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PROPOSED RESIDENTIAL DEVELOPMENT
5219 UPPER MIDDLE ROAD
CITY OF BURLINGTON, ONTARIO

FUNCTIONAL SERVICING AND STORM WATER MANAGEMENT REPORT

Prepared For:

BLOOMFIELD DEVELOPMENT INC.

Original: March 15th, 2017

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Note: This report should be read in conjunction with the Functional Servicing & Grading Plans prepared by The Odan/Detech Group Inc.

APPENDIX A
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Site Plan prepared by Weston Consulting

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Block 223 Woodlot and External Drainage Area Detailed Drainage Analysis by Marshall Macklin Monaghan Ltd. (October 2002)

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1. BACKGROUND

The property under study is a 0.5053 Ha (1.25 acre) parcel of land on the north side of Upper Middle Road in Burlington, Ontario. It is proposed to develop the parcel as a residential development comprising eight freehold residential semi-detached lots and 14 condominium townhouses. The eight semi-detached lots will front to an extension of the Georgina Court public Right of Way which terminates in a proposed cul-de-sac. A private laneway serving the proposed Condominium Townhouses extends westerly from the proposed cul-de-sac. The development is bordered by Upper Middle Road to the south, an existing stormwater management pond to the west, and existing detached houses to the north and east. Refer to the Development Concept plan by Weston Consulting in Appendix A for the proposed layout including building location and curbing etc.

The subject lands fall within the catchment area of the adjacent stormwater management pond to the west. The lands were otherwise originally anticipated to be serviced in the sanitary and water servicing of the adjacent subdivision.

This report will evaluate the serviceability of the site with respect to sanitary, water and storm services. The report evaluates the anticipated sanitary flows from the site as well as domestic water demand. Further, the report outlines the manner in which the subject development complies with the design criteria for the existing subdivision.

2. SCOPE OF WORK

The Odan/Detech Group Inc. was retained by the Owner, Bloomfield Developments Inc., to review the site and provide a Functional Servicing & Stormwater Management Report for the subject Development in support of a Rezoning application.

3. DESIGN CONSIDERATIONS

A. SANITARY WASTE WATER DISPOSAL

i) Existing Conditions

There is an existing 200mm sanitary sewer which commences at an existing maintenance hole at the southerly limit of Georgina Court. The sewer drains northerly beneath Georgina Court and ultimately drains into a municipal sanitary sewer flowing easterly beneath Upper Middle Road at Quinte Street.

The subject property in-part appears in City of Burlington Drawing No. B-9873, External Sanitary Drainage Plan, as an external tributary sanitary drainage area. This catchment plan allows a population of 25 for the subject property.

The subject property in-part appears in Region of Halton Drawing No. 10-08006-SA1 or B-11922, Georgina Court Sanitary Drainage Plan. This catchment plan similarly allows a population of 25.

ii) Proposed Drainage

The subject development will drain sanitary flows in-part via a proposed 200mm municipal sanitary sewer which is an extension of the existing 200mm municipal sanitary sewer beneath Georgina Court. Upstream of this proposed municipal sewer, a proposed private sanitary sewer internal of the townhouses will provide sanitary drainage to the proposed townhouse condominium. Refer to the Functional Servicing Plan for the proposed sanitary sewer layout. Refer to the proposed sewer design sheet on the following pages for the proposed sewer design rationale.

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
- Semi-detached/duplex/4-plex Unit population, P = 100 P/Ha
- Townhouse Unit population, P = 135 P/Ha

The subject development, comprising semi-detached houses and townhouses, produces the following sanitary flow based on municipal criteria. Detailed calculations are provided on the following page. The development area statistics are provided in Appendix A.

Table 1 – Calculated Sanitary Sewage Flows for Proposed Development by Municipal Criteria

	From Land Use (L/s)	*From Infiltration (L/s)*	*Total (L/s)*
Proposed Semi-Detached Houses – Population 15	0.21	0.14	0.75
Proposed Condominium Townhouses – Population 29	0.40		

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) = 0.5024

TOTAL SITE AREA (ha) = 0.5024

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		0.15		15	3622	0.05	4.40	0.21
RESIDENTIAL Townhouses, using 135 persons/site area		0.21		29	6879	0.09	4.36	0.40
RESIDENTIAL Density 3, using 2.7 persons/unit				0	0	0.00	4.50	0.00
COMMERCIAL, Using 90 persons/ha				0	0	0.00	4.50	0.00
COMMERCIAL, Using 0.60 L/sec per ha				0	0	0.00	2.50	0.00

TOTAL V1= 10500 Q1= 0.61

Q2= 0.00

Q = (MqP/86400) + A * I (L/sec) Qinfil 0.14

Qtot 0.75

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 = 2.5 (for Commercial)

The development sanitary flow rate is additionally summarized as follows, based on the following OBC flow calculation. The townhouses were assumed to be 3-bedroom dwellings, and the semi-detached houses 4-bedroom, for this calculation.

Table 2 – Calculated Sanitary Sewage Flows for Proposed Development by OBC

	From Land Use (L/s)	*From Infiltration (L/s)*	*Total (L/s)*
Proposed Semi-Detached Houses	0.19	0.14	0.59
Proposed Condominium Townhouses	0.26		

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PROJECT: ***Proposed Residential Development***
5219 Upper Middle Road

CLIENT: Bloomfield Developments
DATE: 15-Mar-17
PROJECT No.: 17213
DRAWING REF.: SET A

	A	B	C	D	E	F	G	H	I	J
	Area (sq.m.)	**Units**	**Establishment Type (OBC 8.2.1.3.A.)**	**Based on Floor Area**	**Volume (litres)**	**Total Volume (litres) (B x E)**	**Volume (litres)**	**Establishment Type (OBC 8.2.1.3.B.)**	**Based on Employees/Service Chairs/Patrons (ea.)**	**Volume (litres) (G x I)**
Proposed Development										
Freehold Semi-Detached Houses		8	4 Bedroom House	per 4 BR House	2000	*16000*				*0*
Condominium Townhouses		14	3 Bedroom House	per 3 BR House	1600	*22400*				
Total Floor Area	***0***	***22***	***Total Based on Unit Count***			38400	***Total Based on Person/Hours/Service Chairs***			0
Total Volume (Average per day)										***38400***
Total (l/sec)										***0.44***

SANITARY SEWER DESIGN SHEET (PROPOSED SANITARY SEWERS)

Site location: Proposed Development - 5219 Upper Middle Road, Burlington

Ref# PN 17213

ODAN·DETECH CONSULTING ENGINEERS

Location				Proposed Residential				Inflow/ Infiltration	Residential P/F	Peak Residential Sanitary Flow	Unit Inflow/ Infiltration	Segment Inflow/ Infiltration	Accumulative Inflow/ Infiltration	Accumulative Sanitary Flow	Pipe						
Segment SAN Trib ID	Street Name	US Node	DS Node	Townhouse (Ha)	Semi-Detached (Ha)	Segment Population (Cap)	Acc've Pop'n (Cap)	Area (ha)	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
1 (Townhouse Condo)	Private Lane	SAN MH 1	SAN MH 2	0.21		28.66	28.66	0.29	4.36	0.40	0.280	0.08	0.08	0.48	37.63	200	1.00	circle	32.80	1.04	1.46%
2 (Freehold Semi-Detached)	Georgina Court	SAN MH 2	SAN MH 3			-	28.66	-	4.36	0.40	0.280	-	0.08	0.48	18.26	200	1.00	circle	32.80	1.04	1.46%
2 (Freehold Semi-Detached)	Georgina Court	SAN MH 3	EX SAN MH 1		0.15	15.09	43.75	0.22	4.33	0.60	0.280	0.06	0.14	0.74	10.57	200	1.00	circle	32.80	1.04	2.27%

Flow Calculation Criteria
(Unit Flow from 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
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

(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

B. WATER DISTRIBUTION

i) Domestic Water

The subject development will be served for domestic water service from the existing 200mm PVC watermain beneath Georgina Court. This existing municipal watermain will be extended southerly into the subject proposed development to provide domestic service to the proposed freehold semi-detached houses. A private water service will be extended beneath the private laneway.

The domestic water demand for the freehold semi-detached houses and townhouse condominium are 0.21 L/s and 0.40 L/s respectively, as per Table 1, for a total of 0.61 L/s.

ii) Fire Service

The subject development will be served for fire service from the existing 200mm PVC watermain beneath Georgina Court. This existing municipal watermain will be extended southerly into the subject proposed development to provide fire service to the proposed freehold semi-detached houses. A private water service will be extended beneath the private laneway.

There is an existing hydrant near the mid-point of Georgina Court which is within 90m of all proposed townhouses and semi-detached houses.

The pressures and volumes must be sufficient for Peak hour conditions and under fire conditions as established by the Ministry of Environment and the Fire Underwriters Survey booklet (1999). The minimal residual pressure under fire conditions is 140 kPa (20.3 psi).

The allowable pressures are as follows:

Condition	**Allowable Pressures (kpa)**	
	min.	**max.**
1) Min. Hour	275	700
2) Peak Hour	275	700
3) Peak Day + Fire Flow	140	700

The water demand for redeveloped Building is calculated as follows:

a) Average Day domestic demand - 0.61 L/s

b) Peak day demand - 2.25 x average daily demand 1.37 L/s

c) Fire flow as per FUS 1999 manual 217.0 L/s

Table 3 – Fire Flow Demand for Proposed Development		
	L/s	USGM
Peak Day Demand	1.37	22
Fire Flow (per FUS) Demand	217	3434
Total Development Water Demand	218	3456

In the following FUS calculations, the following assumptions were made:

a) The proposed townhouses and semi-detached houses will not be sprinklered
b) The buildings will be of combustible construction (wood frame)
c) The building's contents will be of non-combustible nature
d) Each townhouse or semi detached house unit will have floor area of 1700ft^2 or 158m^2
e) The foregoing Fire Flow demand is based on the largest of the townhouse blocks being considered as a single building for fire protection. The largest townhouse block has 6 units, for a total floor area of 948m^2 (158m^2 x 6 units). This produces a fire flow demand of 217 L/s, which is taken as the fire flow demand, above.

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

$F = 220 \times C \times \sqrt{A}$
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: Burlington - 5219 Upper Middle Road
PROJECT: Proposed Residential Development
OBC OCCUPANCY: Residential
PROJECT No: 17213
BUILDING FOOT PRINT (m2): 948
OF STOREYS: TBD

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

CONSTRUCTION CLASS: Wood Frame

AUTOMATED SPRINKLER PROTECTION		Credit	Total
NFPA 13 sprinkler standard	no	0%	
Standard Water Supply	no	0%	0%
Fully Supervised System	no	0%	
		0%	

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

EXPOSURE 1 (south) Prop TH Block	Distance to Exposure Building (m) / Length - Height	17	15%
EXPOSURE 2 (east) Prop Semi House	Distance to Exposure Building (m) / Length - Height	24	10%
EXPOSURE 3 (west) NA	Distance to Exposure Building (m) / Length - Height	>45	0%
EXPOSURE 4 (north) Existing DT House	Distance to Exposure Building (m) / Length - Height	7	20%
		Total:	45%

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: Yes

FIRE RESISTANT BUILDING Are vertical openings and exterior vertical communications protected with a minimum one (1) hr rating? No

CALCULATIONS

C =	1.5		Wood Frame
A =	948	m2	(2 largest floor + 50% of 8 above floors)
F =	10161	L/min	
Round to Nearest 1000 L/min F =	11000	L/min	must be > 2000 L/min

STOREY AREAS m2	
948	6 TH GROUP

CORRECTION FACTORS:

OCCUPANCY	-2200	L/min
FIRE FLOW ADJUSTED FOR OCCUPANCY	8800	L/min
REDUCTION FOR SPRINKLER	0	L/min
EXPOSURE CHARGE	3960	L/min

REQUIRED FIRE FLOW F = 12760 L/min

Round to Nearest 1000 L/min

F =	13000	L/min	3434	usgm
F =	217	L/sec		

C. STORM WATER MANAGEMENT

i) Existing Conditions & Design Criteria

The subject development falls within the catchment area of the existing stormwater management pond to the west. In pre-development conditions, runoff from the subject site drains as follows:

- Southeast area: drains uncontrolled via overland flow southerly to Upper Middle Road; runoff from Upper Middle Road drains thereafter into the adjacent stormwater management pond to the west
- Southwest area: drains uncontrolled via overland flow into the adjacent stormwater management pond and to Upper Middle Road, and subsequently the adjacent pond
- North area (including Georgina Court and houses fronting Georgina Court): drains via existing swale to existing CB adjacent to southwest corner of site; drains into pond thereafter

The pre-development drainage patterns are illustrated in the excerpt from the subdivision storm drainage plan (Municipal Drawing No. MDR-254) which is provided on the following page. The extents of the subject site are outlined therein; note that external areas such as 6 and 7 Georgina Court drain through the subject site pre-development.

The pre-development drainage patterns are also illustrated on the original Pre-Development Drainage Plan by The Odan/Detech Group on the following page.

The subdivision storm drainage plan on the following page shows that stormwater management capacity was allocated to the subject property based on a runoff coefficient of 0.45. The report shows, as follows, how storm drainage and stormwater management will be designed in compliance with the existing subdivision design.

Design storm data for the City of Burlington 2-year, 5-year and 100-year storms are shown below.

$$I_2 = 592.60 / (6 + t)^{0.780}$$
$$I_5 = 697.40 / (5 + t)^{0.764}$$
$$I_{100} = 1114.20 / (5 + t)^{0.761}$$

When time of concentration, *t*, is 10 minutes, the 2-year, 5-year and 100-year rainfall intensities are as follows.

$$I_2 = 68.2 \text{ mm/hr}$$
$$I_5 = 88.1 \text{ mm/hr}$$
$$I_{100} = 141.9 \text{ mm/hr}$$

In the following stormwater calculations, it is assumed that the existing pond provides stormwater quality control (by settling in the forebay) and quantity control, for up to the 100-year storm based on the characteristics outlined on the subdivision storm drainage plan.

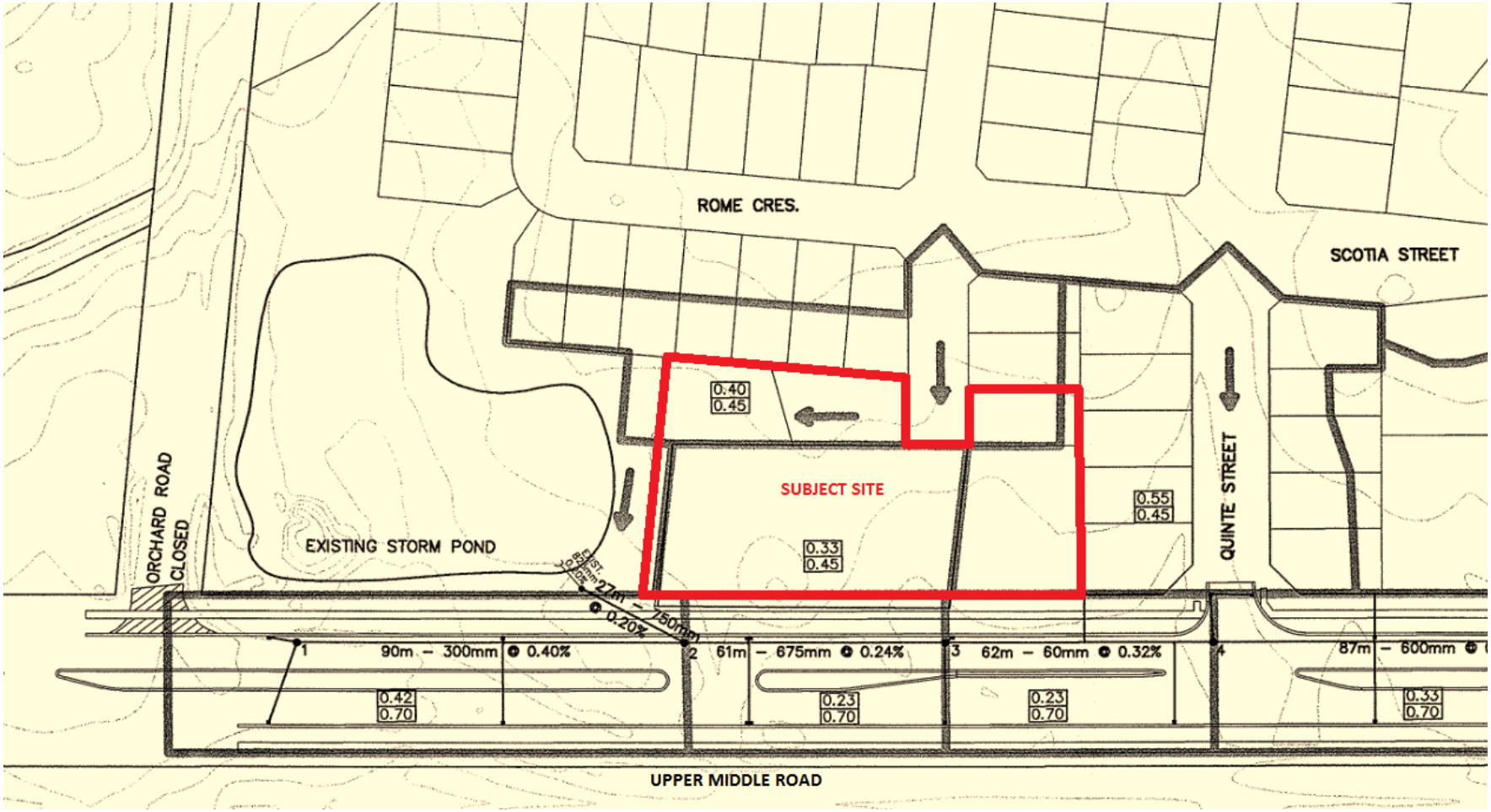
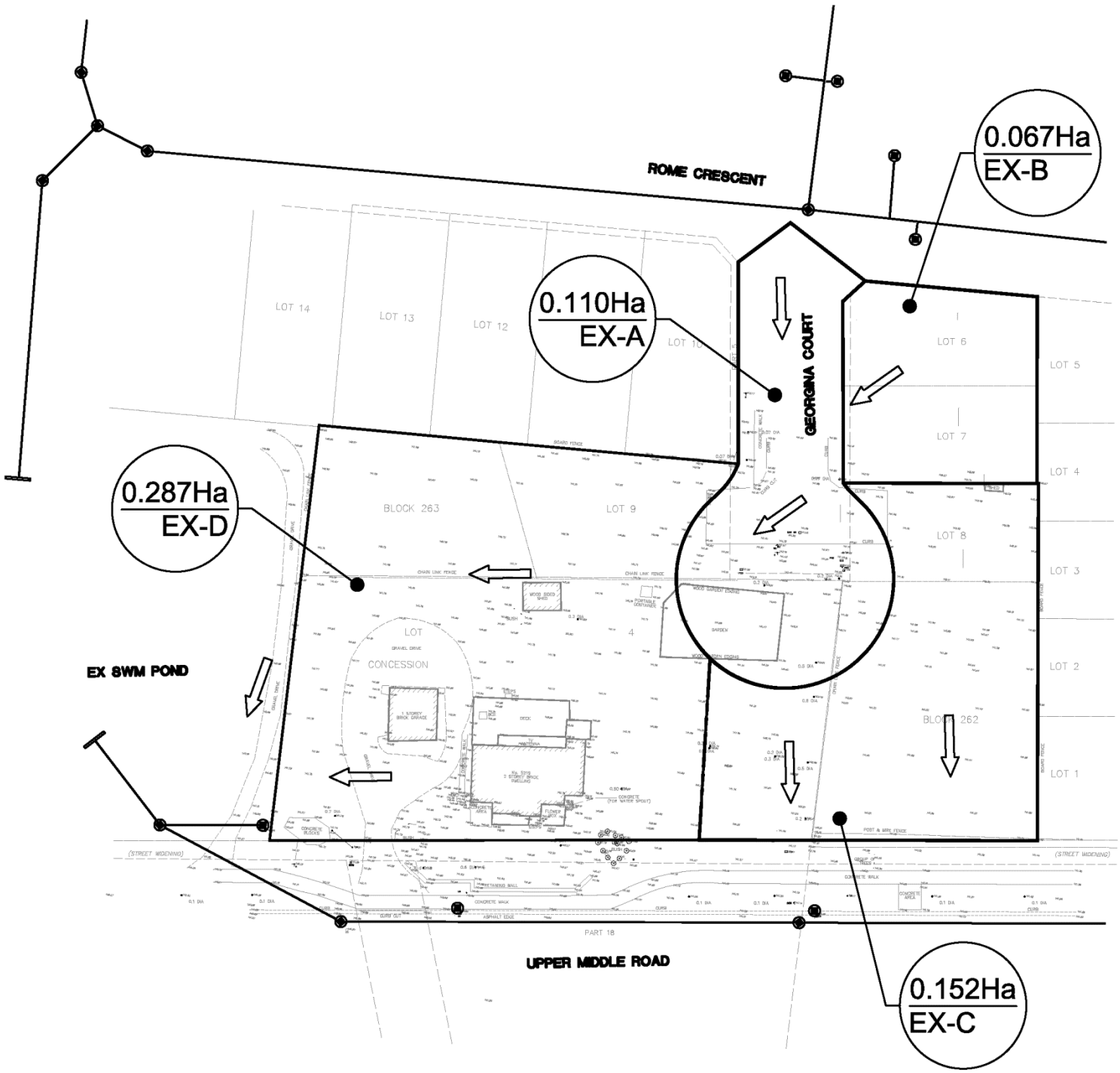


Figure 1 - Subdivision Storm Catchment Plan - Excerpt from drawing Municipal Drawing MDR-254 showing extents of subject site therein



LEGEND

0.412Ha / A — CATCHMENT ID & AREA

DRAWING : PRE-DEVELOPMENT DRAINAGE PLAN

DATE:	PROJ. NO.:	SCALE:
MARCH 2017	17213	1: 750

PROJECT : PROPOSED RESIDENTIAL DEVELOPMENT
6219 UPPER MIDDLE ROAD
BURLINGTON, ON

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ii) Storm Sewer Design

Storm drainage from the subject development will in-part follow the existing drainage patterns and in-part drain via the existing storm sewer draining westerly beneath Rome Crescent to the north.

In pre-development conditions, both the subject site (Catchment Area's EX-C and EX-D in the Pre-Development Drainage Plan) and Georgina Court (Catchment Area's EX-A and EX-B) drained via overland flow and EX CB 6 to the pond to the west. This is quantified in Table 3, as follows, based on the C-Value identified in the subdivision Drainage Plan.

Table 4 –Pre-Development Runoff Rate

					Q = 2.78CiA (l/s)
Existing Catchment	ID	Ex. Area (ha)	Pre-Dev't C-Value	5-Year Intensity (10-minute t_c)	5-Year
Subject Site	EX-C; EX-D	0.44	0.45	88.1 mm/hr	48.5 L/s
External Tributary Catchment	EX-A; EX-B	0.18	0.45	88.1 mm/hr	19.8 L/s

The proposed development comprises a private townhouse condominium corporation in the western half of the subject site (in the area of EX-D) which previously conveyed runoff from EX-A, EX-B, EX-C and EX-D via overland flow to the pond. The development's proposed configuration does not lend itself to drainage via the pre-development drainage patterns wherein EX-A and EX-B drain via overland flow through EX-C and EX-D. This is because it is not feasible to convey drainage from the public Right-of-Way (Georgina Court), to and through the private townhouse condominium. It is therefore proposed to drain Georgina Court and the tributary lots northerly to the existing Rome Crescent 750mm storm sewer via a proposed municipal storm sewer beneath Georgina Court. Refer to the Functional Servicing Plan for the layout of the receiving existing municipal storm sewer beneath Rome Crescent.

The existing 750mm storm sewer beneath Rome Crescent presently conveys runoff from the subdivision to the north via four pipe segments into the existing storm pond to the west. The subject proposed Georgina Court municipal storm sewer will drain into EX MH 126 at the intersection of Georgina Court and Rome Crescent. The sewer then drains via EX MH 126, 127, 133 and 162 to the pond inlet. The design criteria and storm sewer design sheets for this storm sewer system are provided in the *Block 223 Woodlot and External Drainage Area Detailed Drainage Analysis* (Marshall Macklin Monaghan Ltd., October 2002), provided here in Appendix B. Refer to the Storm Sewer Design sheets therein which show that the existing sewers are flowing at no more than 63% in any downstream segment in a 5-year storm.

Note that the storm sewer design sheet pipe specifications (slopes) in the appended report do not always correspond with the as-built drawings. The as-built plan profile drawings have been assumed to be correct in such cases in the following storm sewer design sheets.

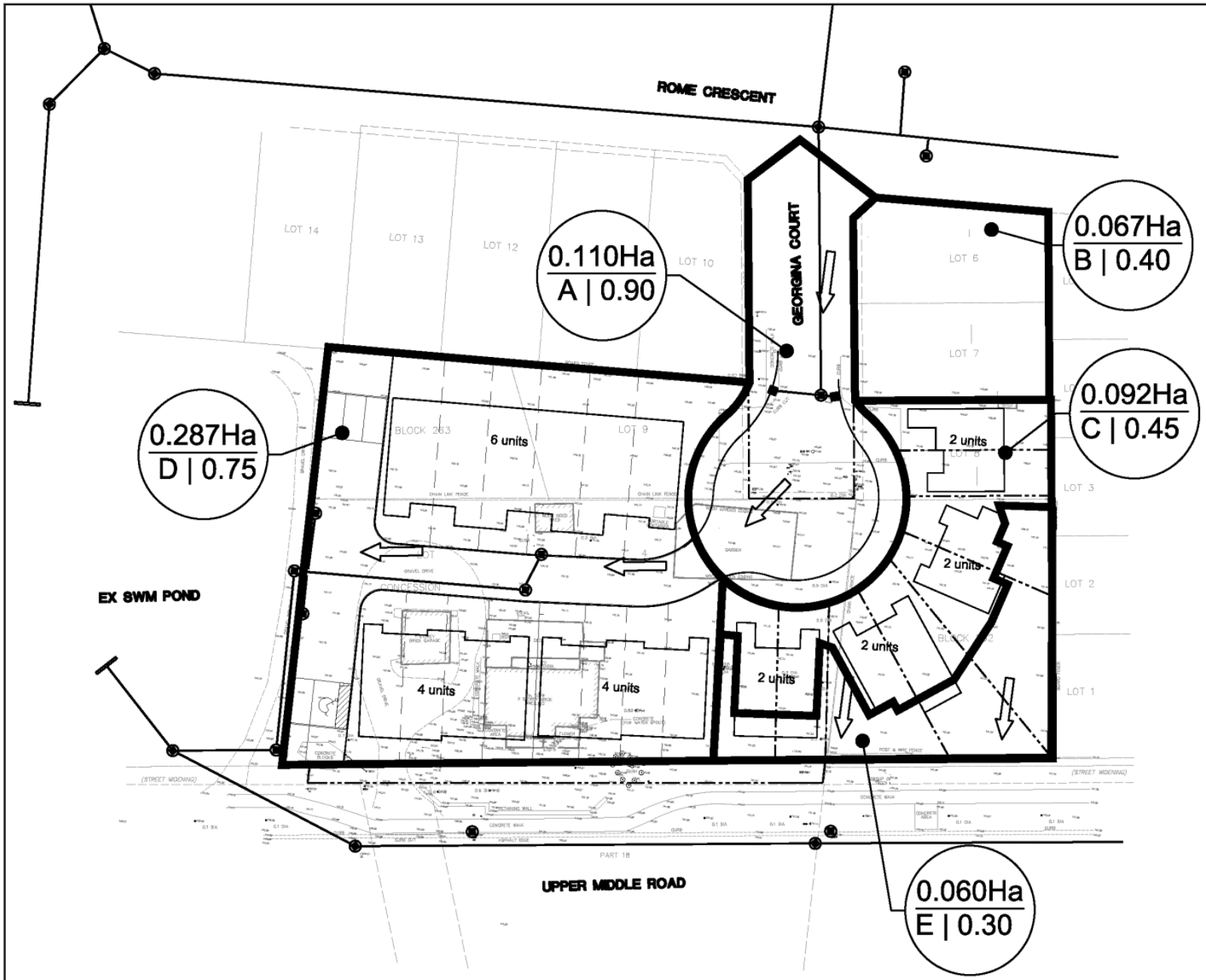
The existing storm sewer design sheets are recreated on the following pages, in pre-development and post-development conditions, to show that the existing Rome Crescent storm sewers have capacity to convey the additional flow from Georgina Court (Catchment Area's 'A', 'B' and 'C') in a 5-year storm. Post-development, no existing receiving storm sewers are flowing at more than 65 % of their capacity, as shown on the following pages.

The private townhouse condominium will drain as per existing drainage conditions via a proposed sewer connection to the existing headwall via EX CB 6. Refer to the Functional Servicing Plan. Because the existing drainage condition and subdivision storm catchment plans reflect this drainage pattern, it is assumed that the existing conveyances serving the townhouse condominium have capacity for the development. A storm sewer design sheet is provided on the following pages to show that the proposed private storm sewers have adequate capacity for the subject development.

A portion of the back yards of the proposed semi-detached houses fronting the Georgina Court roundabout (Catchment 'E') will drain to Upper Middle Road via overland flow. It is not feasible to collect runoff from these areas in rear lot catchbasins or other such conveyances because the site falls southerly and there is not adequate cover to extend the proposed Georgina Court storm sewer southerly. It is anticipated that the Upper Middle Road storm sewers, which ultimately drain to the adjacent storm pond, have capacity for this flow as it is representitive of the existing condition.

Refer to the Post-Development Drainage Plan on the following page for the proposed drainage patterns. The major overland flow route for the Georgina Court Right of Way will be through the townhouse condominium property.

It is anticipated that the receiving storm pond to the west will provide stormwater quantity and quality control for the subject development given that it falls within the subdivision storm catchment plans and that it appears to include a settling forebay and orifice for quantity control. The following design sheets are therefore provided to demonstrate the manner in which stormwater conveyances will be provided to the pond.



LEGEND

0.412Ha
A|0.65
CATCHMENT ID, C–VALUE & AREA

DRAWING :
POST-DEVELOPMENT DRAINAGE PLAN

DATE:	PROJ. NO.:	SCALE:
MARCH 2017	17213	1: 750

PROJECT :
PROPOSED RESIDENTIAL DEVELOPMENT
5219 UPPER MIDDLE ROAD
BURLINGTON, ON

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PRE-DEVELOPMENT STORM SEWER DESIGN SHEET - EXISTING ROME CRESCENT STORM SEWERS

Site location: 5219 Upper Middle Road

Ref# PN 17213

Location				Segment Tributary Area	Accumulative Tributary Area	Time of Concentration	5-year Rainfall Intensity	Segment Catchment Area C-Value	Segment A x C	Accumulative A x C	Accumulative 5-Year Storm Flow	Pipe						
Segment Storm Trib ID	Street Name	US Node	DS Node	(Ha)	(Ha)	(minutes)	(mm/hr)		(Ha)	(Ha)	(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
External	Rome Crescent	EX MH 126	EX MH 127	0.150	10.040	55.970	30	0.45	0.07	4.19	351	91.60	750	0.25	circle	556.64	1.26	63.14%
External	Rome Crescent	EX MH 127	EX MH 133	0.650	10.590	57.182	30	0.45	0.29	4.48	370	8.60	750	0.61	circle	869.50	1.97	42.58%
External	Rome Crescent	EX MH 133	EX MH 162	0.000	11.240	57.254	30	0.45	0.00	4.73	391	11.00	825	1.00	circle	1,435.44	2.69	27.21%
External	EX SWM Pond	EX MH 162	Pond Headwall	0.000	27.590	57.323	30	0.45	0.00	14.34	1183	36.50	1200	0.40	circle	2,465.77	2.18	47.97%

Flow Calculation Criteria

Q=2.78CiA

5-Year Storm IDF data:

Intensity (5-year) = 697.40 / (5 + t) $^{0.764}$

n = 0.013

POST-DEVELOPMENT STORM SEWER DESIGN SHEET - EXISTING ROME CRESCENT STORM SEWERS & PROPOSED GEORGINA COURT STORM SEWER

Site location: 5219 Upper Middle Road

Ref# PN 17213

Location				Segment Tributary Area	Accumulative Tributary Area	Time of Concentration	5-year Rainfall Intensity	Segment Catchment Area C-Value	Segment A x C	Accumulative A x C	Accumulative 5-Year Storm Flow	Pipe						
Segment Storm Trib ID	Street Name	US Node	DS Node	(Ha)	(Ha)	(minutes)	(mm/hr)		(Ha)	(Ha)	(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
A, B & C	Georgina Court	STM MH 1	EX MH 126	0.269	0.269	10	88	0.62	0.17	0.17	41	35.63	300	0.30	circle	52.97	0.75	77.12%
External	Rome Crescent	EX MH 126	EX MH 127	0.150	10.040	55.970	30	0.45	0.07	4.36	365	91.60	750	0.25	circle	556.64	1.26	65.66%
External	Rome Crescent	EX MH 127	EX MH 133	0.650	10.590	57.182	30	0.45	0.29	4.65	384	8.60	750	0.61	circle	869.50	1.97	44.16%
External	Rome Crescent	EX MH 133	EX MH 162	0.000	11.240	57.254	30	0.45	0.00	4.90	404	11.00	825	1.00	circle	1,435.44	2.69	28.16%
External	EX SWM Pond	EX MH 162	Pond Headwall	0.000	27.590	57.323	30	0.45	0.00	14.51	1197	36.50	1200	0.40	circle	2,465.77	2.18	48.53%

Flow Calculation Criteria

Q=2.78CiA

5-Year Storm IDF data:

Intensity (5-year) = 697.40 / (5 + t) $^{0.764}$

n = 0.013

Note: Composite C-value for Tributary Areas A, B & C is 0.62

POST-DEVELOPMENT STORM SEWER DESIGN SHEET - PRIVATE TOWNHOUSE LANE

Site location: 5219 Upper Middle Road

Ref# PN 17213

Location				Segment Tributary Area	Accumulative Tributary Area	Time of Concentration	5-year Rainfall Intensity	Segment Catchment Area C-Value	Segment A x C	Accumulative A x C	Accumulative 5-Year Storm Flow	Pipe						
Segment Storm Trib ID	Street Name	US Node	DS Node	(Ha)	(Ha)	(minutes)	(mm/hr)		(Ha)	(Ha)	(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
D	Private Lane	STM CBMH 2	STM MH 3	0.287	0.287	10	88	0.75	0.22	0.22	53	30.80	300	0.30	circle	52.97	0.75	99.53%
	Pond Area	STM MH 3	STM MH 4	0.000	0.287	10.685	85	0.75	0.00	0.22	51	23.92	300	0.30	circle	52.97	0.75	96.19%

Flow Calculation Criteria

Q=2.78CiA

5-Year Storm IDF data:

Intensity (5-year) = 697.40 / (5 + t) $^{0.764}$

n = 0.013

4. CONCLUSIONS

The foregoing report has demonstrated that there are existing mains available to provide sanitary, storm and water service to the subject development.

Stormwater calculations are provided to show that the receiving infrastructure has capacity to receive flows from the subject development.

Table 5 – Summary Information

Storm Drainage	
5-Y Storm Discharge to Rome Crescent STM Sewer	43 L/s
5-Y Storm Discharge from Townhouse Condo	44 L/s
Sanitary & Water Servicing	
Total Fire-Domestic Flow Required	3456 USGM
Peak Sanitary Discharge Rate	0.75 L/s

Respectfully Submitted;
The Odan Detech Group Inc.

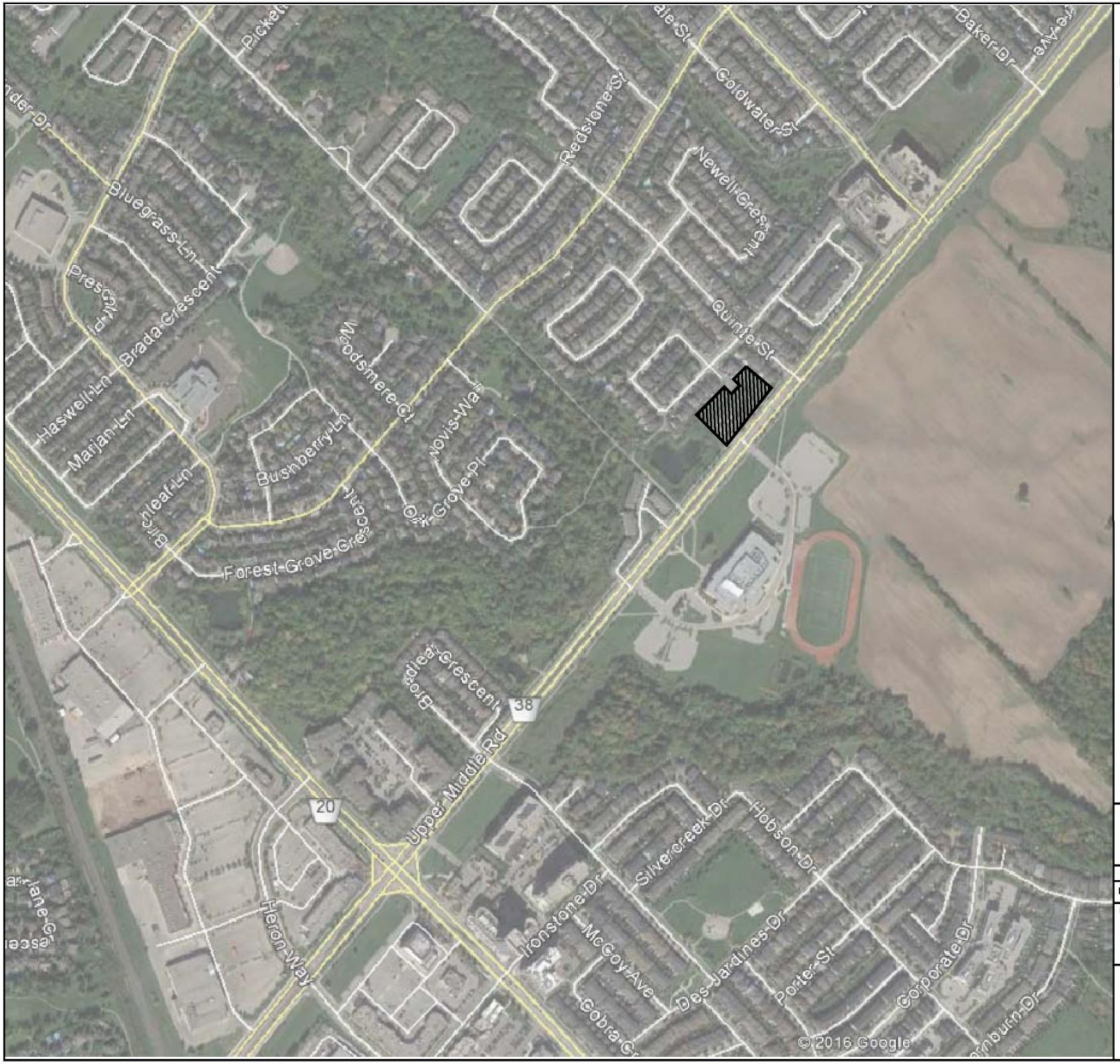


March 15th, 2017

Daniel Bancroft,EIT	John Krpan, M.S.C.E., P.Eng.	DATE

APPENDIX A

Aerial Photo of Site
Site Plan prepared by Weston Consulting



LEGEND

PROPERTY LINE

DRAWING :

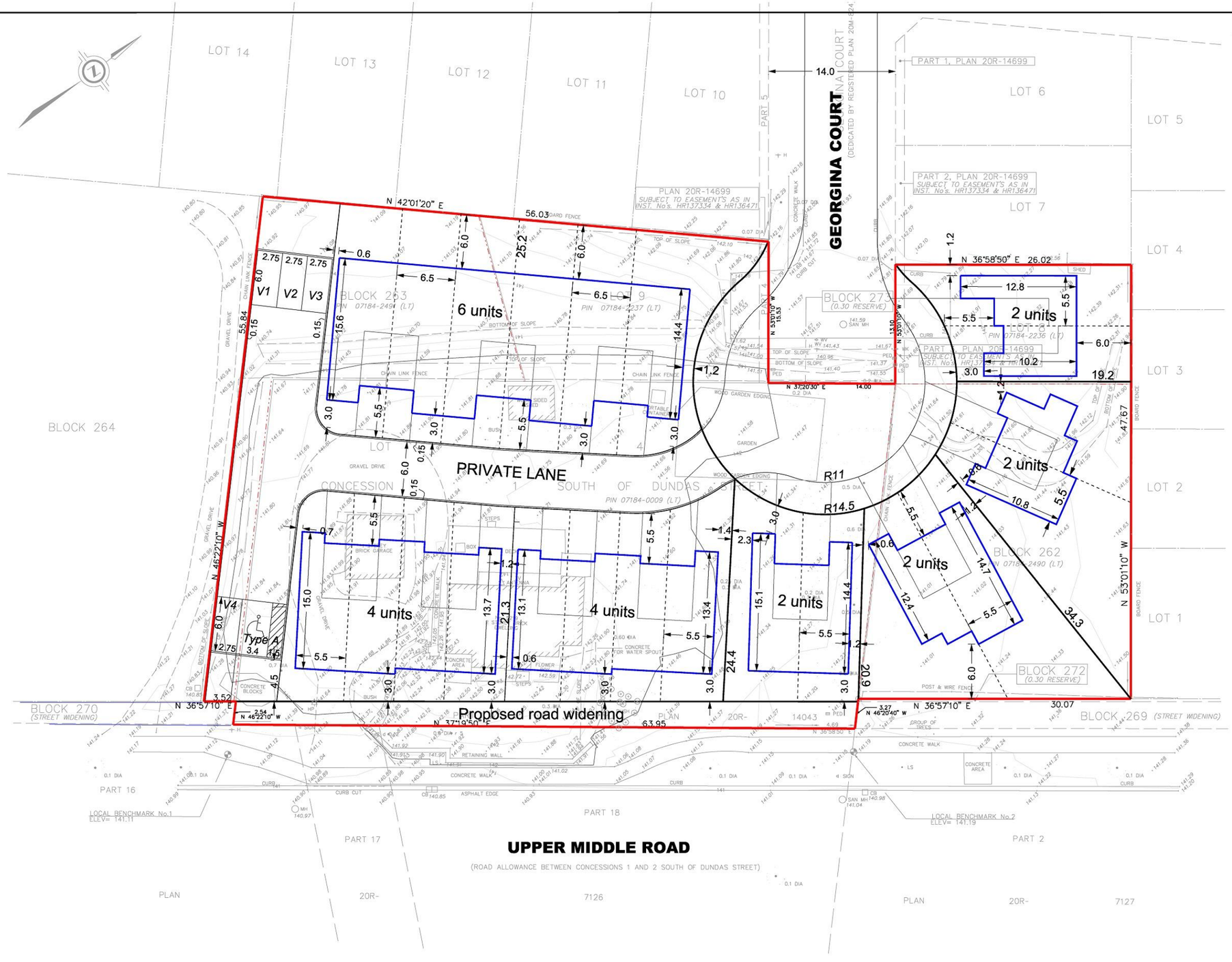
KEY PLAN

DATE:	PROJ. NO.:	SCALE:
MARCH 2017	17213	N.T.S.

PROJECT :

PROPOSED RESIDENTIAL DEVELOPMENT
6219 UPPER MIDDLE ROAD
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



DEVELOPMENT CONCEPT

NO. 5219
UPPER MIDDLE ROAD
CITY OF BURLINGTON
REGIONAL MUNICIPALITY OF HALTON

WESTON CONSULTING
planning + urban design

DRAFT
FOR DISCUSSION PURPOSES ONLY

DEVELOPMENT STATISTICS:

Gross Site Area:	0.5024 ha
Cul-de-sac right-of-way:	0.0467 ha
Road Widening:	0.0188 ha
Street Residential Blocks (Semis):	0.1509 ha
Condo Residential Blocks (Towns):	0.2111 ha
Condo laneway, parking and landscaped area:	0.0749 ha
Net Site Area (excludes cul-de-sac and road widening):	0.4369 ha
Density (based on net area):	50.35 uph
Freehold Semi-detached lots (6.7m):	8 units
Condominium Townhouses (5.5m):	14 units
Total units:	22 units
Parking Provided:	48 spaces
driveway/garage	44 spaces
visitor(excluding accessible space)	4 spaces

Notes:

- Property Boundaries based on Topo Survey prepared by J.D. Barnes, dated February 2017.
- Not based on engineering, floodplain or grading analysis.
- Building locations and setbacks are conceptual and subject to approval by the City.
- Cul-de-sac design subject to comments from City where it meets the existing 14m right-of-way.

0 5 10m
SCALE

WESTON CONSULTING
planning + urban design
1-800.363.3558 westonconsulting.com

Vaughan: 201 Millway Ave, Suite 19 Vaughan, Ontario L4K 5K8 T. 905.738.8080 F. 905.738.6637
Oakville: 1660 North Service Rd. E. Suite 114 Oakville, Ontario L6H 7G3 T. 905.844.8749 F. 905.738.6637
Toronto: 127 Berkeley St. Toronto, Ontario M5A 2X1 T. 416.640.9917 F. 905.738.6637

DRAWN / REVISED

14 MAR 2017	Reduction of units to reduce density
13 MAR 2017	Revisions to laneway, parking and townhouses facing Upper Middle Road.
08 MAR 2017	Revisions to townhouse and semis setbacks and visitor parking.
06 MAR 2017	Revisions to townhouse and semis setbacks.
16 FEB 2017	First Draft

File Number:	7926-1
Drawn By:	SB
Planner:	MQ
Scale:	see scale bar
CAD:	7926-1/concepts/C1.dgn

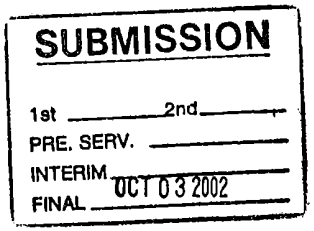
Drawing Number: C1

APPENDIX B

Block 223 Woodlot and External Drainage Area Detailed Drainage Analysis by Marshall Macklin Monaghan Ltd. (October 2002)

APPENDIX A

BLOCK 223 WOODLOT AND EXTERNAL DRAINAGE AREA
DETAILED DRAINAGE ANALYSIS



10-94022
Metrontario Bronte Woods Phase2

DETAILED DRAINAGE ANALYSIS

We have examined the photogrammetric existing point data for the site and adjacent areas to confirm grading variations than occur between the contour intervals shown on the drawings. Our review of the existing grades in the wood lot (Block 223) and the adjacent properties to the north and west reveals:

- approximately 1.07 ha is tributary to the DICB between lots 45B and 46B, however, several ponding/infiltration areas exist in low areas along the overland flow route
- an area of 0.24 ha, primarily on the rear of the Waldorf school property, may be draining onto the Lisani property to the south or to the woodlot (inconclusive from the existing grades)
- a ridge exists in the southwest corner of the wood lot, reducing the total area draining to the DICB in the parkette (Block 222) to 0.41 ha.

Drainage boundaries and flow paths are illustrated on the enclosed plan.

Due to the significant length of flow path through the woodlot for the area tributary to the DICB between lots 45B and 46B, we have calculated the time of concentration (T_C) via the upland method.

Considering the drainage area for the woodlot and external drainage area to the north, as shown on **MMM Dwg. No. 10-94022-ST3** and on the **Design Sheet that considers the full contributing area of the woodlot**, a T_C of 53 minutes is calculated as derived below

Flow path A-C-D		= 234 m	
A-C-D average grade	$\frac{147.40 - 145.39}{234m}$	$= \frac{2.01}{234}$	= 0.86%
Velocity from uplands method	0.24 ft/s	= 0.073 m/s	
T_C to DICB	234m/0.73m/s	53 min.	

The design sheet demonstrates that the downstream sewer system has adequate capacity.

2. However, due to the impact the large T_C in no. 1 has on the downstream sections of the design sheet using the rational method, we have prepared an alternative design sheet which considers the nominal starting T_C of 10 minutes which is expected to provide typical conservative sizing of the storm sewers. To account for the woodlot at this time interval, we derived an approximate corresponding area for the **Woodlot Contribution at T_C = 10 minutes** as follows.

Velocity from uplands	0.24 ft/s	= 0.073 m/s
Distance travelled in 10 min	0.073 m/s x 10min x 60 s/min	= 44m
Approximate area	0.34 ha	

Based on a 44m flow path, we estimate an are of 0.34ha contributes run-off to the receiving RLCB, the design sheet demonstrates that the downstream sewer system has adequate capacity.

3. Our review of the grades indicates that a 0.24 area of the Waldorf school property may drain to Lisani or to the woodlot. We have investigated the impact on the storm sewer system if flows were to be conveyed to the DICB in the woodlot.

Flow path B-C-D		= 218 m	
B-C-D average grade	$\frac{147.20 - 145.39}{218m}$	$= \frac{2.01}{218}$	= 0.83%
Velocity from uplands	0.24 ft/s	= 0.073 m/s	
T_C to DICB	218/0.073	= 49 min	

A design sheet indicating the **Full Woodlot Contribution and Waldorf** demonstrates that the downstream sewer system has adequate capacity.

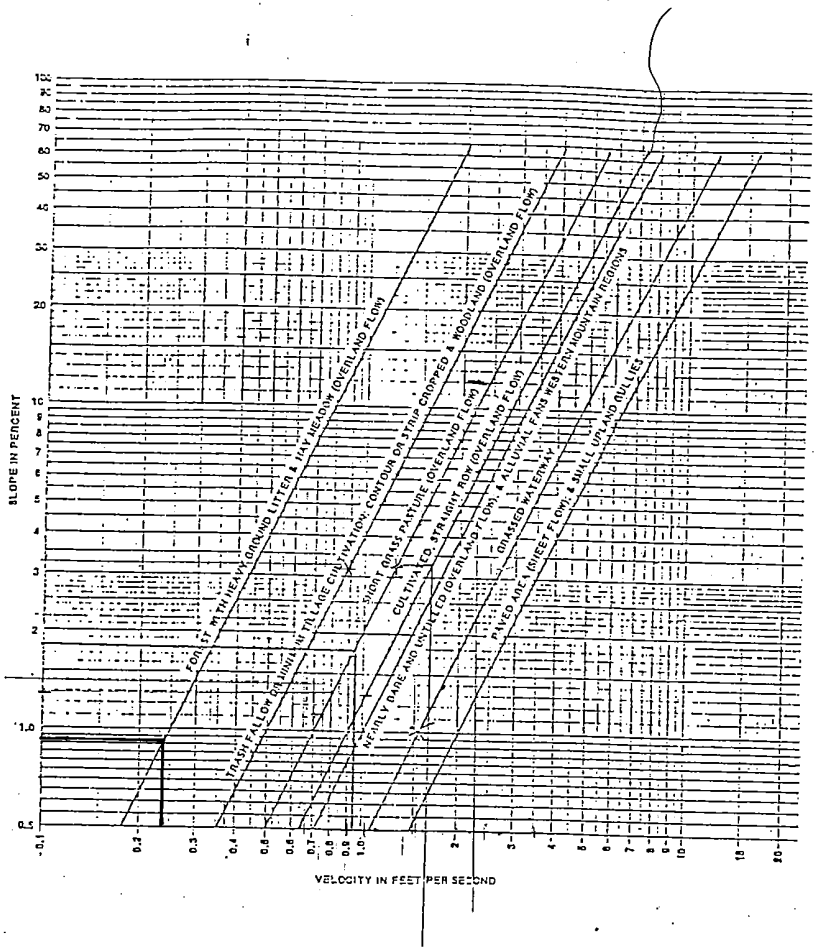


Figure 15.2.--Velocities for upland method of estimating T_c

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

Runoff Coefficient :

Single/Semi Family Residential	0.45
Townhouses	0.75
Commercial & Industrial	0.85
Parks & Open Space	0.30
School	0.75
Conc./Asph. Pavement	0.90

n= 0.013

Phase 1

Future Phase

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

LICENSED PROFESSIONAL ENGINEER T. M. WIEDOW PROVINCE OF ONTARIO

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Jardine Crescent	101		0.28		0.30	0.08												
		102	0.64	0.92	0.45	0.29	0.372	10.00	88.09	0.091	0.06	62.0	1.00	300	0.101	1.38	0.75	90.24%
[redacted]	102		1.07		0.30	0.32		53.00										
[redacted]		103	0.39	2.38	0.45	0.18	0.87	53.00	31.35	0.076	0.06	58.2	0.50	450	0.210	1.28	0.76	35.96%
	103	104	0.07	2.45	0.45	0.03	0.90	53.76	31.04	0.078	0.075	9.6	0.50	450	0.210	1.28	0.13	36.90%
	104	105	0.00	2.45	0.45	0.00	0.90	53.88	30.99	0.077	0.075	29.7	0.50	450	0.210	1.28	0.39	36.84%
	105	106	0.00	2.45	0.45	0.00	0.90	54.27	30.83	0.077	0.06	11.0	0.50	450	0.210	1.28	0.14	36.65%
	106	107	0.40	2.85	0.45	0.18	1.08	54.41	30.78	0.092	0.075	80.3	0.50	525	0.317	1.42	0.94	29.10%
Redstone St.	107	109	0.00	2.85	0.45	0.00	1.08	55.35	30.41	0.091	0.03	31.0	0.50	525	0.317	1.42	0.36	28.76%
Parkette	DICB	CBMH	0.41	0.85	0.38	0.16	0.16	10.00	88.09	0.038	0.03	47.2	0.40	375	0.116	1.01	0.78	32.96%
	CBMH	108	0.28	1.13	0.45	0.13	0.28	10.78	84.77	0.066	0.03	29.0	0.40	375	0.116	1.01	0.48	57.36%
	108	109	0.03	1.16	0.45	0.01	0.30	11.25	82.86	0.068	0.075	6.7	0.40	375	0.116	1.01	0.11	58.75%
	109	116	0.11	4.12	0.45	0.05	1.42	55.72	30.27	0.120	0.075	11.5	0.50	525	0.317	1.42	0.14	37.76%
Crescent 'C'	110	111	0.27	0.27	0.45	0.12	0.12	10.00	88.09	0.030	0.06	43.6	1.00	300	0.101	1.38	0.53	29.47%
	111	112	0.00	0.27	0.45	0.00	0.12	10.53	85.81	0.029	0.075	12.5	0.50	300	0.071	0.98	0.21	40.60%
	112	115	0.46	0.73	0.45	0.21	0.33	10.74	84.92	0.077	0.075	62.1	0.50	375	0.129	1.13	0.91	59.91%
	114	115	0.00	0.50	0.45	0.27	0.27	10.00	88.09	0.066	0.15	70.5	1.00	300	0.101	1.38	0.85	65.49%
Crescent 'K'	115	116	0.22	1.55	0.45	0.10	0.70	11.66	81.34	0.158	0.15	44.7	0.50	450	0.210	1.28	0.58	74.93%
Quinte Street	116	118	0.29	5.96	0.45	0.13	2.25	55.85	30.22	0.189	0.075	71.5	0.50	600	0.453	1.55	0.77	41.75%
Blue Spruce Avenue	117	118	0.51	0.51	0.45	0.23	0.23	10.00	88.09	0.056	0.375	54.1	1.00	300	0.101	1.38	0.65	55.67%
Quinte Street	118	119	0.17	6.64	0.45	0.08	2.56	56.62	29.93	0.213	0.03	73.8	0.50	675	0.620	1.68	0.73	34.31%
	119	120	0.91	7.55	0.45	0.41	2.97	57.35	29.66	0.245	0.075	110.4	0.50	675	0.620	1.68	1.10	39.44%
	120	123	0.91	8.46	0.45	0.41	3.38	58.45	29.27	0.275	0.06	97.9	0.50	750	0.821	1.80	0.90	33.44%
Scotia Street	122	123	0.55	0.55	0.70	0.39	0.39	10.00	88.09	0.094	0.375	78.9	0.50	375	0.129	1.13	1.16	72.84%
																0.00		

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Phase 1

Future Phase

Runoff Coefficient :			n=	0.013
	Single/Semi Family Residential	0.45		
	Townhouses	0.75		
	Commercial & Industrial	0.85		
	Parks & Open Space	0.30		
	School	0.75		
	Conc./Asph. Pavement	0.90		

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Scotia Street	123	126	0.16	9.17	0.45	0.07	3.83	59.35	28.96	0.308	0.03	67.0	0.50	750	0.821	1.80	0.62	37.56%
Rome Crescent	125	126	0.48	0.48	0.45	0.22	0.22	10.00	88.09	0.053	0.45	41.1	0.50	300	0.071	0.96	0.70	74.10%
Rome Crescent	126	127	0.15	9.80	0.45	0.07	4.12	59.97	28.74	0.329	0.06	89.2	0.50	750	0.821	1.80	0.83	40.04%
	127	133	0.65	10.45	0.45	0.29	4.41	60.80	28.47	0.349	0.075	7.5	0.50	750	0.821	1.80	0.07	42.47%
Rome Crescent	128	129	0.19	0.19	0.45	0.09	0.09	10.00	88.09	0.021	0.03	31.2	1.00	300	0.101	1.38	0.38	20.74%
	129	130	0.36	0.55	0.45	0.16	0.25	10.38	86.45	0.059	0.06	29.5	0.50	300	0.071	0.98	0.50	83.31%
	130	131	0.00	0.55	0.45	0.00	0.25	10.88	84.35	0.058	0.06	13.1	0.50	300	0.071	0.98	0.22	81.29%
	131	132	0.00	0.55	0.45	0.00	0.25	11.10	83.45	0.057	0.03	56.9	0.50	300	0.071	0.98	0.97	80.43%
	132	133	0.00	0.55	0.45	0.00	0.25	12.07	79.80	0.055	0.075	7.5	0.50	300	0.071	0.98	0.13	76.91%
																0.00		
	133	162	0.00	11.00	0.45	0.00	4.66	60.87	28.45	0.368	0.5	10.2	0.50	825	1.059	1.92	0.09	34.76%
					Assumed			Assumed										
North Storm Easement	RLCB	CBMH139	0.05	0.05	0.45	0.02	0.02	10.00	88.09	0.006	0.05	45.8	0.50	250	0.042	0.86	0.88	13.09%
	CBMH139	CBMH140	0.08	0.13	0.45	0.04	0.06	10.88	84.34	0.014	0.03	71.6	0.50	300	0.071	0.98	1.22	19.21%
	CBMH140	141	0.08	0.21	0.45	0.04	0.09	12.10	79.70	0.021	0.525	38.7	1.20	375	0.200	1.76	0.37	10.44%
Orchard Road North	External	141	3.69	3.69	0.75	2.77	2.77											
			3.02	3.02	0.75	2.27	2.27											
			3.89	3.89	0.45	1.75	1.75											
			0.80	0.80	0.75	0.60	0.60											
Orchard Road	141	142	0.62	12.23	0.45	0.28	7.76	15.00	70.71	1.524	0.04	150.0	0.50	975	1.653	2.15	1.17	92.16%
Blue Spruce Avenue	142	146	0.38	12.61	0.45	0.17	7.93	16.17	67.70	1.491	0.02	22.5	0.30	1050	1.560	1.76	0.21	95.64%
Blue Spruce Avenue	143	144	0.60	0.58	0.45	0.26	0.26	10.00	88.09	0.064	0.15	67.2	0.90	300	0.096	1.31	0.85	66.73%
	144	145	0.75	1.33	0.45	0.34	0.60	10.85	84.45	0.140	0.04	94.8	0.40	450	0.188	1.15	1.38	74.63%
	145	146	0.00	1.33	0.45	0.00	0.60	12.23	79.23	0.132	0.225	9.6	0.35	525	0.265	1.19	0.13	49.63%
Off-Orchard Road	146	147	0.00	13.94	0.45	0.00	8.53	16.39	67.18	1.591	0.02	21.5	0.35	1050	1.685	1.89	0.19	94.40%
	147	148	0.00	13.94	0.45	0.00	8.53	16.58	66.73	1.580	0.02	43.6	0.35	1050	1.685	1.89	0.39	93.77%
	148	156	0.00	13.94	0.45	0.00	8.53	16.96	65.84	1.559	0.02	33.6	0.35	1050	1.685	1.89	0.30	92.61%

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Runoff Coefficient :

		n= 0.013
Single/Semi Family Residential	0.45	
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Nova Crescent	134	149	0.30	0.30	0.45	0.14	0.14	10.00	88.09	0.033	0.06	31.1	1.50	300	0.124	1.69	0.31	26.74%
	149	150	0.00	0.30	0.45	0.00	0.14	10.31	86.74	0.033	0.06	20.8	0.50	300	0.071	0.98	0.35	45.60%
	150	151	0.00	0.30	0.45	0.00	0.14	10.66	85.24	0.032	0.06	12.9	0.50	300	0.071	0.98	0.22	44.81%
	151	152	0.00	0.30	0.45	0.00	0.14	10.88	84.34	0.032	0.15	31.7	0.50	300	0.071	0.98	0.54	44.34%
	152	153	0.76	1.06	0.45	0.34	0.48	11.42	82.21	0.109	0.03	40.5	0.50	450	0.210	1.28	0.53	51.79%
	153	154	0.24	1.30	0.45	0.11	0.59	11.95	80.25	0.130	0.06	48.2	0.50	450	0.210	1.28	0.63	62.00%
	154	155	0.00	1.30	0.45	0.00	0.59	12.58	78.05	0.127	0.06	13.1	0.50	450	0.210	1.28	0.17	60.31%
	155	156	0.42	1.72	0.45	0.19	0.77	12.75	77.48	0.167	0.9	23.0	0.50	450	0.210	1.28	0.30	79.20%
Nova Crescent	156	157	0.00	15.66	0.45	0.00	9.30	17.26	65.16	1.683	0.02	31.5	0.40	1050	1.802	2.02	0.26	93.43%
	157	159	0.23	15.89	0.45	0.10	9.40	17.52	64.59	1.687	0.02	11.1	0.40	1050	1.802	2.02	0.09	93.63%
Nova Crescent	158	159	0.30	0.30	0.45	0.14	0.14	10.00	88.09	0.033	0.675	54.0	1.00	300	0.101	1.38	0.65	32.75%
Easement	159	160	0.00	15.19	0.45	0.00	9.54	17.61	64.39	1.706	0.02	31.7	0.40	1050	1.802	2.02	0.26	94.68%
2:1	160	161	0.16	16.35	0.45	0.07	9.61	17.87	63.82	1.704	0.02	116.8	0.40	1050	1.802	2.02	0.97	94.56%
	161	162	0.00	16.35	0.45	0.00	9.61	18.84	61.84	1.651	0.02	31.4	0.40	1050	1.802	2.02	0.26	91.62%
Pond 3A	162	Pond Inlet	0.00	27.35	0.45	0.00	14.27	60.96	28.42	1.126		36.5	0.40	1200	2.572	2.20	0.28	43.78%

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Runoff Coefficient :

Single/Semi Family Residential	0.45	n= 0.013
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LICENSED PROFESSIONAL ENGINEER T. M. WIEDOW PROVINCE OF ONTARIO

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Jardine Crescent	101		0.28		0.30	0.08												
		102	0.64	0.92	0.45	0.29	0.372	10.00	88.09	0.091	0.06	60.0	1.00	300	0.101	1.38	0.72	90.24%
Woodlot contribution	102		0.34		0.30	0.10		10.72										
at Tc = 10min		103	0.39	1.65	0.45	0.18	0.65	10.72	84.98	0.153	0.06	58.2	0.50	450	0.210	1.28	0.76	72.90%
	103	104	0.07	1.72	0.45	0.03	0.68	11.48	81.98	0.155	0.075	9.6	0.50	450	0.210	1.28	0.13	73.74%
	104	105	0.00	1.72	0.45	0.00	0.68	11.61	81.51	0.154	0.075	29.7	0.50	450	0.210	1.28	0.39	73.31%
	105	106	0.00	1.72	0.45	0.00	0.68	11.99	80.09	0.152	0.06	11.0	0.50	450	0.210	1.28	0.14	72.04%
	106	107	0.40	2.12	0.45	0.18	0.86	12.13	79.58	0.190	0.075	80.3	0.50	525	0.317	1.42	0.94	59.99%
Redstone St.	107	109	0.00	2.12	0.45	0.00	0.86	13.08	76.39	0.183	0.03	31.0	0.50	525	0.317	1.42	0.36	57.59%
Parkette	DICB	CBMH	0.41	0.85	0.38	0.16	0.16	10.00	88.09	0.038	0.03	47.2	0.40	375	0.116	1.01	0.78	32.96%
	CBMH	108	0.28	1.13	0.45	0.13	0.28	10.78	84.77	0.066	0.03	29.0	0.40	375	0.116	1.01	0.48	57.36%
	108	109	0.03	1.16	0.45	0.01	0.30	11.25	82.86	0.068	0.075	6.7	0.40	375	0.116	1.01	0.11	58.75%
	109	116	0.11	3.39	0.45	0.05	1.21	13.44	75.23	0.252	0.075	11.5	0.50	525	0.317	1.42	0.14	79.43%
Crescent 'K'	110	111	0.27	0.27	0.45	0.12	0.12	10.00	88.09	0.030	0.06	43.6	1.00	300	0.101	1.38	0.53	29.47%
	111	112	0.00	0.27	0.45	0.00	0.12	10.53	86.81	0.029	0.075	12.8	0.50	300	0.071	0.98	0.21	40.60%
	112	115	0.46	0.73	0.45	0.21	0.33	10.74	84.92	0.077	0.075	62.1	0.50	375	0.129	1.13	0.91	59.91%
	114	115	0.60	0.60	0.45	0.27	0.27	10.00	88.09	0.066	0.15	70.5	1.00	300	0.101	1.38	0.85	65.49%
Crescent 'K'	115	116	0.22	1.55	0.45	0.10	0.70	11.65	81.34	0.158	0.15	44.7	0.50	450	0.210	1.26	0.58	74.93%
Quinte Street	116	118	0.29	5.23	0.45	0.13	2.03	13.58	74.81	0.423	0.075	71.5	0.50	600	0.453	1.55	0.77	93.31%
Blue Spruce Avenue	117	118	0.51	0.51	0.45	0.23	0.23	10.00	88.09	0.056	0.375	54.1	1.00	300	0.101	1.38	0.65	55.67%
Quinte Street	118	119	0.17	5.91	0.45	0.08	2.34	14.35	72.53	0.471	0.03	73.8	0.50	675	0.620	1.68	0.73	76.03%
	119	120	0.91	6.82	0.45	0.41	2.75	15.08	70.50	0.538	0.075	110.4	0.50	675	0.620	1.68	1.10	86.83%
	120	123	0.91	7.73	0.45	0.41	3.16	16.17	67.70	0.594	0.06	97.5	0.50	750	0.821	1.80	0.90	72.33%
Scotia Street	122	123	0.55	0.55	0.70	0.39	0.39	10.00	88.09	0.094	0.375	78.0	0.50	375	0.129	1.13	1.16	72.84%
																0.00		

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

STORM SEWER DESIGN SHEET

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Runoff Coefficient :

Single/Semi Family Residential	0.45	n= 0.013
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Scotia Street	123	126	0.16	8.44	0.45	0.07	3.62	17.08	65.57	0.658	0.03	67.0	0.50	750	0.821	1.80	0.62	80.20%
Rome Crescent	125	126	0.48	0.48	0.45	0.22	0.22	10.00	88.09	0.053	0.45	41.1	0.50	300	0.071	0.98	0.70	74.10%
Rome Crescent	126	127	0.15	9.07	0.45	0.07	3.90	17.70	64.20	0.695	0.06	89.2	0.50	750	0.821	1.80	0.83	84.67%
	127	133	0.65	9.72	0.45	0.29	4.19	18.52	62.47	0.727	0.075	7.5	0.50	750	0.821	1.80	0.07	88.58%
Rome Crescent	128	129	0.19	0.19	0.45	0.09	0.09	10.00	88.09	0.021	0.03	31.2	1.00	300	0.101	1.38	0.38	20.74%
	129	130	0.36	0.55	0.45	0.16	0.25	10.38	86.45	0.059	0.06	29.5	0.50	300	0.071	0.98	0.50	83.31%
	130	131	0.00	0.55	0.45	0.00	0.25	10.88	84.35	0.058	0.06	13.1	0.50	300	0.071	0.98	0.22	81.29%
	131	132	0.00	0.55	0.45	0.00	0.25	11.10	83.45	0.057	0.03	56.9	0.50	300	0.071	0.98	0.97	80.43%
	132	133	0.00	0.55	0.45	0.00	0.25	12.07	79.80	0.055	0.525	7.5	0.50	300	0.071	0.98	0.13	76.91%
																0.00		
	133	162	0.00	10.27	0.45	0.00	4.44	18.59	62.33	0.769	0.6	10.2	0.50	825	1.059	1.92	0.09	72.69%
					Assumed			Assumed										
North Storm Easement	RLCB	CBMH139	0.05	0.05	0.45	0.02	0.02	10.00	88.09	0.006	0.05	45.3	0.50	250	0.042	0.86	0.88	13.09%
	CBMH139	CBMH140	0.08	0.13	0.45	0.04	0.06	10.88	84.34	0.014	0.03	71.0	0.50	300	0.071	0.98	1.22	19.21%
	CBMH140	141	0.08	0.21	0.45	0.04	0.09	12.10	79.70	0.021	0.525	38.7	1.20	375	0.200	1.76	0.37	10.44%
Orchard Road North	External	141	3.69	3.69	0.75	2.77	2.77											
			3.02	3.02	0.75	2.27	2.27											
			3.89	3.89	0.45	1.75	1.75											
			0.80	0.80	0.75	0.60	0.60											
Orchard Road	141	142	0.62	12.23	0.45	0.28	7.76	15.00	70.71	1.524	0.04	150.9	0.50	975	1.653	2.15	1.17	92.16%
Blue Spruce Avenue	142	146	0.38	12.61	0.45	0.17	7.93	16.17	67.70	1.491	0.02	22.5	0.30	1050	1.560	1.76	0.21	95.54%
Blue Spruce Avenue	143	144	0.58	0.58	0.45	0.26	0.26	10.00	88.09	0.064	0.15	67.2	0.90	300	0.096	1.31	0.85	66.73%
	144	145	0.75	1.33	0.45	0.34	0.60	10.85	84.45	0.140	0.04	94.8	0.40	450	0.188	1.15	1.38	74.63%
	145	146	0.00	1.33	0.45	0.00	0.60	12.23	79.23	0.132	0.225	9.6	0.35	525	0.265	1.19	0.13	49.63%
Off-Orchard Road	146	147	0.00	13.94	0.45	0.00	8.53	16.39	67.18	1.591	0.02	21.3	0.35	1050	1.685	1.89	0.19	94.40%
	147	148	0.00	13.94	0.45	0.00	8.53	16.58	66.73	1.580	0.02	43.6	0.35	1050	1.685	1.89	0.38	93.77%
	148	156	0.00	13.94	0.45	0.00	8.53	16.96	65.84	1.559	0.02	33.6	0.35	1050	1.685	1.89	0.30	92.61%

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Runoff Coefficient :

		n=
Single/Semi Family Residential	0.45	0.013
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Nova Crescent	134	149	0.30	0.30	0.45	0.14	0.14	10.00	88.09	0.033	0.06	31.1	1.50	300	0.124	1.69	0.31	26.74%
	149	150	0.00	0.30	0.45	0.00	0.14	10.31	86.74	0.033	0.06	20.8	0.50	300	0.071	0.98	0.35	46.60%
	150	151	0.00	0.30	0.45	0.00	0.14	10.66	85.24	0.032	0.06	12.9	0.50	300	0.071	0.98	0.22	44.81%
	151	152	0.00	0.30	0.45	0.00	0.14	10.88	84.34	0.032	0.15	31.7	0.50	300	0.071	0.98	0.54	44.34%
	152	153	0.76	1.06	0.45	0.34	0.48	11.42	82.21	0.109	0.03	40.5	0.50	450	0.210	1.28	0.53	51.79%
	153	154	0.24	1.30	0.45	0.11	0.59	11.95	80.25	0.130	0.06	48.2	0.50	450	0.210	1.28	0.63	62.00%
	154	155	0.00	1.30	0.45	0.00	0.59	12.58	78.05	0.127	0.06	13.1	0.50	450	0.210	1.28	0.17	60.31%
	155	156	0.42	1.72	0.45	0.19	0.77	12.75	77.48	0.167	0.8	23.0	0.50	450	0.210	1.28	0.30	79.20%
Nova Crescent	156	157	0.00	15.66	0.45	0.00	9.30	17.26	65.16	1.683	0.02	31.5	0.40	1050	1.802	2.02	0.26	93.43%
	157	159	0.23	15.89	0.45	0.10	9.40	17.52	64.59	1.687	0.02	11.1	0.40	1050	1.802	2.02	0.09	93.63%
Nova Crescent	158	159	0.30	0.30	0.45	0.14	0.14	10.00	88.09	0.033	0.675	54.0	1.00	300	0.101	1.38	0.65	32.75%
Easement	159	160	0.00	16.19	0.45	0.00	9.54	17.61	64.39	1.706	0.02	31.7	0.40	1050	1.802	2.02	0.26	94.66%
2:1	160	161	0.16	16.35	0.45	0.07	9.61	17.87	63.82	1.704	0.02	116.8	0.40	1050	1.802	2.02	0.97	94.56%
	161	162	0.00	16.35	0.45	0.00	9.61	18.84	61.84	1.651	0.02	31.4	0.40	1050	1.802	2.02	0.26	91.62%
Pond 3A	162	Pond Inlet	0.00	26.62	0.45	0.00	14.05	19.10	61.33	2.393		36.5	0.40	1200	2.572	2.20	0.28	93.04%

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

LICENSED PROFESSIONAL ENGINEER T. M. WIEDOW PROVINCE OF ONTARIO

Runoff Coefficient :

		n=
Single/Semi Family Residential	0.45	0.013
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Jardine Crescent	101		0.28		0.30	0.08												
		102	0.64	0.92	0.45	0.29	0.372	10.00	88.09	0.091	0.06	62.0	1.00	300	0.101	1.38	0.75	90.24%
Full Woodlot contribution and Waldorf	102		1.31		0.30	0.39		49.00										
		103	0.39	2.62	0.45	0.18	0.94	49.00	33.11	0.086	0.06	58.2	0.50	450	0.210	1.28	0.76	41.13%
	103	104	0.07	2.69	0.45	0.03	0.97	49.76	32.76	0.088	0.075	9.6	0.50	450	0.210	1.28	0.13	42.05%
	104	105	0.00	2.69	0.45	0.00	0.97	49.88	32.70	0.088	0.075	29.7	0.50	450	0.210	1.28	0.39	41.98%
	105	106	0.00	2.69	0.45	0.00	0.97	50.27	32.53	0.088	0.06	11.0	0.50	450	0.210	1.28	0.14	41.76%
	106	107	0.40	3.09	0.45	0.18	1.15	50.41	32.46	0.104	0.075	80.3	0.50	525	0.317	1.42	0.94	32.74%
Redstone St.	107	109	0.00	3.09	0.45	0.00	1.15	51.35	32.05	0.103	0.03	31.0	0.50	525	0.317	1.42	0.36	32.32%
Parkette	DICB	CBMH	0.41	0.85	0.38	0.16	0.16	10.00	88.09	0.038	0.03	47.2	0.40	375	0.116	1.01	0.78	32.96%
	CBMH	108	0.28	1.13	0.45	0.13	0.28	10.78	84.77	0.066	0.03	29.0	0.40	375	0.116	1.01	0.48	57.36%
	108	109	0.03	1.16	0.45	0.01	0.30	11.25	82.86	0.068	0.075	6.7	0.40	375	0.116	1.01	0.11	58.75%
	109	116	0.11	4.36	0.45	0.05	1.50	51.72	31.89	0.133	0.075	11.5	0.50	525	0.317	1.42	0.14	41.79%
Crescent 'K'	110	111	0.27	0.27	0.45	0.12	0.12	10.00	88.09	0.030	0.06	43.6	1.00	300	0.101	1.38	0.53	29.47%
	111	112	0.00	0.27	0.45	0.00	0.12	10.53	85.81	0.029	0.075	12.5	0.50	300	0.071	0.98	0.21	40.60%
	112	115	0.46	0.73	0.45	0.21	0.33	10.74	84.92	0.077	0.075	62.1	0.50	375	0.129	1.13	0.91	59.91%
	114	115	0.60	0.60	0.45	0.27	0.27	10.00	88.09	0.066	0.15	70.5	1.00	300	0.101	1.38	0.85	65.49%
Crescent 'K'	115	116	0.22	1.55	0.45	0.10	0.70	11.65	81.34	0.158	0.15	44.7	0.50	450	0.210	1.28	0.58	74.93%
Quinte Street	116	118	0.29	6.20	0.45	0.13	2.32	51.85	31.83	0.206	0.075	71.5	0.50	600	0.453	1.55	0.77	45.38%
Blue Spruce Avenue	117	118	0.51	0.51	0.45	0.23	0.23	10.00	88.09	0.056	0.375	54.1	1.00	300	0.101	1.38	0.65	55.67%
Quinte Street	118	119	0.17	6.88	0.45	0.08	2.63	52.62	31.51	0.230	0.03	73.8	0.50	675	0.620	1.68	0.73	37.13%
	119	120	0.91	7.79	0.45	0.41	3.04	53.35	31.20	0.264	0.075	110.4	0.50	675	0.620	1.68	1.10	42.50%
	120	123	0.01	8.70	0.45	0.41	3.45	54.45	30.76	0.295	0.06	97.5	0.50	750	0.821	1.80	0.90	35.90%
Scotia Street	122	123	0.55	0.55	0.70	0.39	0.39	10.00	88.09	0.094	0.375	78.9	0.50	375	0.129	1.13	1.16	72.84%
																	0.00	

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Runoff Coefficient :

Single/Semi Family Residential	0.45	n= 0.013
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Scotia Street	123	126	0.16	9.41	0.45	0.07	3.91	55.35	30.41	0.330	0.03	67.0	0.50	750	0.821	1.80	0.62	40.19%
Rome Crescent	125	126	0.48	0.48	0.45	0.22	0.22	10.00	88.09	0.053	0.45	41.1	0.50	300	0.071	0.98	0.70	74.10%
Rome Crescent	126	127	0.15	10.04	0.45	0.07	4.19	55.97	30.17	0.351	0.06	89.2	0.50	750	0.821	1.80	0.83	42.77%
	127	133	0.65	10.69	0.45	0.29	4.48	56.80	29.87	0.372	0.075	7.5	0.50	750	0.821	1.80	0.07	45.28%
Rome Crescent	128	129	0.19	0.19	0.45	0.09	0.09	10.00	88.09	0.021	0.03	31.2	1.00	300	0.101	1.38	0.38	20.74%
	129	130	0.36	0.55	0.45	0.16	0.25	10.38	86.45	0.059	0.06	29.5	0.50	300	0.071	0.98	0.50	83.31%
	130	131	0.00	0.55	0.45	0.00	0.25	10.88	84.35	0.058	0.06	13.1	0.50	300	0.071	0.98	0.22	81.29%
	131	132	0.00	0.55	0.45	0.00	0.25	11.10	83.45	0.057	0.03	56.9	0.50	300	0.071	0.98	0.97	80.43%
	132	133	0.00	0.55	0.45	0.00	0.25	12.07	79.80	0.055	0.525	7.5	0.50	300	0.071	0.98	0.13	76.91%
																	0.00	
	133	162	0.00	11.24	0.45	0.00	4.73	56.87	29.84	0.392	0.5	10.2	0.50	825	1.059	1.92	0.09	37.03%
					Assumed			Assumed										
North Storm Easement	RLCB	CBMH139	0.05	0.05	0.45	0.02	0.02	10.00	88.09	0.006	0.05	45.3	0.50	250	0.042	0.86	0.88	13.09%
	CBMH139	CBMH140	0.09	0.13	0.45	0.04	0.06	10.88	84.34	0.014	0.03	71.6	0.50	300	0.071	0.98	1.22	19.21%
	CBMH140	141	0.08	0.21	0.45	0.04	0.09	12.10	79.70	0.021	0.525	38.7	1.20	375	0.200	1.76	0.37	10.44%
Orchard Road North	External	141	3.69	3.69	0.75	2.77	2.77											
			3.02	3.02	0.75	2.27	2.27											
			3.89	3.89	0.45	1.75	1.75											
			0.80	0.80	0.75	0.60	0.60											
Orchard Road	141	142	0.62	12.23	0.45	0.28	7.76	15.00	70.71	1.524	0.04	150.9	0.50	975	1.653	2.15	1.17	92.16%
Blue Spruce Avenue	142	146	0.38	12.61	0.45	0.17	7.93	16.17	67.70	1.491	0.02	22.5	0.30	1050	1.560	1.76	0.21	95.54%
Blue Spruce Avenue	143	144	0.58	0.58	0.45	0.26	0.26	10.00	88.09	0.064	0.15	67.2	0.90	300	0.096	1.31	0.86	66.73%
	144	145	0.75	1.33	0.45	0.34	0.60	10.85	84.45	0.140	0.04	94.8	0.40	450	0.188	1.15	1.38	74.63%
	145	146	0.00	1.33	0.45	0.00	0.60	12.23	79.23	0.132	0.225	9.6	0.35	525	0.265	1.19	0.13	49.63%
Off-Orchard Road	146	147	0.00	13.94	0.45	0.00	8.53	16.39	67.18	1.591	0.02	21.3	0.35	1050	1.685	1.89	0.19	94.40%
	147	148	0.00	13.94	0.45	0.00	8.53	16.58	66.73	1.580	0.02	43.6	0.35	1050	1.685	1.89	0.39	93.77%
	148	156	0.00	13.94	0.45	0.00	8.53	16.96	65.84	1.559	0.02	33.6	0.35	1050	1.685	1.89	0.30	92.51%

SUBDIVISION: BRONTE WOODS COMMUNITY SUBDIVISION

$I_{5yr} = \frac{697.4}{(tc+5)^{0.764}}$

CITY OF BURLINGTON

STORM SEWER DESIGN SHEET

CONSULTANT : MARSHALL MACKLIN MONAGHAN LTD.

PROJECT NO.: 10-94022

DRAINAGE AREA PLAN NO.: 10-94022-ST1,ST3

DESIGNED BY: WYC DATE REVISED: October 2/02

Runoff Coefficient :

		n= 0.013
Single/Semi Family Residential	0.45	
Townhouses	0.75	
Commercial & Industrial	0.85	
Parks & Open Space	0.30	
School	0.75	
Conc./Asph. Pavement	0.90	

Phase 1

Future Phase

LOCATION	FROM MH	TO MH	AREA (ha)	ACCUM AREA (ha)	RUNOFF CO-EFFICIENT	AxR	ACCUM. AxR	Tc minutes	INTENSITY (mm/hr)	EXPECTED FLOW (m^3/s)	MH DROP (m)	LENGTH (m)	GRADIENT (%)	NOMINAL PIPE SIZE (mm)	CAPACITY (m^3/s)	FULL VELOCITY (m/s)	TIME OF FLOW (min)	% OF FULL FLOW
Nova Crescent	134	149	0.30	0.30	0.45	0.14	0.14	10.00	88.09	0.033	0.06	31.1	1.50	300	0.124	1.69	0.31	26.74%
	149	150	0.00	0.30	0.45	0.00	0.14	10.31	86.74	0.033	0.05	20.8	0.50	300	0.071	0.98	0.35	45.60%
	150	151	0.00	0.30	0.45	0.00	0.14	10.66	85.24	0.032	0.06	12.9	0.50	300	0.071	0.98	0.22	44.81%
	151	152	0.00	0.30	0.45	0.00	0.14	10.88	84.34	0.032	0.15	31.7	0.50	300	0.071	0.98	0.54	44.34%
	152	153	0.76	1.06	0.45	0.34	0.48	11.42	82.21	0.109	0.03	40.5	0.50	450	0.210	1.28	0.53	51.79%
	153	154	0.24	1.30	0.45	0.11	0.59	11.95	80.25	0.130	0.06	48.2	0.50	450	0.210	1.28	0.63	62.00%
	154	155	0.00	1.30	0.45	0.00	0.59	12.58	78.05	0.127	0.06	13.1	0.50	450	0.210	1.28	0.17	60.31%
	155	156	0.42	1.72	0.45	0.19	0.77	12.75	77.46	0.167	0.6	23.0	0.50	450	0.210	1.28	0.30	79.20%
Nova Crescent	156	157	0.00	15.66	0.45	0.00	9.30	17.26	65.16	1.683	0.02	31.5	0.40	1050	1.802	2.02	0.26	93.43%
	157	159	0.23	15.89	0.45	0.10	9.40	17.52	64.59	1.687	0.02	11.1	0.40	1050	1.802	2.02	0.09	93.63%
Nova Crescent	158	159	0.30	0.30	0.45	0.14	0.14	10.00	88.09	0.033	0.675	54.0	1.00	300	0.101	1.38	0.65	32.75%
Easement	159	160	0.00	16.19	0.45	0.00	9.54	17.61	64.39	1.706	0.02	31.7	0.40	1050	1.802	2.02	0.26	94.68%
2:1	160	161	0.16	16.35	0.45	0.07	9.61	17.87	63.82	1.704	0.02	116.6	0.40	1050	1.802	2.02	0.97	94.56%
	161	162	0.00	16.35	0.45	0.00	9.61	18.84	61.84	1.651	0.02	31.4	0.40	1050	1.802	2.02	0.26	91.62%
Pond 3A	162	Pond Inlet	0.00	27.59	0.45	0.00	14.34	56.96	29.81	1.187		36.5	0.40	1200	2.572	2.20	0.28	46.18%

APPENDIX C

Functional Servicing Plan
Functional Grading Plan

ROME CRESCENT

GEORGINA COURT

PRIVATE LANE

UPPER MIDDLE ROAD

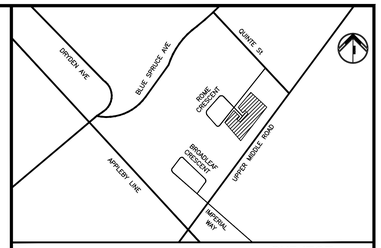
EX SWM POND

EX. STM MH 133
EX 7.45m 750mm CONC STM
EX. STM MH 127
EX 88.48m 750mm CONC STM
EX 10.39m 825mm CONC STM
EX. STM MH 162
EX 39.46m 1200mm CONC STM
EX. HEADWALL
EX 200mm PVC WATER
EX 11.61m 200mm PVC SAN
EX. SAN MH 3
EX. SAN MH 2
EX 40.77m 200mm PVC SAN
EX. CB 3
EX. STM MH 126
RIM ELEV 143.1
SW INV EL 140.05
NE INV EL 140.10
NW INV EL 140.47
EX. CB 4
PROP 35.63m 300mm PVC STM @ 0.30%
EX 46.39m 200mm PVC SAN @ 1.34%
EX 200mm PVC WATER
STM MH 1
RIM ELEV 141.76
NW INV EL 140.46
EX. SAN MH 1
RIM ELEV 141.58
NW INV EL 137.35
EX HYD & VALVE TO BE REMOVED & RETURNED TO CITY
PROP 10.57m 200mm PVC SAN @ 1.00%
SAN MH 3
RIM ELEV 141.94
NW INV EL 138.11
S INV EL 138.17
PROP 16.82m 200mm PVC SAN @ 1.00%
PROP 37.63m 200mm PVC SAN @ 1.00%
PROP 200mm PVC W/M
STM MH 3
RIM ELEV 141.00
NE INV EL 139.60
SE INV EL 139.57
SAN MH 1
RIM ELEV 141.49
NE INV EL 138.78
PROP 30.80m 300mm CONC STM @ 0.30%
PROP 23.82m 200mm CONC STM @ 0.30%
STM CBMH 2
RIM ELEV 141.54
SW INV EL 139.69
SAN MH 2
RIM ELEV 141.98
SW INV EL 138.40
N INV EL 138.35
STM CBMH 4
RIM ELEV 140.96
NW INV EL 139.50
EX. CB 6
TO BE REMOVED
RIM ELEV 140.96
SW INV EL 139.46
EX 13.73m 300mm CONC STM
EX. STM MH 3
EX. FIRE HYDRANT
EX. DCB
EX. STM MH 2
RIM ELEV 140.97
NE INV EL 139.60
SW INV EL 139.60
EX. STM MH 1
RIM ELEV 141.04
SW INV EL 140.00
NE INV EL 140.00
EX. CB 5
PROP ROAD WIDENING
PROPERTY LINE
BOARD FENCE
CHAIN LINK FENCE
POST & WIRE FENCE
GRAVEL DRIVE
CONCRETE WALK
CONCRETE AREA
CURB
CURB CUT
ASPHALT EDGE
RETAINING WALL
GROUP OF TREES
BUSH
GARDEN
SHED
PORTABLE CONTAINER
STEPS
FLOWER BOX
0.07 DIA
0.1 DIA
0.2 DIA
0.3 DIA
0.5 DIA
0.6 DIA
0.7 DIA
0.8 DIA
0.9 DIA
0.60 DIA
2 units
F.F.E. 142.65m
2 units
F.F.E. 142.70m
2 units
F.F.E. 142.76m
2 units
F.F.E. 142.75m
6 units
F.F.E. 141.95m
F.F.E. 142.25m
4 units
F.F.E. 142.60m
4 units
F.F.E. 141.90m
BLOCK 263
BLOCK 262
LOT 14
LOT 13
LOT 12
LOT 11
LOT 10
LOT 9
LOT 4
LOT 3
PART 5
PART 18
(STREET WIDENING)
No. 5219 2 STOREY BRICK WELLING
ONE STOREY BRICK GARAGE
TV ANTENNA
CONCRETE (FOR WATER SPOUT)
CONCRETE BLOCKS

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 SIAMESE 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

CONTRACTION NORTH



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.

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 J.D.BARNES LAND SURVEYORS LTD. DATED FEBRUARY 16, 2017.

BENCH MARK:

ELEVATION SHOW ON THIS PLAN ARE RELATED TO CANADIAN GEODETIC VERTICAL DATUM, 1978. AND ARE DERIVED FROM THE CITY OF BURLINGTON BENCH MARKS. No.482 HAVING A PUBLISHED ELEVATION OF 143.042m. AND No.841 HAVING A PUBLISHED ELEVATION OF 139.273m

LOCAL BENCHMARK No. 1 CUT CROSS ON CONCRETE SIDEWALK ON THE NORTH SIDE UPPERMIDDLE READ. SOUTH WEST OF GRAVEL DRIVEWAY FOR HOUSE No. 5219, OPPOSITE FIRE HYDRANT. ELEVATION = 141.11m

LOCAL BENCHMARK No. 2 CUT CROSS ON CONCRETE SIDEWALK ON THE NORTH SIDE OF UPPERMIDDLE ROAD OPPOSITE THE PRODUCTION OF THE CHAINLINK FENCE ALONG SOUTHWEST BOUNDARY OF BLOCH 262.
ELEVATION = 141.19m

METRIC NOTE:

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

SCALE: 0 5 10 15 20

DRAWING :
FUNCTIONAL SERVICING PLAN

CLIENT :
BLOOMFIELD DEVELOPMENTS

PROJECT :
PROPOSED RESIDENTIAL DEVELOPMENT
5219 UPPER MIDDLE ROAD
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:	DESIGN BY:
1:200	17213	MARCH 17	D.B.
			DRAWN BY: T.G.
DRAWING NO: 17213 – 1A.dwg			CHECKED BY: M.H.
			APPROVED BY: J.K.
FILE NUMBER			DRWG. NO.: 1 OF 2

ROME CRESCENT

GEORGINA COURT

PART 5

PRIVATE LANE

UPPER MIDDLE ROAD

PART 18

EX SWM POND

EX. STM MH 133

EX. STM MH 127

EX. STM MH 162

EX. SAN MH 2

EX. SAN MH 3

EX. CB 3

EX. STM MH 126
RIM ELEV 143.1
SW INV EL 140.05
NE INV EL 140.10
NW INV EL 140.47

EX. CB 4

LOT 14 | LOT 13 | LOT 12 | LOT 11 | LOT 10 | LOT 9 | LOT 4 | LOT 3

BLOCK 263 | BLOCK 262

PROPERTY LINE

EX. HEADWALL

GRAVEL DRIVE

CHAIN LINK FENCE

BOARD FENCE

POST & WIRE FENCE

WOOD GARDEN EDGING

CONCRETE WALK

CONCRETE AREA

CURB

CURB CUT

RETAINING WALL

ASPHALT EDGE

PROP. ROAD WIDENING

(STREET WIDENING)

6 units
F.F.E. 141.95m

F.F.E. 142.25m

4 units
F.F.E. 141.90m

4 units
F.F.E. 142.60m

2 units
F.F.E. 142.65m

2 units
F.F.E. 142.70m

2 units
F.F.E. 142.75m

2 units
F.F.E. 142.76m

EX HYD & VALVE TO BE REMOVED & RETURNED TO CITY

STM MH 1
RIM ELEV 141.76
NW INV EL 140.46

EX. SAN MH 1
RIM ELEV 141.58
NW INV EL 137.35

SAN MH 1
RIM ELEV 141.49
NE INV EL 138.78

SAN MH 2
RIM ELEV 141.98
SW INV EL 138.40
N INV EL 138.35

SAN MH 3
RIM ELEV 141.94
NW INV EL 138.11
S INV EL 138.17

STM CBMH 2
RIM ELEV 141.54
SW INV EL 139.69

STM MH 3
RIM ELEV 141.00
NE INV EL 139.60
SE INV EL 139.57

STM CBMH 4
RIM ELEV 140.96
NW INV EL 139.50

EX. CB 6
TO BE REMOVED
RIM ELEV 140.96
SW INV EL 139.46

EX. FIRE HYDRANT

EX. DCB

EX. CB 5

EX. STM MH 1
RIM ELEV 141.04
SW INV EL 140.00
NE INV EL 140.00

EX. STM MH 2
RIM ELEV 140.97
NE INV EL 139.60
SW INV EL 139.60

PORTABLE CONTAINER

SHED

GARDEN

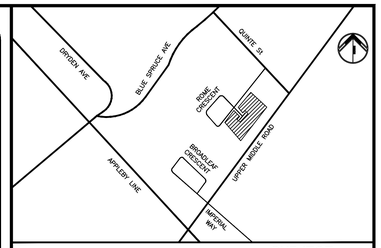
FLOWER BED

BUSH

STEPS

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
- 113.66 +100.00 DENOTES EXISTING SPOT ELEVATION
- + (100.00) DENOTES PROPOSED ELEVATION
- + (100.00)T/C DENOTES PROPOSED TOP OF CURB ELEVATION
- + (100.00)G/L DENOTES PROPOSED GUTTER LINE ELEVATION
- + (100.00) HP DENOTES PROPOSED HIGH POINT
- + (100.00) DENOTES PROPOSED SWALE INVERT ELEVATION
- + (100.00) DENOTES PROPOSED ELEVATION BY OTHERS
- 4.0% DENOTES PROPOSED FLOW ARROW AND SLOPE
- DENOTES PROPOSED FLOW ARROW
- DENOTES EMERGENCY OVERLAND FLOW
- DENOTES PROPOSED SLOPE (3:1 OR HIGHER)
- 195.50 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.

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 J.D.BARNES LAND SURVEYORS LTD. DATED FEBRUARY 16, 2017.

BENCH MARK:

ELEVATION SHOW ON THIS PLAN ARE RELATED TO CANADIAN GEODETIC VERTICAL DATUM, 1978. AND ARE DERIVED FROM THE CITY OF BURLINGTON BENCH MARKS. No.482 HAVING A PUBLISHED ELEVATION OF 143.042m. AND No.841 HAVING A PUBLISHED ELEVATION OF 139.273m

LOCAL BENCHMARK No. 1 CUT CROSS ON CONCRETE SIDEWALK ON THE NORTH SIDE UPPERMIDDLE READ. SOUTH WEST OF GRAVEL DRIVEWAY FOR HOUSE No. 5219, OPPOSITE FIRE HYDRANT. ELEVATION = 141.11m

LOCAL BENCHMARK No. 2 CUT CROSS ON CONCRETE SIDEWALK ON THE NORTH SIDE OF UPPERMIDDLE ROAD OPPOSITE THE PRODUCTION OF THE CHAINLINK FENCE ALONG SOUTHWEST BOUNDARY OF BLOCH 262.
ELEVATION = 141.19m

METRIC NOTE:

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

SCALE: 0 5 10 15 20

DRAWING :
FUNCTIONAL GRADING PLAN

CLIENT :
BLOOMFIELD DEVELOPMENTS

PROJECT :
PROPOSED RESIDENTIAL DEVELOPMENT
5219 UPPER MIDDLE ROAD
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:	DESIGN BY:
1:200	17213	MARCH 17	D.B.
			DRAWN BY: T.G.
DRAWING NO: 17213 – 2A.dwg			CHECKED BY: M.H.
			APPROVED BY: J.K.
FILE NUMBER			DRWG. NO.: 2 OF 2