington, Ontario

DATA		REQUIRED	PROVIDED
ZONING		ZONING -	ZONING -
LOT AREA (m²)		XX (m²)	116,853 ft² (10,856 m²)
SETBACKS	FRONT YARD (PLAINS RD.)	XX (m)	2.0m SOUTH
	INTERIOR SIDE YARD	XX (m)	12.7m NORTH
	EXTERIOR SIDE YARD (CROOKE ST)	XX (m)	9.0m WEST
	EXTERIOR SIDE YARD (CLEARVIEW AVE.)	XX (m)	9.0m EAST
U/G SETBACKS	FRONT YARD (PLAINS RD.)	XX (m)	0m SOUTH
	INTERIOR SIDE YARD	XX (m)	3.0m NORTH
	EXTERIOR SIDE YARD (CROOKE ST)	XX (m)	1.0m WEST
	EXTERIOR SIDE YARD (CLEARVIEW AVE.)	XX (m)	1.8m EAST
ACCESSORY BUILDINGS OR STRUCTURES SETBACK FROM SIDE OR REAR LOT LINE			RAMP STRUCTURE 3.0m

BUILDING 'A' DATA

DATA	REQUIRED	PROVIDED
TOTAL DENSITY (# of units)	XX (units)	300 (UNITS)
		1 BR = 14 (4.67%)
		1 BR + DEN = 146 (9.59%)
		2 BR = 121 (40.33%)
		TOWN = 19 (6.33%)
BUILDING AREA (m²)	XX (m²)	30,672 ft² (2,850 m²)
GROSS FLOOR AREA (m²)	XX (m²)	282,571 ft² (26,252 m²)
NUMBER OF STOREYS	---	BUILDING 'A' = 12 STOREYS
BUILDING HEIGHT (m)	XX (m) MAX.	40.1m + MECH. PENTHOUSE
COMMERCIAL/RETAIL AREA (m²)	XX (m²)	8,092 ft² (752 m²)
INDOOR AMENITY AREA (m²)	XX (m²)	3,406 ft² (316 m²)
OUTDOOR AMENITY AREA (m²)	XX (m²)	3,859 ft² (357 m²)

BUILDING 'B' DATA

DATA	REQUIRED	PROVIDED
TOTAL DENSITY (# of units)	XX (units)	150 (UNITS)
		STUDIO = 6 (4.0%)
		1 BR = 25 (16.67%)
		1 BR + DEN = 51 (34.0%)
		2 BR = 64 (42.67%)
		TOWN = 4 (2.67%)
BUILDING AREA (m²)	XX (m²)	14,614 ft² (1,358 m²)
GROSS FLOOR AREA (m²)	XX (m²)	135,288 ft² (12,569 m²)
NUMBER OF STOREYS	---	BUILDING 'B' = 10 STOREYS
BUILDING HEIGHT (m)	XX (m) MAX.	34.0m + MECH. PENTHOUSE
COMMERCIAL/RETAIL AREA (m²)	XX (m²)	4,904 ft² (456 m²)
INDOOR AMENITY AREA (m²)	XX (m²)	1,018 ft² (95 m²)

TOTAL COMBINED BUILDING DATA

COMBINED DENSITY (# of units)	**XX (m²)**	**450 (UNITS)**
COMBINED BUILDING AREA (m²)	**XX (m²)**	**45,286 ft² (4,207 m²)**
COMBINED GROSS AREA (m²)	**XX (m²)**	**417,859 ft² (38,820 m²)**
TOTAL CONSTRUCTION AREA (m²)	**XX (m²)**	**631,961 ft² (58,713 m²) INCLUDING U/G**
COMBINED AMENITY (m²)	**XX (m²)**	**4,424 ft² (411 m²)**
COMBINED RETAIL (m²)	**XX (m²)**	**12,996 ft² (1,207 m²)**

2 KEY MAP
N.T.S.

TOTAL COMBINED UNIT BREAKDOWN

DATA	REQUIRED	PROVIDED
STUDIO	XX (m²)	6 UNITS (1.33%)
1 BEDROOM	XX (m²)	39 UNITS (8.67%)
1 BEDROOM + DEN	XX (m²)	197 (43.78%)
2 BEDROOM	XX (m²)	185 (41.11%)
TOWN	XX (m²)	23 (5.11%)

SITE COVERAGE

DATA	REQUIRED	PROVIDED
BUILDING COVERAGE	XX (m²)	38.7%
LANDSCAPE AREA (includes sidewalks and patios)	XX (%)	25.6% 36.1% including rooftop
LANDSCAPE AREA AT GRADE (m²)	XX (m²)	**29,987 ft² (2,785 m²)**
ROOFTOP LANDSCAPE AREA (m²)	XX (m²)	12,460 ft² (1,157 m²)
TOTAL LANDSCAPE AREA (m²)	XX (m²)	**42,260 ft² (3,926 m²)**

PARKING INFORMATION

DATA	REQUIRED	PROVIDED
RESIDENTIAL	---	SURFACE: 91 STALLS UNDERGROUND: 461 STALLS **TOTAL: 552 STALLS** 1.22 STALLS / UNIT
COMMERCIAL / VISITOR	---	SHARED VISITOR / COMMERCIAL **91 STALLS** 0.2 STALLS / UNIT
STREET PARKING	---	STREET PARKING **TOTAL: 29 STALLS**

Project North

True North

GENERAL NOTES

1. **DO NOT SCALE DRAWINGS**. WRITTEN DIMENSIONS SHALL HAVE PRECEDENCE OVER SCALED DIMENSIONS.
2. ALL WORK SHALL COMPLY WITH THE 2012 ONTARIO BUILDING CODE AND AMENDMENTS.
3. CONTRACTORS MUST CHECK AND VERIFY ALL DIMENSIONS AND SPECIFICATIONS AND REPORT ANY DISCREPANCIES TO THE ARCHITECT BEFORE PROCEEDING WITH THE WORK.
4. ALL CONTRACTORS AND SUB-CONTRACTORS SHALL HAVE A SET OF APPROVED CONSTRUCTION DOCUMENTS ON SITE AT ALL TIMES.
5. ALL DOCUMENTS REMAIN THE PROPERTY OF THE ARCHITECT. UNAUTHORIZED USE, MODIFICATION, AND/OR REPRODUCTION OF THESE DOCUMENTS IS PROHIBITED WITHOUT WRITTEN PERMISSION. THE CONTRACT DOCUMENTS WERE PREPARED BY THE CONSULTANT FOR THE ACCOUNT OF THE OWNER.
6. THE MATERIAL CONTAINED HEREIN REFLECTS THE CONSULTANTS BEST JUDGEMENT IN LIGHT OF THE INFORMATION AVAILABLE TO HIM AT THE TIME OF PREPARATION. ANY USE WHICH A THIRD PARTY MAKES OF THE CONTRACT DOCUMENTS, OR ANY RELIANCE ON/OR DECISIONS TO BE MADE BASED ON THEM ARE THE RESPONSIBILITY OF SUCH THIRD PARTIES.
7. THE CONSULTANT ACCEPTS NO RESPONSIBILITY FOR DAMAGES, IF ANY, SUFFERED BY ANY THIRD PARTY AS A RESULT OF DECISIONS MADE OR ACTIONS BASED ON THE CONTRACT DOCUMENTS.

No.	Date	Revision
1	2017-12-07	ISSUED FOR REZONING

1 SITE PLAN
1 : 200

srm ARCHITECTS INC.

Project No	17092
Issue Date	2017-12-01
Drawn by	WC
Checked by	MV
Plot Date / Time	2017-12-07 2:09:13 PM

53-71 Plains Rd E

SITE PLAN

PRELIMINARY

Drawing Scale	As indicated
Status	
Drawing No.	Revision No.
A1.1	

APPENDIX B

Pre-Development Visual OTTHYMO Model Output (5-Year Storm)
Post-Development Visual OTTHYMO Model Output (5- to 100-Year Storms)

Pre-Development Visual OTTHYMO Model Output (5-Year Storm)

```
================================================================================================
======

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
        V  V    I      SS   U   U  A   A  L
         VV     I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

Developed and Distributed by Clarifica Inc.
Copyright 1996, 2007 Clarifica Inc.
All rights reserved.

                    *****  D E T A I L E D   O U T P U T *****

  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\2017\17249\Visual OTTHYMO\Pre-Development\17249 PRE-DEV\PRE-DEV.out
  Summary filename: P:\2017\17249\Visual OTTHYMO\Pre-Development\17249 PRE-DEV\PRE-DEV.sum


DATE: 12/6/2017                           TIME: 12:02:02 PM

USER:


COMMENTS: _____________________________________________________


-------------------------------------------------------------------------------------------------
------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 697.400
| Ptotal= 41.69 mm |                          B=   5.000
--------------------                          C=    .764
                       used in:   INTENSITY =  A / (t + B)^C

                       Duration of storm  =  4.00 hrs
                       Storm time step    = 10.00 min
                       Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    2.98 |  1.17   21.37 |  2.17    6.78 |  3.17    3.52
                 .33    3.40 |  1.33   88.09 |  2.33    5.81 |  3.33    3.28
                 .50    3.97 |  1.50   27.73 |  2.50    5.11 |  3.50    3.08
                 .67    4.84 |  1.67   15.03 |  2.67    4.57 |  3.67    2.90
                 .83    6.29 |  1.83   10.53 |  2.83    4.15 |  3.83    2.74
                1.00    9.36 |  2.00    8.21 |  3.00    3.81 |  4.00    2.60


--------------------------------------------------------------------------------
--------------------
| CALIB            |
| NASHYD    (0003) |   Area    (ha)=    .55   Curve Number   (CN)= 80.0
|ID= 1 DT=10.0 min |   Ia      (mm)=   5.00   # of Linear Res.(N)= 3.00
--------------------   U.H. Tp(hrs)=    .20

     Unit Hyd Qpeak  (cms)=    .106

     PEAK FLOW       (cms)=    .020 (i)
     TIME TO PEAK    (hrs)=   1.500
     RUNOFF VOLUME    (mm)=  13.088
     TOTAL RAINFALL   (mm)=  41.693
     RUNOFF COEFFICIENT   =    .314

     (i) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0002) |   Area    (ha)=    .43
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .39          .04
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     53.60        40.00
     Mannings n           =      .013         .250

         NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.

                                ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    2.98 | 1.083   21.37 | 2.083    6.78 |  3.08    3.52
                .167    2.98 | 1.167   21.37 | 2.167    6.78 |  3.17    3.52
                .250    3.40 | 1.250   88.09 | 2.250    5.81 |  3.25    3.28
                .333    3.40 | 1.333   88.09 | 2.333    5.81 |  3.33    3.28
                .417    3.97 | 1.417   27.73 | 2.417    5.11 |  3.42    3.08
                .500    3.97 | 1.500   27.73 | 2.500    5.11 |  3.50    3.08
                .583    4.84 | 1.583   15.03 | 2.583    4.57 |  3.58    2.90
                .667    4.84 | 1.667   15.03 | 2.667    4.57 |  3.67    2.90
                .750    6.29 | 1.750   10.53 | 2.750    4.15 |  3.75    2.74
                .833    6.29 | 1.833   10.53 | 2.833    4.15 |  3.83    2.74
                .917    9.36 | 1.917    8.21 | 2.917    3.81 |  3.92    2.60
               1.000    9.36 | 2.000    8.21 | 3.000    3.81 |  4.00    2.60

     Max.Eff.Inten.(mm/hr)=      88.09        30.00
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.85 (ii)    4.93 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=       .32          .22
                                                          *TOTALS*
     PEAK FLOW       (cms)=       .09          .00          .098 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.33         1.33
     RUNOFF VOLUME    (mm)=     40.69        15.89        38.21
     TOTAL RAINFALL   (mm)=     41.69        41.69        41.69
     RUNOFF COEFFICIENT   =       .98          .38          .92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
             CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=    .10
|ID= 1 DT= 5.0 min |   Total Imp(%)=  99.00   Dir. Conn.(%)=  99.00
--------------------

                              IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .10          .00
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     25.90        40.00
     Mannings n           =      .013         .250

     Max.Eff.Inten.(mm/hr)=      88.09       150.02
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      1.19 (ii)    2.38 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
```

```
     Unit Hyd. peak  (cms)=        .33          .30
                                                          *TOTALS*
     PEAK FLOW       (cms)=        .02          .00           .025 (iii)
     TIME TO PEAK    (hrs)=       1.33         1.33          1.33
     RUNOFF VOLUME    (mm)=      40.69        15.89         40.44
     TOTAL RAINFALL   (mm)=      41.69        41.69         41.69
     RUNOFF COEFFICIENT   =        .98          .38           .97

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
            CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------

-------------------
| ADD HYD   (0004) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0002):       .43    .098     1.33    38.21
       + ID2= 2 (0001):       .10    .025     1.33    40.44
         ================================================
         ID = 3 (0004):       .53    .123     1.33    38.63

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

-------------------
| ADD HYD   (0005) |
|   1 +  2 =  3    |         AREA    QPEAK    TPEAK     R.V.
-------------------          (ha)    (cms)    (hrs)     (mm)
         ID1= 1 (0003):       .55    .020     1.50    13.09
       + ID2= 2 (0004):       .53    .123     1.33    38.63
         ================================================
         ID = 3 (0005):      1.09    .139     1.33    25.60

     NOTE:  PEAK FLOWS DO NOT INCLUDE BASEFLOWS IF ANY.

--------------------------------------------------------------------------------

 FINISH
================================================================================================
======
```

Post-Development Visual OTTHYMO Model Output (5- and 100-Year Storms)

```
================================================================================

       V    V   I    SSSSS  U   U    A    L
       V    V   I    SS     U   U   A A   L
        V  V    I     SS    U   U  AAAAA  L
         V V    I      SS   U   U  A   A  L
          VV    I    SSSSS  UUUUU  A   A  LLLLL

        OOO   TTTTT  TTTTT  H   H  Y   Y  M   M   OOO
       O   O    T      T    H   H   Y Y   MM MM  O   O
       O   O    T      T    H   H    Y    M M M  O   O
        OOO     T      T    H   H    Y    M   M   OOO

Developed and Distributed by Clarifica Inc.
Copyright 1996, 2007 Clarifica Inc.
All rights reserved.

                  ***** D E T A I L E D   O U T P U T *****


  Input   filename: C:\Program Files (x86)\Visual OTTHYMO 2.3.3\voin.dat
  Output  filename: P:\2017\17249\Visual OTTHYMO\17249 Post Dev\Post Dev.out
  Summary filename: P:\2017\17249\Visual OTTHYMO\17249 Post Dev\Post Dev.sum


DATE: 12/6/2017                          TIME: 1:03:26 PM

USER:


COMMENTS: _____________________________________________

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   2 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A= 697.400
| Ptotal= 41.69 mm |                          B=   5.000
--------------------                          C=    .764
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    2.98 |  1.17   21.37 |  2.17    6.78 |  3.17    3.52
                 .33    3.40 |  1.33   88.09 |  2.33    5.81 |  3.33    3.28
                 .50    3.97 |  1.50   27.73 |  2.50    5.11 |  3.50    3.08
                 .67    4.84 |  1.67   15.03 |  2.67    4.57 |  3.67    2.90
                 .83    6.29 |  1.83   10.53 |  2.83    4.15 |  3.83    2.74
                1.00    9.36 |  2.00    8.21 |  3.00    3.81 |  4.00    2.60

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .98          .11
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     85.20        40.00
     Mannings n          =      .013         .250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    2.98 | 1.083   21.37 | 2.083    6.78 |  3.08    3.52
                .167    2.98 | 1.167   21.37 | 2.167    6.78 |  3.17    3.52
                .250    3.40 | 1.250   88.09 | 2.250    5.81 |  3.25    3.28
                .333    3.40 | 1.333   88.09 | 2.333    5.81 |  3.33    3.28
                .417    3.97 | 1.417   27.73 | 2.417    5.11 |  3.42    3.08
                .500    3.97 | 1.500   27.73 | 2.500    5.11 |  3.50    3.08
                .583    4.84 | 1.583   15.03 | 2.583    4.57 |  3.58    2.90
                .667    4.84 | 1.667   15.03 | 2.667    4.57 |  3.67    2.90
                .750    6.29 | 1.750   10.53 | 2.750    4.15 |  3.75    2.74
                .833    6.29 | 1.833   10.53 | 2.833    4.15 |  3.83    2.74
                .917    9.36 | 1.917    8.21 | 2.917    3.81 |  3.92    2.60
               1.000    9.36 | 2.000    8.21 | 3.000    3.81 |  4.00    2.60

     Max.Eff.Inten.(mm/hr)=      88.09        33.77
               over (min)        5.00        10.00
     Storage Coeff.  (min)=      2.44 (ii)    5.52 (ii)
     Unit Hyd. Tpeak (min)=      5.00        10.00
     Unit Hyd. peak  (cms)=       .30          .16

                                                          *TOTALS*
     PEAK FLOW       (cms)=       .24          .01           .243 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.42          1.33
     RUNOFF VOLUME    (mm)=     40.69        15.89         38.21
     TOTAL RAINFALL   (mm)=     41.69        41.69         41.69
     RUNOFF COEFFICIENT   =       .98          .38           .92

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0     Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
--------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
--------------------      (cms)     (ha.m.)   |   (cms)     (ha.m.)
                           .0000       .0000   |    .1390       .0270

                              AREA      QPEAK       TPEAK       R.V.
                              (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0001)    1.090      .243        1.33       38.21
     OUTFLOW: ID= 1 (0005)    1.090      .083        1.50       38.17

                   PEAK   FLOW   REDUCTION [Qout/Qin](%)= 34.24
                   TIME SHIFT OF PEAK FLOW          (min)= 10.00
                   MAXIMUM  STORAGE   USED       (ha.m.)=   .0162

--------------------------------------------------------------------------------
  ****************************
  ** SIMULATION NUMBER:   6 **
  ****************************

--------------------
| CHICAGO STORM    |    IDF curve parameters: A=1114.100
| Ptotal= 67.71 mm |                          B=   5.000
--------------------                          C=    .761
                        used in:   INTENSITY =  A / (t + B)^C

                        Duration of storm  =  4.00 hrs
                        Storm time step    = 10.00 min
                        Time to peak ratio =   .33

                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                 .17    4.90 |  1.17   34.68 |  2.17   11.09 |  3.17    5.78
                 .33    5.58 |  1.33  141.88 |  2.33    9.51 |  3.33    5.39
                 .50    6.52 |  1.50   44.96 |  2.50    8.37 |  3.50    5.05
                 .67    7.92 |  1.67   24.46 |  2.67    7.49 |  3.67    4.76
                 .83   10.29 |  1.83   17.17 |  2.83    6.80 |  3.83    4.50
                1.00   15.27 |  2.00   13.40 |  3.00    6.24 |  4.00    4.28

--------------------------------------------------------------------------------
--------------------
| CALIB            |
| STANDHYD  (0001) |   Area    (ha)=   1.09
|ID= 1 DT= 5.0 min |   Total Imp(%)=  90.00   Dir. Conn.(%)=  90.00
--------------------
                           IMPERVIOUS    PERVIOUS (i)
     Surface Area     (ha)=       .98          .11
     Dep. Storage     (mm)=      1.00         1.00
     Average Slope     (%)=      1.00         2.00
     Length            (m)=     85.20        40.00
     Mannings n          =      .013         .250

        NOTE:  RAINFALL WAS TRANSFORMED TO   5.0 MIN. TIME STEP.


                          ---- TRANSFORMED HYETOGRAPH ----
                TIME    RAIN |  TIME    RAIN |  TIME    RAIN |  TIME    RAIN
                 hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr |   hrs   mm/hr
                .083    4.90 | 1.083   34.68 | 2.083   11.09 |  3.08    5.78
                .167    4.90 | 1.167   34.68 | 2.167   11.09 |  3.17    5.78
                .250    5.58 | 1.250  141.88 | 2.250    9.51 |  3.25    5.39
                .333    5.58 | 1.333  141.88 | 2.333    9.51 |  3.33    5.39
                .417    6.52 | 1.417   44.96 | 2.417    8.37 |  3.42    5.05
                .500    6.52 | 1.500   44.96 | 2.500    8.37 |  3.50    5.05
                .583    7.92 | 1.583   24.46 | 2.583    7.49 |  3.58    4.76
                .667    7.92 | 1.667   24.46 | 2.667    7.49 |  3.67    4.76
                .750   10.29 | 1.750   17.17 | 2.750    6.80 |  3.75    4.50
                .833   10.29 | 1.833   17.17 | 2.833    6.80 |  3.83    4.50
                .917   15.27 | 1.917   13.40 | 2.917    6.24 |  3.92    4.28
               1.000   15.27 | 2.000   13.40 | 3.000    6.24 |  4.00    4.28

     Max.Eff.Inten.(mm/hr)=     141.88        67.54
               over (min)        5.00         5.00
     Storage Coeff.  (min)=      2.02 (ii)    4.57 (ii)
     Unit Hyd. Tpeak (min)=      5.00         5.00
     Unit Hyd. peak  (cms)=       .31          .23

                                                          *TOTALS*
     PEAK FLOW       (cms)=       .38          .02           .404 (iii)
     TIME TO PEAK    (hrs)=      1.33         1.33          1.33
```

```
     RUNOFF VOLUME    (mm)=      66.71         34.18          63.46
     TOTAL RAINFALL   (mm)=      67.71         67.71          67.71
     RUNOFF COEFFICIENT   =        .99           .50            .94

***** WARNING: STORAGE COEFF. IS SMALLER THAN TIME STEP!

       (i) CN PROCEDURE SELECTED FOR PERVIOUS LOSSES:
           CN*  =  80.0    Ia = Dep. Storage  (Above)
      (ii) TIME STEP (DT) SHOULD BE SMALLER OR EQUAL
           THAN THE STORAGE COEFFICIENT.
     (iii) PEAK FLOW DOES NOT INCLUDE BASEFLOW IF ANY.

--------------------------------------------------------------------------------
-------------------
| RESERVOIR (0005) |
| IN= 2---> OUT= 1 |
| DT=  5.0 min     |     OUTFLOW    STORAGE   |  OUTFLOW    STORAGE
-------------------      (cms)      (ha.m.)   |   (cms)     (ha.m.)
                          .0000       .0000   |    .1390       .0270

                                 AREA      QPEAK       TPEAK       R.V.
                                 (ha)      (cms)       (hrs)       (mm)
     INFLOW : ID= 2 (0001)      1.090       .404        1.33       63.46
     OUTFLOW: ID= 1 (0005)      1.090       .137        1.50       63.42

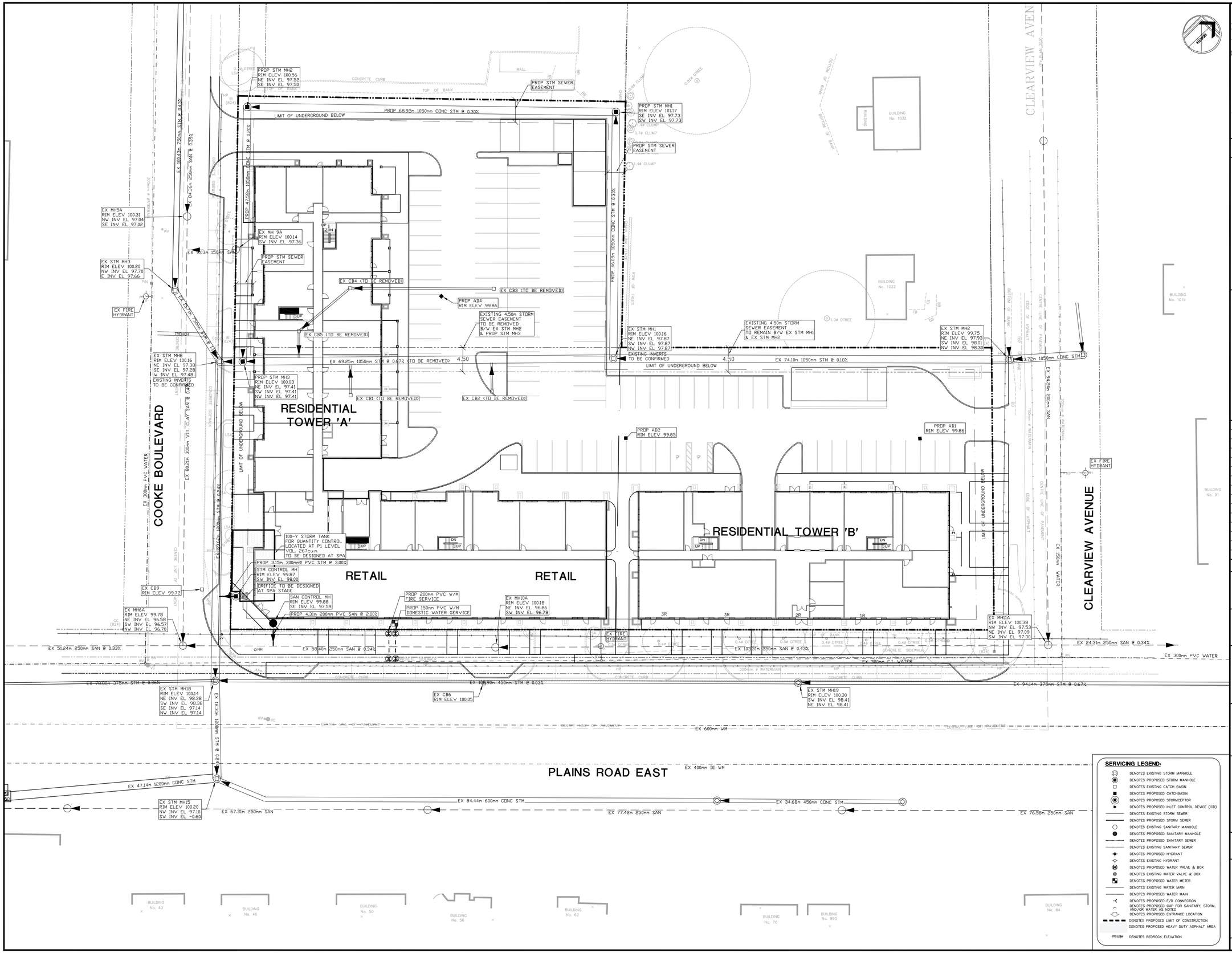
                PEAK   FLOW   REDUCTION [Qout/Qin](%)= 33.99
                TIME SHIFT OF PEAK FLOW         (min)= 10.00
                MAXIMUM  STORAGE   USED       (ha.m.)=   .0267

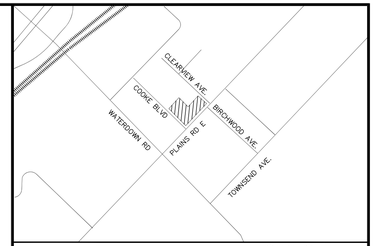
--------------------------------------------------------------------------------

 FINISH
================================================================================================================
=
```

APPENDIX C

Functional Servicing Plan
Functional Grading Plan





KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

NOTE :

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES 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 THE WORK THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY DISCREPANCY TO THE ARCHITECTS/ENGINEERS BEFORE PROCEEDING WITH THE WORKS.

ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK.

THIS DRAWING IS NOT TO BE SCALED. CONTRACTOR TO USE DIGITAL FILES FOR LAYOUT PROVIDED BY ENGINEER.

THIS PLAN MUST NOT BE USED TO SITE THE PROPOSED BUILDINGS.

THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S CONTRACTOR FROM OBTAINING, BUT NOT LIMITED TO THE FOLLOWING PERMITS: ROAD CUT, SEWER PERMITS, RELOCATION OF SERVICES, ENCROACHMENT AGREEMENTS, APPROACH APPROVAL PERMITS, ETC...

EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY A.T. MCLAREN LTD. IN THEIR BOUNDARY AND TOPOGRAPHIC SURVEY OF NOVEMBER 1, 2017.

BENCH MARK:

MONUMENT 3488
MAPLEHURST SCHOOL, 481 PLAINS ROAD EAST (HIGHWAY NO. 2) 1.92 KM NORTHEAST OF WATERDOWN ROAD; TABLET IN THE FRONT OF SOUTHEAST CONCRETE FOUNDATION WALL, 1.5M SOUTHWEST OF THE MOST EASTERLY OF TWO ENTRANCES, 0.1M BELOW RED BRICK SIDING, NO. 3488.
ELEVATION: 98.754 metres

BEARING NOTE:

OBSERVED REFERENCE POINTS (ORP's): UTM ZONE 17, NAD83 (CSRS) (2010.0). COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10		
POINT ID	NORTHING	EASTING
ORP ⓐ	4795663.981	593592.002
ORP ⓑ	4795752.966	593249.373

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
1.	ISSUED FOR REZONING	DEC. 13/17	DB

SCALE : 0 10 20 30

DRAWING :

FUNCTIONAL SERVICING PLAN

CLIENT :

BROOKLYN CONTRACTING INC.

PROJECT :

PROPOSED MIXED-USE DEVELOPMENT
53-71 PLAINS ROAD EAST
BURLINGTON, ONTARIO

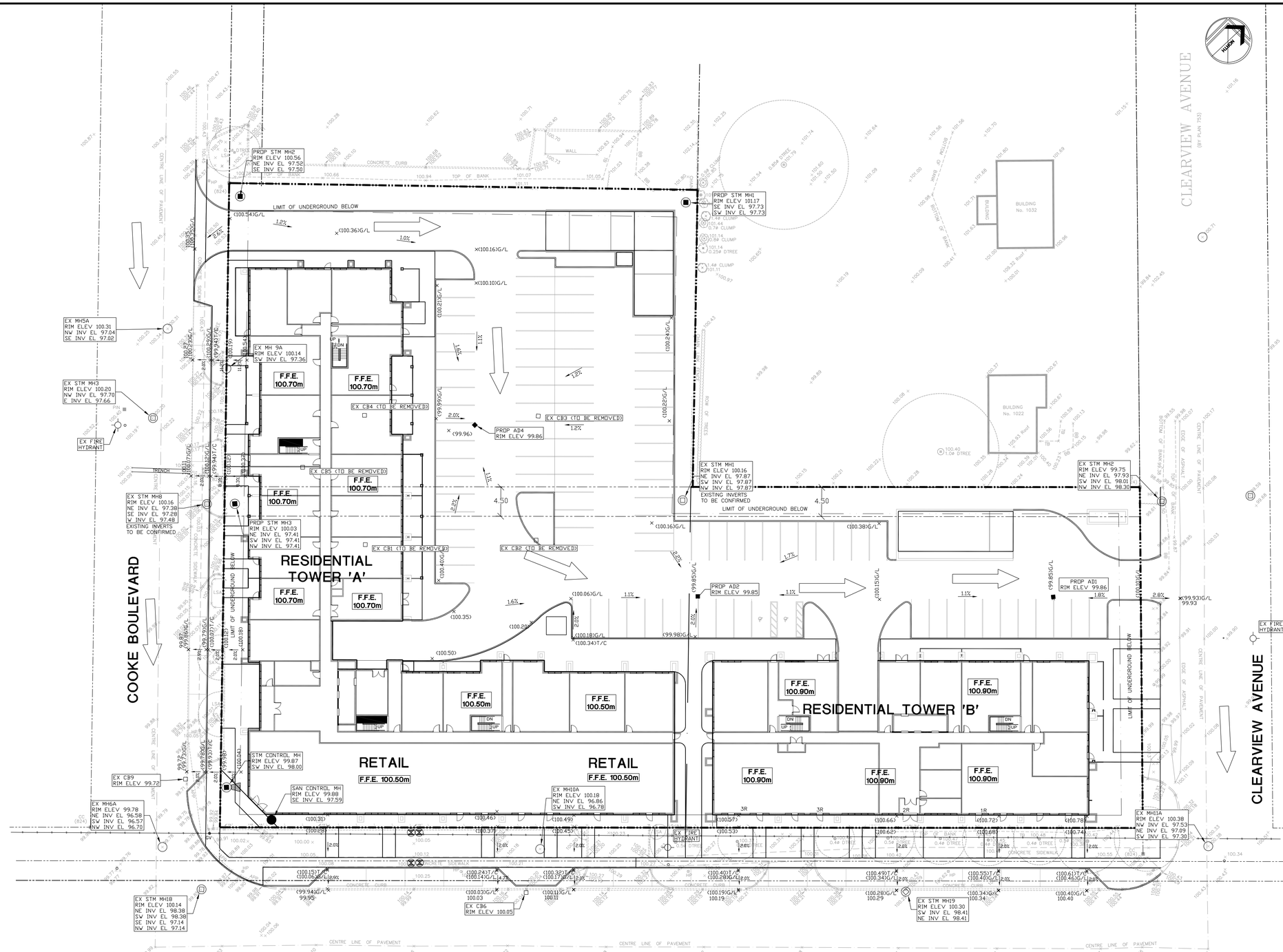
SERVICING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES PROPOSED INLET CONTROL DEVICE (ICD)
- DENOTES EXISTING STORM SEWER
- DENOTES PROPOSED STORM SEWER
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED SANITARY SEWER
- DENOTES EXISTING SANITARY SEWER
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES EXISTING WATER VALVE & BOX
- DENOTES PROPOSED WATER METER
- DENOTES EXISTING WATER MAIN
- DENOTES PROPOSED WATER MAIN
- DENOTES PROPOSED F/D CONNECTION
- DENOTES PROPOSED CAP FOR SANITARY, STORM, AND/OR WATER AS NOTED
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES PROPOSED LIMIT OF CONSTRUCTION
- DENOTES PROPOSED HEAVY DUTY ASPHALT AREA
- 279.123R DENOTES BEDROCK ELEVATION

ODAN·DETECH
CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

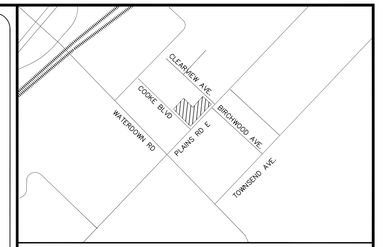
SCALE :	PROJ. NO.:	DATE STARTED:	DESIGN BY:
1:300	17249	DEC 2017	D.B.
			DRAWN BY: D.B.
17249-1A.dwg			CHECKED BY: P.H.
			APPROVED BY: D.C.S.
			DRWG. NO.: 1 OF 2

LICENSED PROFESSIONAL ENGINEER
DEC 13/17
D. T. BANCROFT
100200672
PROVINCE OF ONTARIO
ENGINEER



GRADING LEGEND:

- DENOTES EXISTING STORM MANHOLE
- DENOTES PROPOSED STORM MANHOLE
- DENOTES EXISTING CATCH BASIN
- DENOTES PROPOSED CATCHBASIN
- DENOTES PROPOSED STORMCEPTOR
- DENOTES EXISTING SANITARY MANHOLE
- DENOTES PROPOSED SANITARY MANHOLE
- DENOTES PROPOSED HYDRANT
- DENOTES EXISTING HYDRANT
- DENOTES PROPOSED WATER VALVE & BOX
- DENOTES EXISTING WATER VALVE & BOX
- DENOTES PROPOSED WATER METER
- DENOTES PROPOSED SIAMESE CONNECTION
- DENOTES EXISTING SPOT ELEVATION
- DENOTES PROPOSED ELEVATION
- DENOTES PROPOSED TOP OF CURB ELEVATION
- DENOTES PROPOSED GUTTER LINE ELEVATION
- DENOTES PROPOSED HIGH POINT
- DENOTES PROPOSED SWALE INVERT ELEVATION
- DENOTES PROPOSED ELEVATION BY OTHERS
- DENOTES PROPOSED FLOW ARROW AND SLOPE
- DENOTES PROPOSED FLOW ARROW
- DENOTES EMERGENCY OVERLAND FLOW
- DENOTES PROPOSED SLOPE (3:1 OR HIGHER)
- DENOTES EXISTING CONTOUR
- DENOTES PROPOSED SILT FENCE
- DENOTES PROPOSED ENTRANCE LOCATION
- DENOTES EXTENT OF MAX. PONDING (0.30m) 100 YEAR STORM.
- DENOTES PROPOSED LIMIT OF CONSTRUCTION



KEY PLAN
Scale : N.T.S.

SUBJECT LANDS

NOTE :

THE POSITION OF POLE LINES, CONDUITS, WATERMAINS, SEWERS AND UNDERGROUND AND ABOVE GROUND UTILITIES 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 THE WORK THE CONTRACTOR SHALL INFORM HIMSELF OF THE EXACT LOCATION OF ALL UTILITIES AND STRUCTURES, AND SHALL ASSUME ALL LIABILITY FOR DAMAGE TO THEM.

THE CONTRACTOR MUST CHECK AND VERIFY ALL DIMENSIONS ON THE JOB AND REPORT ANY DISCREPANCY TO THE ARCHITECTS/ENGINEERS BEFORE PROCEEDING WITH THE WORKS.

ALL DRAWINGS AND SPECIFICATIONS ARE INSTRUMENTS OF SERVICE AND THE PROPERTY OF THE ENGINEER WHICH MUST BE RETURNED AT THE COMPLETION OF WORK.

THIS DRAWING IS NOT TO BE SCALED. CONTRACTOR TO USE DIGITAL FILES FOR LAYOUT PROVIDED BY ENGINEER.

THIS PLAN MUST NOT BE USED TO SITE THE PROPOSED BUILDINGS.

THE APPROVAL OF THIS PLAN DOES NOT EXEMPT THE OWNER'S CONTRACTOR FROM OBTAINING, BUT NOT LIMITED TO THE FOLLOWING PERMITS: ROAD CUT, SEWER PERMITS, RELOCATION OF SERVICES, ENCROACHMENT AGREEMENTS, APPROACH APPROVAL PERMITS, ETC...

EXISTING TOPOGRAPHICAL INFORMATION SUPPLIED BY A.T. MCLAREN LTD. IN THEIR BOUNDARY AND TOPOGRAPHIC SURVEY OF NOVEMBER 1, 2017.

BENCH MARK:

MONUMENT 3488
MAPLEHURST SCHOOL, 481 PLAINS ROAD EAST (HIGHWAY NO. 2) 1.92 KM NORTHEAST OF WATERDOWN ROAD; TABLET IN THE FRONT OF SOUTHEAST CONCRETE FOUNDATION WALL, 1.5M SOUTHWEST OF THE MOST EASTERLY OF TWO ENTRANCES, 0.1M BELOW RED BRICK SIDING NO. 3488.
ELEVATION: 98.754 metres

BEARING NOTE:

OBSERVED REFERENCE POINTS (ORP's), UTM ZONE 17, NAD83 (CSRS) (2010.0), COORDINATES TO URBAN ACCURACY PER SEC. 14(2) OF O.REG. 216/10		
POINT ID	NORTHING	EASTING
ORP @	4790683.881	593093.002
ORP @	4795752.966	593249.373
COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.		

METRIC NOTE:

DISTANCES AND ELEVATIONS ON THIS PLAN ARE TYPICALLY SHOWN IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

NO.	REVISIONS	DATE	BY
1.	ISSUED FOR REZONING	DEC. 13/17	DB

SCALE : 0 10 20 30

DRAWING :

FUNCTIONAL GRADING PLAN

CLIENT :

BROOKLYN CONTRACTING INC.

PROJECT :

PROPOSED MIXED-USE DEVELOPMENT
53-71 PLAINS ROAD EAST
BURLINGTON, ONTARIO

ODAN·DETECH CONSULTING ENGINEERS
The Odan/Detech Group Inc. P: (905) 632-3811 F: (905) 632-3363
5230 SOUTH SERVICE ROAD, BURLINGTON, ONTARIO, L7L 5K2

SCALE :	PROJ. NO.:	DATE STARTED:	DESIGN BY:
1:300	17249	DEC 2017	D.B.
			DRAWN BY: D.B.
17249-2A.dwg			CHECKED BY: P.H.
			APPROVED BY: D.C.S.
			DRWG. NO.: 2 OF 2

LICENSED PROFESSIONAL ENGINEER — DEC 13/17 — D. T. BANCROFT — 100200672 — PROVINCE OF ONTARIO
ENGINEER