Manga Hotels (Richmond) Inc.

SITE SERVICING AND STORMWATER MANAGEMENT BRIEF

465 – 471 Richmond Street West

38 Camden Street

City of Toronto

April 2019

19114

Disclaimer

This Report represents the work of LEA Consulting Ltd ("LEA"). This Report may not be relied upon for detailed implementation or any other purpose not specifically identified within this Report. This Document is confidential and prepared solely for the use of Manga Hotels (Richmond) Inc. Neither LEA, its sub-consultants nor their respective employees assume any liability for any reason, including, but not limited to, negligence, to any party other than Manga Hotels (Richmond) Inc. for any information or representation herein.

TABLE OF CONTENTS

LIST OF TABLES

APPENDICES

1 INTRODUCTION

1.1 SCOPE OF THE STORMWATER MANAGMENT AND SERVICING BRIEF

Manga Hotel (Richmond) Inc. is proposing to redevelop two existing commercial sites located at 465 - 471 Richmond Street West and 38 Camden Street in the City of Toronto, Ontario. LEA Consulting Ltd. has been retained by Manga Hotels (Richmond) Inc. to prepare a Site Servicing and Stormwater Management Brief in support of the Zoning By-Law Amendment application for their proposed hotel building in the City of Toronto. This servicing and stormwater management brief shall:

- Examine the potential water quality and quantity impacts of the proposed building and summarize how each will be addressed in accordance with the City of Toronto and the Toronto and Region Conservation Authority (TRCA) stormwater management requirements; and
- Review the adequacy of the existing water supply, storm and sanitary services, and propose a site servicing plan.

1.2 SITE LOCATION AND PROPOSED DEVELOPMENT

The proposed development site is located at the southwest quadrant of Richmond Street West and Spadina Avenue, within Lake Ontario Waterfront and under the jurisdiction of the TRCA.

Manga Hotel proposed to demolish the existing 3-storey commercial building at 38 Camden Street, and the existing 2-storey commercial building and its adjacent parking lot at 471 Richmond Street West. A 17-storey mixed-use (hotel) building with three levels of underground parking will be constructed.

The development site is approximately 0.133 ha in area.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management (SWM) plan is to determine site specific stormwater management requirements, review the potential stormwater environment impact by the proposed hotel development, and address the City's and TRCA's requirements for stormwater quantity control and quality control as required. A preliminary stormwater management design documenting the strategy along with the technical information necessary for the sizing of the proposed stormwater management practices are included in this report.

1.4 SWM DESIGN CRITERIA

The SWM plan for the proposed development shall conform to the criterion and / or guidelines from the City of Toronto and the TRCA. The City of Toronto requires that all stormwater management plans shall follow the Wet Weather Flow Management (WWFM) Guidelines dated November 2006. A summary of the storm water management criteria applied for this project is provided below:

- Water Balance Control: Retain at-least the first 5mm from each rainfall through on-site infiltration, evapotranspiration and rainwater reuse
- Storm Water Quality Control: Long-term average removal of 80% of total suspended solids (TSS) on an annual loading basis.
- Storm Water Quantity Control: The required level of peak flow control from a development site shall follow the TRCA Stormwater Quantity (Flood) Control Criteria.
- Erosion & Sediment Control: Regardless of size for all development sites, temporary erosion and sediment control for construction must be provided on-site.
- Discharge Criteria to Municipal Infrastructure: The allowable release rate to the municipal storm sewer system from the development site during a 2-year design storm event must not exceed the peak runoff rate from the site under pre-development conditions during the same storm event, or existing capacity of the receiving storm sewer, whichever is less. When the % imperviousness of a development site under pre-development condition is higher than 50% (regardless of what the post-development condition is), the maximum value of C (Runoff Coefficient) used in calculating the pre-development peak runoff rate is limited to 0.5.

2 EXISTING CONDITIONS

2.1 GENERAL

The proposed development site consists of two commercial sites and is bounded by Richmond Street West to the north, Camden Street to the south, and existing buildings to the east and west. According to the proposed development plan, the two existing commercial buildings at 38 Camden Street and 471 Richmond Street West and the existing parking lot east of the building at 471 Richmond Street West will be demolished and replaced with a 17-storey hotel building (390 guest suites). The total development site area is 0.133 ha with overall runoff coefficient of 0.90. The site currently does not accept any external drainage. **Figure 1** in **Appendix G** illustrates the existing drainage condition.

Based on our review of the topographic survey and the background materials available, there is no on-site stormwater management facility under existing condition.

2.2 ALLOWABLE PEAK FLOW RATES UNDER EXISTING CONDITION

The rainfall intensity for the development site was calculated using the following equation:

Rational Formula $Q = 2.78\ C\ I\ A$ (L/s)

Where: C: run off coefficient,

I: rainfall intensity (mm/hr), and

A: development site area (ha)

IDF Curve Equation: $I = aT^c$ (for City of Toronto)

Where: I: rainfall intensity (mm/hr)

T: time of concentration (hour)

a, c: parameters

The parameters, a and c, recommended for use in the City of Toronto are defined in section 3.1 of the WWFM Guidelines and are summarized in **Table 1**. A time of concentration, T, of 10 minutes is recommended in the WWFMG document.

Table 1: Parameters of a and c

Return Period	a	c
2-year	21.8	-0.78
10-year	38.7	-0.80
50-year	53.5	-0.80
100-year	59.7	-0.80

Based on the existing site condition and rainfall parameters, the Rational Method is adopted to calculate peak flows for different design storm events. The calculated peak flow rates for the proposed development site in the pre-development condition are summarized below in **Table 2.** Detailed calculations are provided in **Appendix A-04**.

Table 2: Pre-Development Peak Flow Rate (L/s)

Return Period (Year)	Peak Flow Rates (L/s)
2	16.36
10	30.10
50	41.61
100	46.43

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed project consists of the construction of two 17-storey buildings with shared ground level and three levels of underground parking. The building will have a total green roof coverage of 54.5 m^2. Stormwater generated within the proposed development site will be retained and detained in the underground stormwater storage tank within the underground parking, then discharged into the City's combined sewer on Richmond Street West at an allowable release rate. Refer to **Figure 2** in **Appendix G** for details of post-development drainage condition.

Based on the proposed development site condition, two sub-catchment areas are delineated. Sub-Catchment #1 solely consists of the proposed building. Surface runoff will be collected by building roof leaders, conveyed through internal storm pipes to the proposed storage cistern, and outlet to the combined sewer on Richmond Street West. Based on the proposed land use, the composite runoff coefficient is 0.87 for this sub-catchment, refer to **Appendix A-02** for details.

Sub-Catchment #2 consists of the proposed building frontage on Camden Street. Since runoff from area in front of the building façade facing Camden Street cannot be controlled, the runoff from this sub-catchment will be drained directly to the municipal sewers on Camden Street via roadway catchbasins without control under post-development condition. Based on the proposed land use, the composite runoff coefficient is estimated at 0.90 for this sub-catchment, refer to **Appendix A-02** for details.

The land use is provided below in **Table 3** for comparison between existing and proposed conditions.

Table 3: Land-Use Area Breakdown

Impervious Area (m^2)			Pervious Area (m^2)		
Existing	Proposed		Existing	Proposed	
	Sub-catchment #1	Sub-catchment #2		Sub-catchment #1	Sub-catchment #2
1334.4	1254.9	25.0	0.0	54.5	0.0

Table 3 demonstrates that the impervious area will be decreased by 4.1% after the construction of new buildings.

3.2 PEAK FLOW RATES UNDER PROPOSED CONDITION

Based on the proposed site condition and rainfall parameters, the Rational Method is adopted to calculate peak flow rates for different design storm events.

The calculated peak flow rates for the proposed site area in the post-development condition are tabulated below in **Table 4**. Detailed calculations are provided in **Appendix A-04**.

Table 4: Post-Development Peak Flow Rates (L/s)

Return Period (Year)	Peak Flow Rates - Sub-Catchment #1 (L/s)	Peak Flow Rates - Sub-Catchment #2 (L/s)
2	28.00	0.55
10	51.52	1.01
50	71.23	1.40
100	79.48	1.56

3.3 STORMWATER DISCHARGE COMPARISON

Based on the review and analysis of existing and proposed site conditions, **Table 5** summarizes the key hydrologic parameters for the proposed development site under existing and proposed conditions.

Table 5: Key Hydrologic Parameters

Imperviousness (%)			Area (Runoff Coefficient)			100-year Peak Flow Rate (L/s)		
Pre-Dev	Post-Dev		Pre-Dev	Post-Dev		Pre-Dev	Post-Dev	
	SC#1	SC#2		SC#1	SC#2		SC#1	SC#2
100	95.8	100	0.133 ha (C = 0.50)	0.131 ha (C = 0.87)	0.003 ha (C = 0.90)	46.43	79.48	1.56

The actual pre-development runoff coefficient for the proposed development site is 0.90, however the maximum runoff coefficient of 0.50 will be considered under pre-development condition in accordance with the City's design criteria. If actual runoff coefficient were considered, there would be no significant difference between pre- and post-development condition, or negligible impact on the stormwater discharge rate.

However, mitigation measures are required in accordance with the TRCA's design criteria and, thus, are presented in the subsequent section.

4 PROPOSED SWM PLAN

4.1 WATER BALANCE REQUIREMENT

Based on the water balance criteria of the City of Toronto's WWFM Guideline, the minimum on-site runoff retention requires retaining all runoff of the first 5mm from each rainfall through infiltration and evapo-transpiration, etc. To satisfy the water balance criteria, a 5.12 m^3 on-site storage volume will be provided in P1 and P2 level of the underground parking area. Refer to **Appendix A-03** for detailed calculations.

The potential methods to address the water balance criteria are outlined as follows:

- Rainwater harvesting: Re-use of rainwater as grey water for toilet flushing, and
- Irrigation of trees and plants on the property.

The exact application and consumption rates will be determined at the next design stage in consultation with project design team architect and mechanical engineer. The reused rainwater will be free of solids and will be treated to conform to the Ontario Building Code 7.1.5.3

4.2 WATER QUANTITY CONTROL REQUIREMENT

According to the City's stormwater quantity control criteria, the proposed development site is required to control post-development peak flow rates to 2-year pre-development levels for all storms up to and including 100-year storm.

Since Sub-Catchment #2 will be located adjacent to the municipal right-of-way of Camden Street, it is not feasible to control the small area without impacting pedestrian movement. Therefore, runoff from Sub-Catchment #2 will drain to the existing municipal sewers without any control.

Stormwater from Sub-Catchment #1 will be collected by roof drains, piped to the proposed storage cistern, and outlet to the municipal storm sewer at the allowable release rate. Since it is not feasible to implement discharge control for Sub-Catchment #2, the discharge from Sub-Catchment #1 will be overcontrolled to satisfy the City's discharge control criteria.

Based on the post-development condition, the discharge rates and stormwater detention requirements for Sub-Catchment #1 for different design storm events are summarized in **Table 6** below. Detail calculations are provided in **Appendix A**.

Table 6: Required On-Site Storage Volumes (m^3)

Return Period (Year)	2 - Year	10 - Year	50 - Year	100 - Year
Allowable Discharge Rate (L/s)	15.81	15.34	14.95	14.79
Storage Volume (m^3)	7.33	21.73	33.80	38.85

Based on the proposed site condition and on-site stormwater retention & detention requirement, a 44.0 m^3 stormwater storage tank will be required at P1 and P2 level of the underground parking. The exact tank and discharge details (pumps, backflow check valve, piping and valves, etc.) will be provided by the project team mechanical engineer in the next stage of design.

Detailed storage volume calculations are provided in **Appendix A-06** to **Appendix A-09**.

4.3 WATER QUALITY CONTROL REQUIREMENT

Unlike parking lots, building rooftop is not subjected to vehicular traffic and the application of sand and de-icing salt constituents, petroleum hydrocarbons and heavy metals. Therefore, all the stormwater generated from the building rooftop is considered clean for the purposes of the WWFM Guideline water quality control.

To achieve the long-term average 80% TSS removal efficiency on an annual basis from all runoff leaving the site, stormwater quality treatment system will be utilized. Stormcepter EFO10 has been sized to treat the stormwater runoff from the entire site to provide at least 80% TSS removal. Information regarding the stormcepter is provided in **Appendix A**.

Table 7: TSS Removal Assessment

Water Quality Control Component	Area (m^2)	TSS Removal Efficiency	Composite TSS Removal Efficiency (%)
Impervious Roof	1309	80	78.5
Oil Grit Separator	1334	50*	50.0
Total	1334	--	>80

**TSS removal efficiency of OGS devices based on the City of Toronto WWFM Guidelines.*

4.4 EROSION AND SEDIMENT CONTROL DURING CONSTRUCTION

During site construction, it is recommended that all erosion and sediment control Best Management Practices (BMPs) shall be installed and maintained in accordance with the Greater Golden Horseshoe Area Conservation Authorities' (GGHA CAs) *Erosion & Sediment Control Guideline for Urban Construction* (December 2006). In brief, the measures below are anticipated to be provided on site during the entire period of construction:

- Siltation control fence along the perimeter of the construction site before commencement of construction;
- Sediment control measures to prevent silt entry at all the existing area drains and catch basins;
- Granular mud-mats at all construction ingress / egress locations;
- Street sweeping program; and
- An inspection and monitoring program following the GGHA CA's *Erosion & Sediment Control Guideline for Urban Construction* (December 2006).

5 SITE SERVICING

The purpose of this site servicing report is to review the site servicing requirement of the proposed new development, and propose a site servicing plan, including water supply, sanitary and storm services. Refer to **Dwg. C-02** - Site Servicing Plan for details of the proposed site service connections.

5.1 EXISTING MUNICIPAL SERVICES

The municipal services in the vicinity of the proposed development site include the following:

- 150mm dia. watermain on Richmond Street West;
- 600mm × 900mm E.S.Br. combined sewer on Richmond Street West;
- 150mm dia. watermain on Camden Street; and
- 450mm V.P. combined sewer on Camden Street.

The proposed development site occupies two commercial sites, 465-471 Richmond Street West and 38 Camden Street. Based on the background information collected from the City of Toronto, there is no storm sewers along the municipal right-of-way of Richmond Street West and Camden Street, between Brant Street and Spadina Avenue. Hence, it can be expected that the existing sanitary and storm flows from the commercial building at 465-471 Richmond Street West and the commercial building at 38 Camden Street are discharged to the 600mm × 900mm E.S.Br. combined sewer on Richmond Street West and 450mm V.P. combined sewers on Camden Street respectively, and discharge to the 1650mm × 1200mm combined sewer on Spadina Avenue. The existing water supply for the building at 465-471 Richmond Street West and the building 38 Camden Street are serviced from the 150mm watermain on Richmond Street West and Camden Street respectively.

5.2 PROPOSED SITE SERVICE CONNECTIONS

Based on the project statistics of proposed development provided by the architect and the design criteria of the City, sanitary flow and water demand are estimated in **Appendix B-01** and **Appendix E-02** and is summarized in **Table 8**. Storm flow discharge rate have been provided in the previous section of this report.

Table 8: Site Servicing Requirement for Proposed Development Site

Total Allowable Storm Discharge Rate (L/s)	Sanitary Discharge Rate (L/s)	Water Demand (L/s)
16.36*	8.15	67.6

**The storm flow discharged is an overcontrolled rate as discussed in the previous section. The proposed discharge rate through the storm service connection varies between 15.81 L/s during 2-year storm event and 14.79 L/s during 100-year storm event.*

Through discussion with design team mechanical engineer, the locations and sizes of the proposed site service connections have been determined to satisfy the requirements of the City of Toronto and the Ontario Building Code (OBC). In summary:

a) Sanitary Service: As requested by the project team mechanical engineer, a proposed 250 mm sanitary service connection will be installed to discharge sanitary flow to the existing 450 mm combined sewer on Camden Street.

b) Storm Service: Storm flow will be discharged at the allowable release rate through a 250 mm storm service connection to the existing egg shaped 600 mm × 900 mm brick combined sewer on Richmond Street West.

c) Water service:

- Domestic Water Service: A 100 mm dia. PVC domestic water service connection will be installed to service the proposed buildings and connected to the proposed 150 mm dia. PVC fire protection water service connection with a cut-in tee-connection.
- Fire Protection Service: A 150 mm fire protection PVC water service will be installed.
- The 150 mm watermain on Richmond Street West will be utilized to service the proposed development site.

Refer to **Dwg. C-02** in **Appendix G** for details of proposed service connections.

Adequacy of Existing Municipal Services

Based on the design criteria and the design records, assessment of the existing 450mm V.P. combined sewer on Camden Street, and 600mm × 900mm E.S.Br. combined sewer and 150mm watermain on Richmond Street West are reviewed as below:

600mm × 900mm E.S.Br. combined sewer on Richmond Street West:

The capacity of the existing 600mm × 900mm E.S.Br. combined sewer on Richmond Street West is reviewed based on the site servicing requirement and the HVM sewer model data provided by the City. Refer to **Appendix A** for the stormwater discharge rate and **Appendix C** for the hydraulic calculation output of HVM modelling provided by the City of Toronto.

Table 9: Comparison of Existing Spare Flow Capacities and Storm Design Flows

Corresponding Sewer Segment in HVM Model	Existing Spare Flow Capacity (L/s)	Proposed 2-year Storm Discharge Rate (L/s)	Remaining Spare Flow Capacity (L/s)
2540	-363	15.81	-378.81

Based on the results from the HVM Model, it is evident that the existing 600mm × 900mm egg shaped brick combined sewer on Richmond Street West is surcharged and would not have any spare capacity to accommodate the 2-year storm (15.81 L/s) discharge flow from the proposed development. To further access the impact of the proposed development on the existing combined sewer along Richmond Street West, calculations are undertaken to compare the discharge flow rates under both existing and proposed conditions. Refer to **Appendix D-01** and **Appendix D-02** for the existing storm and sanitary discharge rate from 465-471 Richmond Street West.

Table 10: Discharging Flow Rates Comparison to the 600mm × 900mm E.S.Br. Combined Sewer

Sanitary Flow Rate (L/s)		2-year Storm Discharge Rate (L/s)		Total Discharge to Combined Sewer (L/s)	
Existing	Proposed	Existing	Proposed	Existing	Proposed
0.23	0.00	18.70	15.81	18.93	15.81

Table 10 shows that the discharge flows to the 600mm × 900mm combined sewer on Richmond Street West will decrease by 16.5% under proposed condition. Therefore, the proposed development will not aggravate the existing condition and, hence, will not contravene the Ministry of Environment Procedure F-5-5.

450mm V.P. combined sewer on Camden Street:

The capacity of the existing 450mm V.P. combined sewer on Camden Street is reviewed based on the site servicing requirement and the HVM sewer model data provided by the City. Refer to **Appendix B** for the sanitary discharge rate and **Appendix C** for the hydraulic calculation output of HVM modelling provided by the City of Toronto.

Table 11: Comparison of Existing Spare Flow Capacities and Sanitary Design Flows

Corresponding Sewer Segment in HVM Model	Existing Spare Flow Capacity (L/s)	Proposed Sanitary Discharge Rate (L/s)	Remaining Spare Flow Capacity (L/s)
2553	21	8.15	12.85

Based on the results from the HVM Model, it is evident that the existing 450mm combined sewer on Camden Street has spare capacity to accommodate the sanitary (8.15 L/s) flow from the proposed development. To further access the impact of the proposed development on the existing combined sewer along Camden Street, calculations are undertaken to compare the discharge flow rates under both existing and proposed conditions. Refer to **Appendix D-03** and **Appendix D-04** for the existing storm and sanitary discharge rate from 38 Camden Street.

Table 12: Discharging Flow Rates Comparison to the 450mm Combined Sewer

Sanitary Flow Rate (L/s)		Storm Discharge Rate (L/s)		Total Discharge to Combined Sewer (L/s)	
Existing	Proposed	Existing (2-yr)	Proposed (100-yr)	Existing	Proposed
0.50	8.15	10.75	1.56	11.25	9.71

Table 12 shows that the discharge flows to the 450mm combined sewer on Camden Street will decrease by 13.7% under proposed condition. Therefore, the proposed development will not aggravate the existing condition and, hence, will not contravene the Ministry of Environment Procedure F-5-5.

150mm Watermain:

The design water demand is estimated at 67.6 L/s based on the project statistics. In order to evaluate the adequacy of the 150mm watermain located on Richmond Street West, a hydrant flow test was conducted on August 8, 2018 by Classic Fire Protection Inc. Test results are included in **Appendix F**.

As shown by the test readings, the available water pressure ranges from 52 psi with a flow of 596.6 US GPM to 45 psi with a flow of 730.7 US GPM during the flow tests with a static pressure of 74 psi. At the design water demand of 67.6 L/s (or 1071.6 US GPM) generated from the development, the flow test results show a residual pressure of 15.8 psi, which is less than the minimum requirement of 20 psi (150 kPa).

Since there is inadequate water supply and pressure available to serve the proposed development, a booster pump will be sized by the project team mechanical engineer in the next stage of design.

6 CONCLUSIONS

6.1 STORMWATER MANAGEMENT PLAN

- Under existing condition, there are no existing on-site stormwater management facilities.
- On-site storage volume of approximate 5.12 m^3 will be provided for retaining the first 5mm rainfall runoff as required to achieve water balance target. This portion of water shall be reused on site for irrigation, grey water, etc. The consumption rates will be provided by the project team mechanical engineer in the next stage of design.
- On-site storage tank with approximate 44.0 m^3 in volume will be required in order to control the post-development 100-year stormwater flows to 2-year pre-development level and to provide 5mm Stormwater retention.
- In addition to clean roof, a stormceptor is proposed to satisfy the water quality control requirement of 80% TSS removal.

6.2 TEMPORARY EROSION & SEDIMENT CONTROL MEASURES

Temporary erosion and sediment control measures will be provided before construction and maintained during construction in accordance with GGHA CA's *Erosion & Sediment Control Guideline for Urban Construction* (December 2006)

6.3 SITE SERVICING

Proposed site service connections for the proposed development site:

- Storm service: 250mm dia. PVC pipe;
- Sanitary service: 250mm dia. PVC pipe;
- Water service: 100mm dia. domestic and 150mm dia. PVC pipe fire water supply;

Prepared By:

LEA Consulting Ltd.

Cristina Iliescu, P.Eng.
Senior Municipal Engineer

APPENDIX A

Stormwater Peak Flow and Storage Calculation

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	D.P.	Page No.	A-01
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

471 RICHMOND STREET WEST AND 38 CAMDEN STREET

EXISTING CONDITIONS:

Existing Land Use	Area (m^2)
Building & Paved Area	1334.4
Landscape	0.0
Total Site Area:	**1334.4**

PROPOSED DEVELOPMENT:

Proposed Land Use	Area (m^2)
Sub-Catchment #1	
Building	1254.9
Green Roof Coverage	54.5
Sub-Catchment #2	
Paved Area	25.0
Total Site Area	**1334.4**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	D.P.	Page No.	A-02
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

Pre-Development Composite Runoff Coefficient "C"

Location	Area (ha)	C	Composite "C"	
Building & Paved Area	0.133	0.90		
Total Site Area:	**0.133**		**0.90**	
			0.50	max. allowable by City of Toronto
Imperviousness Percent:			**100.0**	

Post-Development Composite Runoff Coefficient "C"

Sub-Catchment #1

Location	Area (ha)	C	Composite "C"
Building	0.125	0.90	
Green Roof Coverage	0.005	0.25	
Sub-Catchment #1 Area	**0.131**		**0.87**
Imperviousness Percent:			**95.8**

Sub-Catchment #2

Location	Area (ha)	C	Composite "C"
Paved Area	0.003	0.90	
Sub-Catchment #2 Area	**0.003**		**0.90**
Imperviousness Percent:			**100.0**

Total Site Area

Location	Area (ha)	C	Composite "C"
Building	0.128	0.90	
Green Roof Coverage	0.005	0.25	
Total Site Area	**0.133**		**0.87**
Imperviousness Percent:			**95.9**

LEA Consulting Ltd. Consulting Engineers and Planners	5mm Rainfall Retention Volume (Water Balance)			
	Prepared:	D.P.	Page No.	A-03
	Checked:	M.D.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

According to the WWFM Guidelines, in order to achieve the water balance target, it is required to retain all runoff from a small event - typically 5mm (in Toronto, storms with 24 hour volumes of 5mm or less contribute about 50% of the total average annual rainfall volume) through infiltration, evapotranspiration & rainwater reuse.

Site Area:	0.133	ha
Runoff Coefficient :	0.87	Post-development site conditions

Runoff volume from 5mm rainfall event on site:

V = 0.133 x 10 x 5 =6.67 m^3

Initial Abstraction:

Paved area:	1280 x 1 mm /1000	=1.28	m3
Landscaped area:	55 x 5 mm /1000	=0.27	m3

Required on-site retention volume for 5mm rainfall event: 5.12 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	D.P.	Page No.	A-04
	Checked:	C.I.		
Project: 471 Richmond Street West	Proj. #	19114		
38 Camden Street	Date:	24-Apr-19		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	0.133	ha
Time of Concentratior	10	minutes as per WWFM Guidelines
Runoff Coefficient :	0.50	Pre-development condition

Rainfall Intensity: I = aT^c (City of Toronto Design Criteria for Sewers and Watermains)

Return Period:	2-yr	10-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	88.19	162.27	224.32	250.32

Peak Flow Rate (L/s):

Return Period:	2-yr	10-yr	50-yr	100-yr
Under existing site conditions (L/s):	16.36	30.10	41.61	46.43

Allowable discharge rate into municipal storm sewer:

Since the stormwater from Sub-Catchment #2 is not controlleddue to the site constraints, the stormwater discharged from Sub-Catchment #1 will be overcontrolled, i.e. the allowabel discharge flow rates from two catchment areas:

Sub-Catchment #1 (overcontrolled):	14.79	L/s
Sub-Catchment #2 (100-year storm):	1.56	L/s

Overcontrolled discharge rate (100-yr) from cistern into municipal storm sewer:

14.79 L/s

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation (Uncontrolled)			
	Prepared:	D.P.	Page No.	A-05
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area:	0.133	ha
Runoff Coefficient:	0.87	Post-development
Time of Concentration:	10	minutes as per WWFM Guidelines
Sub-Catchment #1 Area:	0.131	ha
Runoff Coefficient :	0.87	Post-development
Sub-Catchment #2 Area:	0.003	ha
Runoff Coefficient :	0.90	Post-development

Rainfall Intensity: $I = aT^c$ (City of Toronto Design Criteria for Sewers and Watermains)

Return Period:	2-yr	10-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	88.19	162.27	224.32	250.32

Sub-Catchment #1 Peak Flow Rate (L/s):

Return Period:	2-yr	10-yr	50-yr	100-yr
Under post-development conditions (L/s):	28.00	51.52	71.23	79.48

Sub-Catchment #2 Peak Flow Rate (L/s):

Return Period:	2-yr	10-yr	50-yr	100-yr
Under post-development conditions (L/s):	0.55	1.01	1.40	1.56

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (2-Year Storm)			
	Prepared:	D.P.	Page No.	A-06
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

Sub-Catchment #1 Drainage Area (ha) = 0.131 ha
Sub-Catchment #1 Composite C = 0.87
Allowable Overcontrolled Release Rate = 15.81 L/s
Return Period = 2 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
10	88.19	28.02	16.81	15.81	9.48	7.33
12	76.50	24.31	17.50	15.81	11.38	6.12
14	67.83	21.55	18.11	15.81	13.28	4.83
16	61.12	19.42	18.65	15.81	15.17	3.48
18	55.76	17.72	19.13	15.81	17.07	2.06
20	51.36	16.32	19.58	15.81	18.97	0.61
22	47.68	15.15	20.00	15.81	20.86	-0.86
24	44.55	14.16	20.38	15.81	22.76	-2.38
26	41.85	13.30	20.75	15.81	24.66	-3.91
28	39.50	12.55	21.09	15.81	26.55	-5.46
30	37.43	11.89	21.41	15.81	28.45	-7.04
32	35.60	11.31	21.72	15.81	30.35	-8.63
34	33.95	10.79	22.01	15.81	32.24	-10.23
36	32.47	10.32	22.29	15.81	34.14	-11.85
38	31.13	9.89	22.55	15.81	36.04	-13.49
40	29.91	9.50	22.81	15.81	37.93	-15.12
42	28.79	9.15	23.06	15.81	39.83	-16.77
44	27.77	8.82	23.29	15.81	41.73	-18.44
46	26.82	8.52	23.52	15.81	43.62	-20.10
48	25.94	8.24	23.74	15.81	45.52	-21.78

2-Year Required Storage Volume = 7.33 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (10-Year Storm)			
	Prepared:	D.P.	Page No.	A-07
	Checked:	C.I.		
Project: 471 Richmond Street West	Proj. #	19114		
38 Camden Street	Date:	24-Apr-19		

Sub-Catchment #1 Drainage Area (ha) = 0.131 ha
Sub-Catchment #1 Composite C = 0.87
Allowable Overcontrolled Release Rate = 15.34 L/s
Return Period = 10 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
10	162.27	51.56	30.94	15.34	9.21	21.73
12	140.24	44.56	32.09	15.34	11.05	21.04
14	123.97	39.39	33.09	15.34	12.89	20.20
16	111.41	35.40	33.99	15.34	14.73	19.26
18	101.39	32.22	34.80	15.34	16.57	18.23
20	93.20	29.61	35.54	15.34	18.41	17.13
22	86.36	27.44	36.22	15.34	20.25	15.97
24	80.55	25.59	36.86	15.34	22.09	14.77
26	75.55	24.01	37.45	15.34	23.93	13.52
28	71.20	22.63	38.01	15.34	25.78	12.23
30	67.38	21.41	38.54	15.34	27.62	10.92
32	63.99	20.33	39.04	15.34	29.46	9.58
34	60.96	19.37	39.52	15.34	31.30	8.22
36	58.24	18.50	39.97	15.34	33.14	6.83
38	55.77	17.72	40.40	15.34	34.98	5.42
40	53.53	17.01	40.82	15.34	36.82	4.00
42	51.48	16.36	41.22	15.34	38.66	2.56
44	49.60	15.76	41.61	15.34	40.50	1.11
46	47.87	15.21	41.98	15.34	42.35	-0.37
48	46.26	14.70	42.34	15.34	44.19	-1.85

10-Year Required Storage Volume = 21.73 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (50-Year Storm)			
	Prepared:	D.P.	Page No.	A-08
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

Sub-Catchment #1 Drainage Area (ha) = 0.131 ha
Sub-Catchment #1 Composite C = 0.87
Allowable Overcontrolled Release Rate = 14.95 L/s
Return Period = 50 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
10	224.32	71.28	42.77	14.95	8.97	33.80
12	193.88	61.61	44.36	14.95	10.77	33.59
14	171.38	54.46	45.74	14.95	12.56	33.18
16	154.02	48.94	46.98	14.95	14.36	32.62
18	140.17	44.54	48.10	14.95	16.15	31.95
20	128.84	40.94	49.13	14.95	17.95	31.18
22	119.38	37.93	50.07	14.95	19.74	30.33
24	111.35	35.38	50.95	14.95	21.53	29.42
26	104.45	33.19	51.77	14.95	23.33	28.44
28	98.43	31.28	52.55	14.95	25.12	27.43
30	93.15	29.60	53.28	14.95	26.92	26.36
32	88.46	28.11	53.97	14.95	28.71	25.26
34	84.27	26.78	54.63	14.95	30.51	24.12
36	80.51	25.58	55.26	14.95	32.30	22.96
38	77.10	24.50	55.86	14.95	34.10	21.76
40	74.00	23.51	56.43	14.95	35.89	20.54
42	71.17	22.61	56.99	14.95	37.69	19.30
44	68.57	21.79	57.52	14.95	39.48	18.04
46	66.17	21.03	58.03	14.95	41.28	16.75
48	63.96	20.32	58.53	14.95	43.07	15.46

50-Year Required Storage Volume = 33.80 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (100 - Year Storm)			
	Prepared:	D.P.	Page No.	A-09
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	24-Apr-19		

Sub-Catchment #1 Drainage Area (ha) = 0.131 ha
Sub-Catchment #1 Composite C = 0.87
Allowable Overcontrolled Release Rate = 14.79 L/s
Return Period = 100 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
10	250.32	79.54	47.72	14.79	8.88	38.84
12	216.35	68.74	49.50	14.79	10.65	38.85
14	191.25	60.77	51.05	14.79	12.43	38.62
16	171.87	54.61	52.43	14.79	14.20	38.23
18	156.41	49.70	53.68	14.79	15.98	37.70
20	143.77	45.68	54.82	14.79	17.75	37.07
22	133.22	42.33	55.88	14.79	19.53	36.35
24	124.26	39.48	56.86	14.79	21.30	35.56
26	116.55	37.03	57.77	14.79	23.08	34.69
28	109.84	34.90	58.64	14.79	24.85	33.79
30	103.94	33.03	59.45	14.79	26.63	32.82
32	98.71	31.37	60.22	14.79	28.40	31.82
34	94.04	29.88	60.96	14.79	30.18	30.78
36	89.84	28.55	61.66	14.79	31.95	29.71
38	86.03	27.34	62.33	14.79	33.73	28.60
40	82.57	26.24	62.97	14.79	35.50	27.47
42	79.41	25.23	63.59	14.79	37.28	26.31
44	76.51	24.31	64.18	14.79	39.05	25.13
46	73.84	23.46	64.76	14.79	40.83	23.93
48	71.37	22.68	65.31	14.79	42.60	22.71

100-Year Required Storage Volume = 38.85 m^3

Stormceptor®

FORTERRA™

Brief Stormceptor Sizing Report - 471 Richmond St W & 38 Camden St

Project Information & Location			
Project Name	471 Richmond Street West & 38 Camden Street	**Project Number**	19114
City	Toronto	**State/ Province**	Ontario
Country	Canada	**Date**	4/24/2019
Designer Information		**EOR Information (optional)**	
Name	Dorothy Poon	**Name**	
Company	LEA Consulting	**Company**	
Phone #	905-470-0015	**Phone #**	
Email	dpoon@lea.ca	**Email**	

Stormwater Treatment Recommendation
The recommended Stormceptor Model(s) which achieve or exceed the user defined water quality objective for each site within the project are listed in the below Sizing Summary table.

Site Name	471 Richmond St W & 38 Camden St
Target TSS Removal (%)	70
TSS Removal (%) Provided	70
Recommended Stormceptor Model	EF10

The recommended Stormceptor Model achieves the water quality objectives based on the selected inputs, historical rainfall records and selected particle size distribution.

EF Sizing Summary	
EF Model	**% TSS Removal Provided**
EF4	63
EF6	67
EF8	69
EF10	70
EF12	70
Parallel Units / MAX	Custom

Stormceptor® FORTERRA

Sizing Details

Drainage Area	
Total Area (ha)	0.133
Imperviousness %	95.9

Water Quality Objective	
TSS Removal (%)	70.0
Runoff Volume Capture (%)	
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	
Water Quality Flow Rate (L/s)	

Rainfall	
Station Name	TORONTO CENTRAL
State/Province	Ontario
Station ID #	0100
Years of Records	18
Latitude	43°37'N
Longitude	79°23'W

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.000	0.000

Up Stream Flow Diversion	
Max. Flow to Stormceptor (cms)	

Particle Size Distribution (PSD)
The selected PSD defines TSS removal

CA ETV		
Particle Diameter (microns)	Distribution %	Specific Gravity
2.0	5.0	2.65
5.0	5.0	2.65
8.0	10.0	2.65
20.0	15.0	2.65
50.0	10.0	2.65
75.0	5.0	2.65
100.0	10.0	2.65
150.0	15.0	2.65
250.0	15.0	2.65
500.0	5.0	2.65
1000.0	5.0	2.65

Notes

- Stormceptor performance estimates are based on simulations using PCSWMM for Stormceptor, which uses the EPA Rainfall and Runoff modules.
- Design estimates listed are only representative of specific project requirements based on total suspended solids (TSS) removal defined by the selected PSD, and based on stable site conditions only, after construction is completed.
- For submerged applications or sites specific to spill control, please contact your local Stormceptor representative for further design assistance.

For Stormceptor Specifications and Drawings Please Visit:
http://www.imbriumsystems.com/technical-specifications

STANDARD SPECIFICATION FOR
"OIL GRIT SEPARATOR" (OGS) STORMWATER QUALITY TREAMENT DEVICE

PART 1 – GENERAL

1.1 WORK INCLUDED

This section specifies requirements for selecting, sizing, designing, maintaining, and constructing an underground Oil Grit Separator (OGS) device for stormwater quality treatment, with third-party testing results and a Statement of Verification in accordance with ISO 14034 Environmental Management – Environmental Technology Verification (ETV). Work includes supply and installation of concrete bases, precast sections, and the appropriate precast section with OGS internal components correctly installed within the system, watertight sealed to the precast concrete prior to arrival to the project site.

1.2 REFERENCE STANDARDS

1.2.1 For Canadian projects only, the following reference standards apply:

CAN/CSA-A257.4-14: Joints for Circular Concrete Sewer and Culvert Pipe, Manhole Sections, and Fittings Using Rubber Gaskets
CAN/CSA-A257.4-14: Precast Reinforced Circular Concrete Manhole Sections, Catch Basins, and Fittings
CAN/CSA-S6-00: Canadian Highway Bridge Design Code

1.2.2 For ALL projects, the following reference standards apply:

ASTM D-4097:	Contact Molded Glass Fiber Reinforced Chemical Resistant Tanks
ASTM C 478:	Specification for Precast Reinforced Concrete Manhole Sections
ASTM C 443:	Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
ASTM C 891:	Standard Practice for Installation of Underground Precast Concrete Utility Structures
ASTM D2563:	Standard Practice for Classification of Visual Defects in Reinforced Plastics

1.3 SHOP DRAWINGS

1.3.1 Shop drawings shall be submitted upon request with each order to the contractor then forwarded to the Engineer of Record for review and acceptance. Shop drawings shall detail the precast concrete components and OGS internal components prior to shipment, including the sequence for installation.

1.3.2 Unless directed otherwise by the Engineer of Record, OGS stormwater quality treatment product substitutions or alternatives submitted within ten days prior to project bid shall not be accepted. All alternatives or substitutions submitted shall be based on the exact same criteria detailed in Section 3, in entirety, subject to review and approval by the Engineer of Record. Any and all changes to project cost estimates, bonding amounts, plan check fees for revision of approved documents, or design impacts due to regulatory requirements as a result of a product substitution shall be coordinated by the Contractor with the Engineer of Record.

1.4 HANDLING AND STORAGE

Prevent damage to materials during storage and handling.

1.4.1 OGS internal components supplied by the Manufacturer for attachment to the precast concrete vessel shall be pre-fabricated, bolted to the precast and watertight sealed to the precast vessel surface prior to site delivery to ensure Manufacturer's internal assembly process and quality control processes are fully adhered to, and to prevent materials damage on site.

1.4.2 Follow all instructions including the sequence for installation in the shop drawings during installation.

PART 2 – PRODUCTS

2.1 GENERAL

2.1.1 The OGS vessel shall be cylindrical and constructed from precast concrete riser and slab components.

2.1.2 The precast concrete OGS internal components shall include a fiberglass insert bolted and watertight sealed inside the precast concrete vessel, prior to site delivery. Primary internal components that are to be anchored and watertight sealed to the precast concrete vessel shall be done so only by the Manufacturer prior to arrival at the job site to ensure product quality.

2.1.3 The OGS shall be allowed to be specified and have the ability to function as a 240-degree bend structure in the stormwater drainage system, or as a junction structure.

2.1.4 The OGS to be specified shall have the capability to accept influent flow from an inlet grate and an inlet pipe.

2.2 PRECAST CONCRETE SECTIONS

All precast concrete components shall be designed and manufactured to meet highway loading conditions per State/Provincial or local requirements.

2.3 GASKETS

Only profile neoprene or nitrile rubber gaskets that are oil resistant shall be accepted. For Canadian projects only, gaskets shall be in accordance to CSA A257.4-14. Mastic sealants, butyl tape/rope or Conseal CS-101 alone are not acceptable gasket materials.

2.4 JOINTS

The concrete joints shall be watertight and meet the design criteria according to ASTM C-990. For projects where joints require gaskets, the concrete joints shall be watertight and oil resistant and meet the design criteria according to ASTM C-443. Mastic sealants or butyl tape/rope alone are not an acceptable alternative.

2.5 FRAMES AND COVERS

Frames and covers shall be manufactured in accordance with State/Provincial or local requirements for inspection and maintenance access purposes. A minimum of one cover, at least 22-inch (560 mm) in diameter, shall be clearly embossed with the OGS manufacturer's product name to properly identify this asset's purpose is for stormwater quality treatment.

2.6 PRECAST CONCRETE

All precast concrete components shall conform to the appropriate CSA or ASTM specifications.

2.7 FIBERGLASS

The fiberglass portion of the OGS device shall be constructed in accordance with ASTM D2563, and in accordance with the PS15-69 manufacturing standard, and shall only be installed, bolted and watertight sealed to the precast concrete by the Manufacturer prior to arrival at the project site to ensure product quality.

2.8 OGS POLLUTANT STORAGE

The OGS device shall include a sump for sediment storage, and a fiberglass insert for the capture and storage of petroleum hydrocarbons and buoyant gross pollutants. The total sediment storage capacity shall be a minimum 40 ft^3 (1.1 m^3). The total petroleum hydrocarbon storage capacity shall be a minimum 50 gallons (189 liters). The access opening to the sump of the OGS device for periodic inspection and maintenance purposes shall be a minimum 16 inches (406 mm) in diameter.

2.9 LADDERS

Ladder rungs shall be provided upon request or to comply with State/Provincial or local requirements.

2.10 INSPECTION

All precast concrete sections shall be level and inspected to ensure dimensions, appearance, integrity of internal components, and quality of the product meets State/Provincial or local specifications and associated standards.

PART 3 – PERFORMANCE & DESIGN

3.1 GENERAL

The OGS stormwater quality treatment device shall be verified in accordance with ISO 14034:2016 Environmental management – Environmental technology verification (ETV). The OGS stormwater quality treatment device shall remove oil, sediment and gross pollutants from stormwater runoff during frequent wet weather events, and retain these pollutants during less frequent high flow wet weather events below the insert within the OGS for later removal during maintenance. The Manufacturer shall have at least ten (10) years of local experience, history and success in engineering design, manufacturing and production and supply of OGS stormwater quality treatment device systems, acceptable to the Engineer of Record.

3.2 HYDROLOGY AND RUNOFF VOLUME

The OGS device shall be engineered, designed and sized to treat a minimum of 90 percent of the average annual runoff volume, unless otherwise stated by the Engineer of Record, using historical rainfall data. Rainfall data sets should be comprised of a minimum 15-years of rainfall data or a longer continuous period if available for a given location, but in all cases a minimum 5-year period of rainfall data.

3.3 ANNUAL (TSS) SEDIMIMENT LOAD AND STORAGE CAPACITY

The OGS device shall be capable of removing and have sufficient storage capacity for the calculated annual total suspended solids (TSS) mass load and volume without scouring previously captured pollutants prior to maintenance being required. The annual (TSS) sediment load and volume transported from the drainage area should be calculated and compared to the OGS device's available storage capacity by the specifying Engineer to ensure adequate capacity between maintenance cycles. Sediment loadings shall be determined by land use and defined as a minimum of 450 kg (992 lb) of sediment (TSS) per impervious hectare of drainage area per year, or greater based on land use, as noted in Table 1 below.

Annual sediment volume calculations shall be performed using the projected average annual treated runoff volume, a typical sediment bulk density of 1602 kg/m^3 (100 lbs/ft^3) and an assumed Event Mean Concentration (EMC) of 125 mg/L TSS in the runoff, or as otherwise determined by the Engineer of Record.

Example calculation for a 1.3-hectares parking lot site:

- 1.28 meters of rainfall depth, per year

- 1.3 hectares of 100% impervious drainage area
- EMC of 125 mg/L TSS in runoff
- Treatment of 90% of the average annual runoff volume
- Target average annual TSS removal rate of 60% by OGS

Annual Runoff Volume:
- 1.28 m rain depth x 1.3 ha x 10,000 m^2/ha= 16,640 m^3 of runoff volume
- 16,640 m^3 x 1000 L/m^3 = 16,640,000 L of runoff volume
- 16,640,000 L x 0.90 = 14,976,000 L to be treated by OGS unit

Annual Sediment Mass and Sediment Volume Load Calculation:
- 14,976,000 L x 125 mg/L x kg/1,000,000 mg = 1,872 kg annual sediment mass
- 1,872 kg x m^3/1602 kg = 1.17 m^3 annual sediment volume
- 1.17 m^3 x 60% TSS removal rate by OGS = 0.70 m^3 minimum expected annual storage requirement in OGS

As a guideline, the U.S. EPA has determined typical annual sediment loads per drainage area for various sites by land use (see Table 1). Certain States, Provinces and local jurisdictions have also established such guidelines.

Table 1 – Annual Mass Sediment Loading by Land Use

	Commercial	Parking Lot	Residential			Highways	Industrial	Shopping Center
			High	Med.	Low			
(lbs/acre/yr)	1,000	400	420	250	10	880	500	440
(kg/hectare/yr)	1,124	450	472	281	11	989	562	494

Source: U.S. EPA Stormwater Best Management Practice Design Guide Volume 1, Appendix D, Table D-1, Burton and Pitt 2002

3.4 SIZING METHODOLOGY

The OGS device shall be engineered, designed and sized to provide stormwater quality treatment based on treating a minimum of 90 percent of the average annual runoff volume and a minimum removal of an annual average 60% of the sediment (TSS) load based on the Particle Size Distribution (PSD) specified in Table 2, Section 3.5, and based on third-party performance testing conducted in accordance with the Canadian Environmental Technology Verification (ETV) Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Sizing shall be determined using historical rainfall data (as specified in Section 3.2) and a sediment removal performance curve derived from the actual third-party verified laboratory testing data. The OGS device shall also have sufficient annual sediment storage capacity as specified and calculated in Section 3.3.

3.4.1 The Peclet Number is not an approved method or model for calculating TSS removal, sizing, or scaling OGS devices.

3.4.2 If an alternate OGS device is proposed, supporting documentation shall be submitted that demonstrates:
- Canadian ETV or ISO 14034 ETV Verification Statement which verifies third-party performance testing conducted in accordance with the **Procedure for Laboratory Testing of Oil-Grit Separators**
- Equal or better sediment (TSS) removal of the PSD specified in Table 2 at equivalent surface loading rates, as compared to the OGS device specified herein.
- Equal or greater sediment storage capacity, as compared to the OGS device specified herein.
- Supporting documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.5 PARTICLE SIZE DISTRIBUTION (PSD) FOR SIZING

The OGS device shall be sized to achieve the Engineer-specified average annual percent sediment (TSS) removal based solely on the test sediment used in the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators.** This test sediment is comprised of inorganic ground silica with a specific gravity of 2.65, uniformly mixed, and containing a broad range of particle sizes as specified in Table 2. No alternative PSDs or deviations from Table 2 shall be accepted.

Table 2
Canadian ETV Program Procedure for Laboratory Testing of Oil-Grit Separators
Particle Size Distribution (PSD) of Test Sediment

Particle Diameter (Microns)	% by Mass of All Particles	Specific Gravity
1000	5%	2.65
500	5%	2.65
250	15%	2.65
150	15%	2.65
100	10%	2.65
75	5%	2.65
50	10%	2.65
20	15%	2.65
8	10%	2.65
5	5%	2.65
2	5%	2.65

3.6 CANADIAN ETV or ISO 14034 ETV VERIFICATION OF SCOUR TESTING

The OGS device shall have Canadian ETV or ISO 14034 ETV Verification of third-party scour testing conducted in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. This scour testing is conducted with the device pre-loaded with test sediment comprised of the particle size distribution (PSD) illustrated in Table 2.

3.6.1 To be acceptable for on-line installation, the OGS device must demonstrate an average scour test effluent concentration less than 10 mg/L at each surface loading rate tested, up to and including 2600 L/min/m^2.

Data generated from laboratory scour testing performed with an OGS device pre-loaded with a coarser PSD than in Table 2 (i.e. the coarser PSD has no particles in the 1-micron to 50-micron size range, or the D_{50} of the test sediment exceeds 75 microns) shall not be acceptable for the determination of the device's suitability for on-line installation.

3.7 DESIGN ACCOUNTING FOR BYPASS

3.7.1 The OGS device shall be specified to achieve the TSS removal performance and water quality objectives without washout of previously captured pollutants. The OGS device shall also have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record. To ensure this is achieved, there are two design options with associated requirements:

3.7.1.1 The OGS device shall be placed **off-line** with an upstream diversion structure (typically in an upstream manhole) that only allows the water quality volume to be diverted to the OGS device, and excessive flows diverted downstream around the OGS device to prevent high flow washout of pollutants previously captured. This design typically incorporates a triangular layout including an upstream bypass manhole with an appropriately engineered weir wall, the OGS device, and a downstream junction manhole, which is connected to both the OGS device and bypass structure. In this case with an external bypass required, the OGS device manufacturer must provide calculations and designs for all structures, piping and any other required material applicable to the proper functioning of the system, stamped by a Professional Engineer.

3.7.1.2 Alternatively, OGS devices in compliance with Section 3.6 shall be acceptable for an **on-line** design configuration, thereby eliminating the requirement for an upstream bypass manhole and downstream junction manhole.

3.7.2 The OGS device shall also have sufficient hydraulic conveyance capacity to convey the peak storm event, in accordance with hydraulic conditions per the Engineer of Record. If an alternate OGS device is proposed, supporting documentation shall be submitted that demonstrates equal or better hydraulic conveyance capacity as compared to the OGS device specified herein. This documentation shall be signed and sealed by a local registered Professional Engineer. All costs associated with preparing and certifying this documentation shall be born solely by the Contractor.

3.8 PETROLEUM HYDROCARBONS AND FLOATABLES STORAGE CAPACITY

Petroleum hydrocarbons and floatables storage capacity in the OGS device shall be a minimum 50 gallons (189 Liters), or more as specified.

3.8.1 The OGS device shall have gasketed precast concrete joints that are watertight, and oil resistant and meet the design criteria according to ASTM C-443 to provide safe oil and other hydrocarbon materials storage and ground water protection. Mastic sealants or butyl tape/rope alone are not an acceptable alternative.

3.9 SURFACE LOADING RATE SCALING OF DIFFERENT MODEL SIZES

The reference device for scaling shall be an OGS device that has been third-party tested in accordance with the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**. Other model sizes of the tested device shall only be scaled such that the claimed TSS removal efficiency of the scaled device shall be no greater than the TSS removal efficiency of the tested device at identical **surface loading rates** (flow rate divided by settling surface area). The depth of other model sizes of the tested device shall be scaled in accordance with the depth scaling provisions within Section 6.0 of the Canadian ETV Program's **Procedure for Laboratory Testing of Oil-Grit Separators**.

3.9.1 The Peclet Number and volumetric scaling are not approved methods for scaling OGS devices.

PART 4 – INSPECTION & MAINTENANCE

The OGS manufacturer shall provide an Owner's Manual upon request.

4.1 A Quality Assurance Plan that provides inspection and maintenance for a minimum of 5 years shall be included with the OGS stormwater quality device, and written into the Environmental Compliance Approval (ECA) or the appropriate State/Provincial or local approval document.

4.2 OGS device inspection shall include determination of sediment depth and presence of petroleum hydrocarbons and floatables below the insert. Inspection shall be easily conducted from finished grade through a Frame and Cover of at least 22 inch (560 mm) in diameter.

4.3 Inspection and pollutant removal from below the OGS's insert shall be conducted as a periodic maintenance practice using a standard maintenance truck and vacuum apparatus, and shall be easily conducted from finished grade through a Frame and Cover of at least 22-inches (560 mm) in diameter, and through an access opening to the OGS device's sump with a minimum 16-inches diameter (406 mm).

4.4 No confined space for sediment removal or inspection of internal components shall be required for normal operation, annual inspection or maintenance activity.

PART 5 – EXECUTION

5.1 PRECAST CONCRETE INSTALLATION

The installation of the precast concrete OGS stormwater quality treatment device shall conform to ASTM C 891, ASTM C 478, ASTM C 443, CAN/CSA-A257.4-14, CAN/CSA-A257.4-14, CAN/CSA-S6-00 and all highway, State/Provincial, or local specifications for the construction of manholes. Selected sections of a general specification that are applicable are summarized below. The Contractor shall furnish all labor, equipment and materials necessary to offload, assemble as needed the OGS internal components as specified in the Shop Drawings.

5.2 EXCAVATION

5.2.1 Excavation for the installation of the OGS stormwater quality treatment device shall conform to highway, State/Provincial or local specifications. Topsoil that is removed during the excavation for the OGS stormwater quality treatment device shall be stockpiled in designated areas and not be mixed with subsoil or other materials. Topsoil stockpiles and the general site preparation for the installation of the OGS stormwater quality device shall conform to highway, State/Provincial or local specifications.

5.2.2 The OGS device shall not be installed on frozen ground. Excavation shall extend a minimum of 12 inch (300 mm) from the precast concrete surfaces plus an allowance for shoring and bracing where required. If the bottom of the excavation provides an unsuitable foundation additional excavation may be required.

5.2.3 In areas with a high water table, continuous dewatering shall be provided to ensure that the excavation is stable and free of water.

5.3 BACKFILLING

Backfill material shall conform to highway, State/Provincial or local specifications. Backfill material shall be placed in uniform layers not exceeding 12 inches (300 mm) in depth and compacted to highway, State/Provincial or local specifications.

5.4 OGS WATER QUALITY DEVICE CONSTRUCTION SEQUENCE

5.4.1 The precast concrete OGS stormwater quality treatment device is installed and leveled in sections in the following sequence:

- aggregate base
- base slab, or base
- riser section(s) (if required)
- riser section w/ pre-installed fiberglass insert
- upper riser section(s)
- internal OGS device components
- connect inlet and outlet pipes
- riser section, top slab and/or transition (if required)
- frame and access cover

5.4.2 The precast concrete base shall be placed level at the specified grade. The entire base shall be in contact with the underlying compacted granular material. Subsequent sections, complete with oil resistant, watertight joint seals, shall be installed in accordance with the precast concrete manufacturer's recommendations.

5.4.3 Adjustment of the OGS stormwater quality treatment device can be performed by lifting the upper sections free of the excavated area, re-leveling the base, and re-installing the sections.

Damaged sections and gaskets shall be repaired or replaced as necessary. Once the OGS stormwater quality treatment device has been constructed, any lift holes must be plugged with mortar.

5.5 <u>DROP PIPE AND OIL INSPECTION PIPE</u>

Once the upper precast concrete riser has been attached to the lower precast concrete riser section, the OGS device Drop Pipe and Oil Inspection Pipe must be attached, and watertight sealed to the fiberglass insert using Sikaflex 1a. Installation instructions and required materials shall be provided by the OGS manufacturer.

5.6 <u>INLET AND OUTLET PIPES</u>

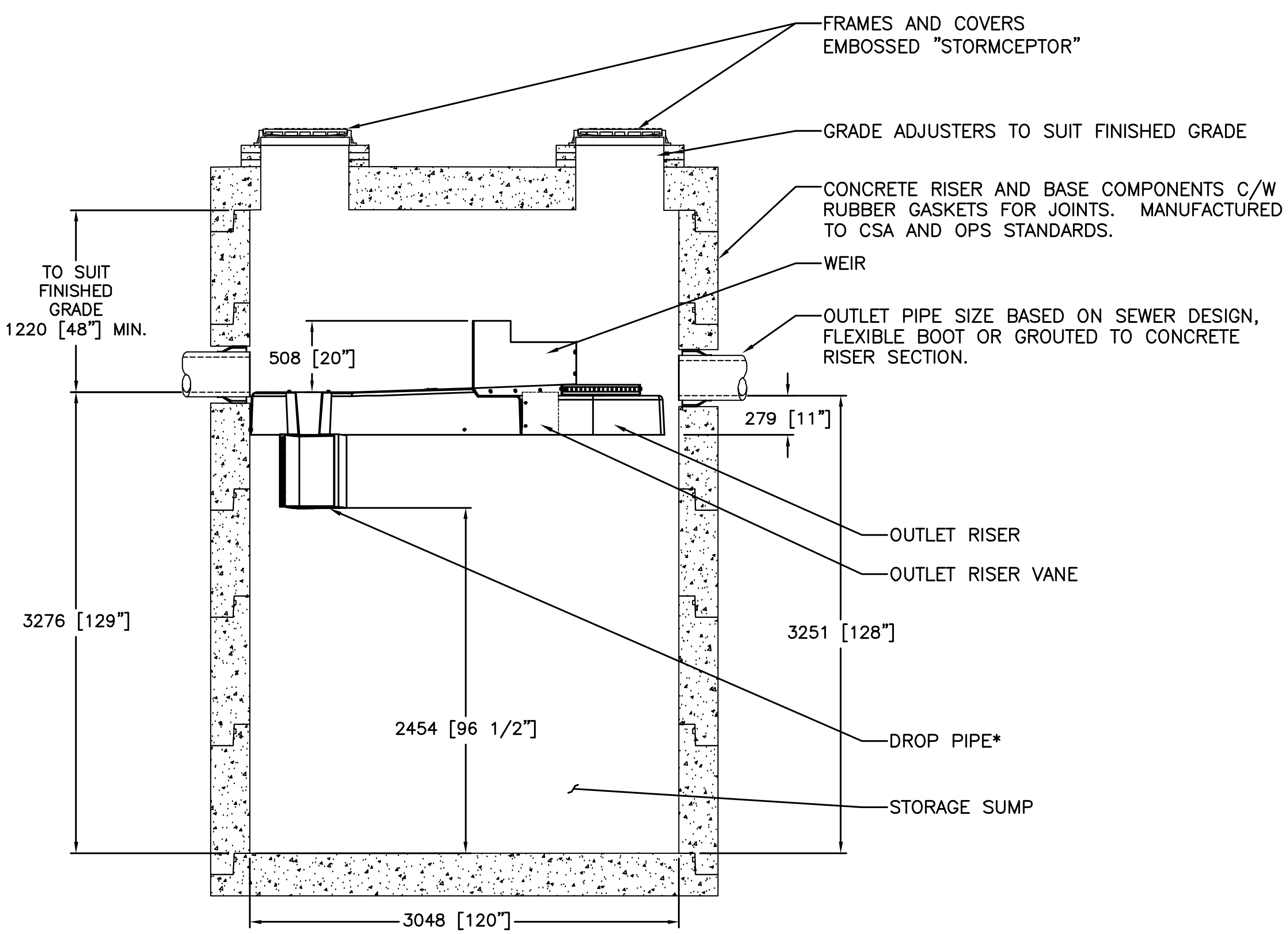
Inlet and outlet pipes shall be securely set using grout or approved pipe seals (flexible boot connections, where applicable) so that the structure is watertight. Non-secure inlets and outlets will result in improper performance.

5.7 <u>FRAME AND COVER OR FRAME AND GRATE INSTALLATION</u>

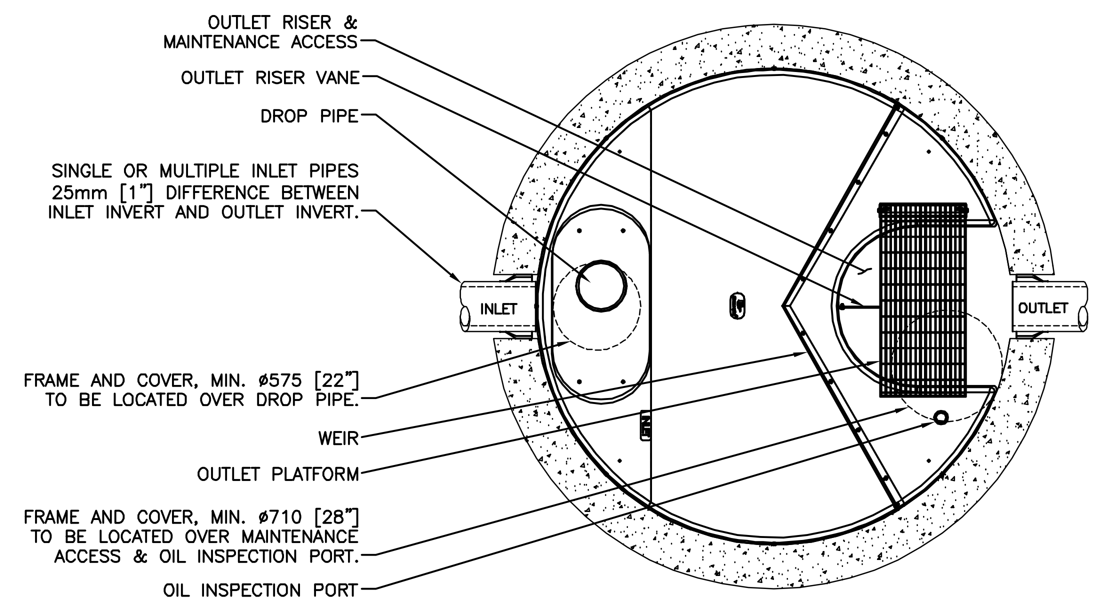
Precast concrete adjustment units shall be installed to set the frame and cover/grate at the required elevation. The adjustment units shall be laid in a full bed of mortar with successive units being joined using sealant recommended by the manufacturer. Frames for the cover/grate should be set in a full bed of mortar at the elevation specified.

5.7.1 A minimum of one cover, at least 22-inch (560 mm) in diameter, shall be clearly embossed with the OGS device brand or product name to properly identify this asset's purpose is for stormwater quality treatment.

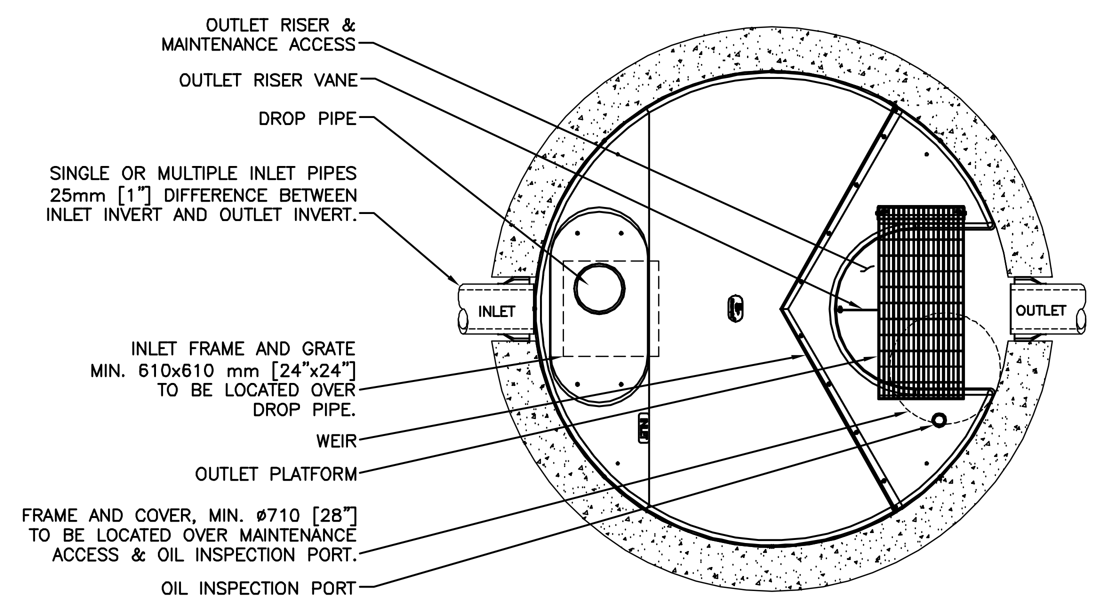
DRAWING NOT TO BE USED FOR CONSTRUCTION



SECTION VIEW



PLAN VIEW (STANDARD)



PLAN VIEW (INLET TOP)

GENERAL NOTES:

* MAXIMUM SURFACE LOADING RATE (SLR) INTO LOWER CHAMBER THROUGH DROP PIPE IS 1135 L/min/m^2 (27.9 gpm/ft^2) FOR STORMCEPTOR EF10 AND 535 L/min/m^2 (13.1 gpm/ft^2) FOR STORMCEPTOR EFO10 (OIL CAPTURE CONFIGURATION).

1. ALL DIMENSIONS INDICATED ARE IN MILLIMETERS (INCHES) UNLESS OTHERWISE SPECIFIED.
2. STORMCEPTOR STRUCTURE INLET AND OUTLET PIPE SIZE AND ORIENTATION SHOWN FOR INFORMATIONAL PURPOSES ONLY.
3. UNLESS OTHERWISE NOTED, BYPASS INFRASTRUCTURE, SUCH AS ALL UPSTREAM DIVERSION STRUCTURES, CONNECTING STRUCTURES, OR PIPE CONDUITS CONNECTING TO COMPLETE THE STORMCEPTOR SYSTEM SHALL BE PROVIDED AND ADDRESSED SEPARATELY.
4. DRAWING FOR INFORMATION PURPOSES ONLY. REFER TO ENGINEER'S SITE/UTILITY PLAN FOR STRUCTURE ORIENTATION.
5. NO PRODUCT SUBSTITUTIONS SHALL BE ACCEPTED UNLESS SUBMITTED 10 DAYS PRIOR TO PROJECT BID DATE, OR AS DIRECTED BY THE ENGINEER OF RECORD.

FOR SITE SPECIFIC DRAWINGS PLEASE CONTACT YOUR LOCAL STORMCEPTOR REPRESENTATIVE. SITE SPECIFIC DRAWINGS ARE BASED ON THE BEST AVAILABLE INFORMATION AT THE TIME. SOME FIELD REVISIONS TO THE SYSTEM LOCATION OR CONNECTION PIPING MAY BE NECESSARY BASED ON AVAILABLE SPACE OR SITE CONFIGURATION REVISIONS. ELEVATIONS SHOULD BE MAINTAINED EXCEPT WHERE NOTED ON BYPASS STRUCTURE (IF REQUIRED).

INSTALLATION NOTES

A. ANY SUB-BASE, BACKFILL DEPTH, AND/OR ANTI-FLOTATION PROVISIONS ARE SITE-SPECIFIC DESIGN CONSIDERATIONS AND SHALL BE SPECIFIED BY ENGINEER OF RECORD.
B. CONTRACTOR TO PROVIDE EQUIPMENT WITH SUFFICIENT LIFTING AND REACH CAPACITY TO LIFT AND SET THE STRUCTURE (LIFTING CLUTCHES PROVIDED)
C. CONTRACTOR WILL INSTALL AND LEVEL THE STRUCTURE, SEALING THE JOINTS, LINE ENTRY AND EXIT POINTS (NON-SHRINK GROUT WITH APPROVED WATERSTOP OR FLEXIBLE BOOT)
D. CONTRACTOR TO TAKE APPROPRIATE MEASURES TO PROTECT THE DEVICE FROM CONSTRUCTION-RELATED EROSION RUNOFF.
E. DEVICE ACTIVATION, BY CONTRACTOR, SHALL OCCUR ONLY AFTER SITE HAS BEEN STABILIZED AND THE STORMCEPTOR UNIT IS CLEAN AND FREE OF DEBRIS.

STANDARD DETAIL
NOT FOR CONSTRUCTION

SITE SPECIFIC DATA REQUIREMENTS

STORMCEPTOR MODEL	EF10				
STRUCTURE ID	*				
WATER QUALITY FLOW RATE (L/s)	*				
PEAK FLOW RATE (L/s)	*				
RETURN PERIOD OF PEAK FLOW (yrs)	*				
DRAINAGE AREA (HA)	*				
DRAINAGE AREA IMPERVIOUSNESS (%)	*				
PIPE DATA:	I.E.	MAT'L	DIA	SLOPE %	HGL
INLET #1	*	*	*	*	*
INLET #2	*	*	*	*	*
OUTLET	*	*	*	*	*

* PER ENGINEER OF RECORD

MARK	DATE	REVISION DESCRIPTION	BY
0	5/26/17	INITIAL RELEASE	JSK
1	6/8/18	OUTLET PLATFORM	JSK
####	####	####	####
####	####	####	####
####	####	####	####

The design and information shown on this drawing is provided as a service to the project owner, engineer and contractor by Imbrium Systems ("Imbrium"). Neither this drawing, nor any part thereof, may be used, reproduced or modified in any manner without the prior written consent of Imbrium. Failure to comply is done at the user's own risk and Imbrium expressly disclaims any liability or responsibility for such use.

If discrepancies between the supplied information upon which the drawing is based and actual field conditions are encountered as site work progresses, these discrepancies must be reported to Imbrium immediately for re-evaluation of the design. Imbrium accepts no liability for designs based on missing, incomplete or inaccurate information supplied by others.

Stormceptor® EF

SCALE = NTS

imbrium®

7037 RIDGE ROAD, SUITE 350, HANOVER, MD 21076

DATE: 5/26/2017	
DESIGNED: JSK	DRAWN: JSK
CHECKED: BSF	APPROVED: SP
PROJECT No.: EF10	SEQUENCE No.: *
SHEET: 1 OF 1	

I:\IMBRIUM\PRODUCTS\STORMCEPTOR EF\40 DRAWINGS & DETAILS\STANDARD DETAILS\EF10-DETAIL.DWG 10/19/2018 9:38 AM

APPENDIX B

Sanitary Demand Calculation

LEA Consulting Ltd. Consulting Engineers and Planners	Proposed Sanitary Flow Rate Calculation			
	Prepared:	D.P.	Page No.	B-01
	Checked:	C.I.		
Project: 471 Richmond Street West **38 Camden Street**	Proj. #	19114		
	Date:	24-Apr-19		

471 Richmond Street West (Hotel)

POPULATION CALCULATION

(Based on the Architect Statistics dated Mar. 19, 2019)

Site Area	1334.4	m^2
Proposed Total GFA	14313.9	m^2
Proposed Above Grade GFA	14089.4	m^3

Proposed Land Use		Density		Population
Type	GFA (m^2)			
Guest Suite	10900.3	1	m^2×bed/30m^2×1p/bed	363
Amenity	843.0	1.1	person/100m^2	9
Office	427.83	3.3	person/100m^2	14
Total	**12171.1**			**387**

SANITARY FLOW CALCULATION

Harmon Peaking Factor: $M=1+14/(4+(P/1000)^{0.5})$

Peaking Factor	4.03	
Average Daily Wastewater Flow	450	L/cap/day
Total Domestic Flow	8.12	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.03	L/sec
Design Flow	**8.15**	L/sec

APPENDIX C

Existing Storm and Sanitary Sewers Network Modeling (HVM), City of Toronto

TORONTO SEWER SYSTEM STUDY AREA 7 - WEST AREA

```
 2528  EGG              1.22/1.60  INFLOW  2527  2494        OUTFLOW  2542        B.NO. 726900                EXIST. COMB.   2528
       YU  84.795  YL  84.094   QF  4517   DQ       59   QDLM    32  VNIGHT0.62   DUC  -0.67   DLC  -0.21    QLM    2090   CAP     2427
       SU  90.611  SL  90.038   AF 1.444   DQD     0.1   HDLM 0.12  HNIGHT0.04   DUS  -4.88   DLS  -4.55    RAIN   7MS5   QLM/QF 0.46
       RES     53  A     0.20   VF  3.13   GAMMA 1.00   VDLM 1.11  VNORM 0.0    HUM   0.93   HLM   1.39    QRQLM  2058   DY      0.70
       IW     0.0  L     88.4   S 1/ 126   N   0.0130   SCOD 102   DWB   0.02   YUM  85.73   YLM  85.49    VLM    1.75   DH     -0.46

       RD       QLM    QRQLM    QDQLM     VLM   DQRMAX       HUM       DUC       DUS           HLM       DLC       DLS          DH
       7MS2    1719     1684       35    1.69       59      0.75     -0.85     -5.06          1.13     -0.47     -4.82       -0.37
       7MS5    2090     2058       32    1.75       74      0.93     -0.67     -4.88          1.39     -0.21     -4.55       -0.46

 2539  EGG              0.61/0.91  INFLOW  2538              OUTFLOW  2540        B.NO. 653902                EXIST. COMB.   2539
       YU  85.283  YL  84.887   QF   720   DQ      135   QDLM     7  VNIGHT0.38   DUC   0.99   DLC   0.91    QLM     864   CAP     -143
       SU  90.760  SL  90.623   AF 0.422   DQD     0.1   HDLM 0.06  HNIGHT0.02   DUS  -3.57   DLS  -3.92    RAIN   7MS5   QLM/QF 1.20
       RES     15  A     0.62   VF  1.71   GAMMA 0.76   VDLM 0.66  VNORM 0.0    HUM   1.90   HLM   1.82    QRQLM   857   DY      0.40
       IW     0.0  L     79.2   S 1/ 200   N   0.0130   SCOD  15   DWB    0.0   YUM  87.19   YLM  86.70    VLM    2.05   DH      0.09

       RD       QLM    QRQLM    QDQLM     VLM   DQRMAX       HUM       DUC       DUS           HLM       DLC       DLS          DH
       7MS2     706      699        7    1.71      135      1.11      0.20     -4.37          1.18      0.27     -4.56       -0.07
       7MS5     864      857        6    2.05      176      1.90      0.99     -3.57          1.82      0.91     -3.92        0.09

 2540  EGG              0.61/0.91  INFLOW  2539              OUTFLOW  2541        B.NO. 653902                EXIST. COMB.   2540
       YU  84.887  YL  84.265   QF   720   DQ      216   QDLM     7  VNIGHT0.38   DUC   0.91   DLC   0.39    QLM    1084   CAP     -363
       SU  90.623  SL  89.986   AF 0.422   DQD     0.2   HDLM 0.06  HNIGHT0.02   DUS  -3.92   DLS  -4.42    RAIN   7MS5   QLM/QF 1.51
       RES     15  A     0.99   VF  1.71   GAMMA 0.76   VDLM 0.66  VNORM 0.0    HUM   1.82   HLM   1.30    QRQLM  1078   DY      0.62
       IW     0.0  L    124.4   S 1/ 200   N   0.0130   SCOD  15   DWB    0.0   YUM  86.70   YLM  85.57    VLM    2.57   DH      0.52

       RD       QLM    QRQLM    QDQLM     VLM   DQRMAX       HUM       DUC       DUS           HLM       DLC       DLS          DH
       7MS2     879      872        7    2.08      216      1.18      0.27     -4.56          1.05      0.14     -4.67        0.13
       7MS5    1084     1078        7    2.57      281      1.82      0.91     -3.92          1.30      0.39     -4.42        0.52

 2541  EGG              0.61/0.91  INFLOW  2540              OUTFLOW  2542        B.NO. 653900                EXIST. COMB.   2541
       YU  84.265  YL  84.189   QF   720   DQ        0   QDLM     7  VNIGHT0.38   DUC   0.39   DLC   0.29    QLM    1084   CAP     -363
       SU  89.986  SL  90.038   AF 0.422   DQD     0.0   HDLM 0.06  HNIGHT0.02   DUS  -4.42   DLS  -4.64    RAIN   7MS5   QLM/QF 1.51
       RES     15  A      0.0   VF  1.71   GAMMA 1.00   VDLM 0.66  VNORM 0.0    HUM   1.30   HLM   1.20    QRQLM  1077   DY      0.08
       IW     0.0  L     15.2   S 1/ 200   N   0.0130   SCOD 102   DWB    0.0   YUM  85.57   YLM  85.39    VLM    2.57   DH      0.10

       RD       QLM    QRQLM    QDQLM     VLM   DQRMAX       HUM       DUC       DUS           HLM       DLC       DLS          DH
       7MS2     879      872        8    2.08        0      1.05      0.14     -4.67          1.01      0.10     -4.84        0.04
       7MS5    1084     1077        7    2.57        0      1.30      0.39     -4.42          1.20      0.29     -4.64        0.10

 2542  EGG              1.22/1.60  INFLOW  2528  2541        OUTFLOW  2543        B.NO. 726800                EXIST. COMB.   2542
       YU  84.094  YL  84.064   QF  3557   DQ        0   QDLM    39  VNIGHT0.57   DUC  -0.28   DLC  -0.28    QLM    3172   CAP      385
       SU  90.038  SL  90.007   AF 1.444   DQD     0.0   HDLM 0.12  HNIGHT0.04   DUS  -4.62   DLS  -4.62    RAIN   7MS5   QLM/QF 0.89
       RES     15  A      0.0   VF  2.46   GAMMA 1.00   VDLM 0.98  VNORM 0.0    HUM   1.32   HLM   1.32    QRQLM  3133   DY      0.03
       IW     0.0  L      6.1   S 1/ 203   N   0.0130   SCOD 102   DWB    0.0   YUM  85.41   YLM  85.38    VLM    2.58   DH      0.00
```

```
      RD        QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC        DUS             HLM        DLC        DLS           DH
      7MS2     2596     2553       43     2.56        0       1.12      -0.48      -4.82            1.12      -0.48      -4.82         0.00
      7MS5     3172     3133       39     2.58        0       1.32      -0.28      -4.62            1.32      -0.28      -4.62         0.00

2543  EGG                1.22/1.60  INFLOW  2542               OUTFLOW  2552         B.NO. 726800                 EXIST. COMB.    2543
      YU  84.064  YL  83.790   QF  4808   DQ      18   QDLM   39  VNIGHT0.69   DUC  -0.55   DLC  -0.55    QLM    3178   CAP     1630
      SU  90.007  SL  89.764   AF 1.444   DQD    0.0   HDLM 0.10  HNIGHT0.03   DUS  -4.90   DLS  -4.93    RAIN   7MS5   QLM/QF 0.66
      RES     48  A     0.06   VF  3.33   GAMMA 1.00   VDLM 1.22  VNORM 0.0    HUM   1.05   HLM   1.05    QRQLM  3139   DY      0.27
      IW     0.0  L     30.5   S 1/ 111   N   0.0130   SCOD 102   DWB   0.0    YUM  85.11   YLM  84.84    VLM    3.43   DH     -0.00

      RD        QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC        DUS             HLM        DLC        DLS           DH
      7MS2     2596     2553       43     3.32       18       0.92      -0.68      -5.02            0.92      -0.68      -5.05        -0.00
      7MS5     3178     3139       39     3.43       22       1.05      -0.55      -4.90            1.05      -0.55      -4.93        -0.00

2552  EGG                1.22/1.60  INFLOW  2543  2551         OUTFLOW  2556         B.NO. 726800                 EXIST. COMB.    2552
      YU  83.790  YL  83.485   QF  4952   DQ      18   QDLM   39  VNIGHT0.70   DUC  -0.56   DLC  -0.54    QLM    3218   CAP     1734
      SU  89.764  SL  89.416   AF 1.444   DQD    0.0   HDLM 0.10  HNIGHT0.03   DUS  -4.94   DLS  -4.87    RAIN   7MS5   QLM/QF 0.65
      RES     48  A     0.06   VF  3.43   GAMMA 1.00   VDLM 1.25  VNORM 0.0    HUM   1.04   HLM   1.06    QRQLM  3179   DY      0.30
      IW     0.0  L     32.0   S 1/ 105   N   0.0130   SCOD 102   DWB   0.0    YUM  84.83   YLM  84.54    VLM    3.44   DH     -0.02

      RD        QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC        DUS             HLM        DLC        DLS           DH
      7MS2     2619     2576       43     3.30       18       0.91      -0.69      -5.06            0.93      -0.67      -5.00        -0.02
      7MS5     3218     3179       40     3.44       22       1.04      -0.56      -4.94            1.06      -0.54      -4.87        -0.02

2553  CIRCULAR           0.46/0.46  INFLOW                     OUTFLOW  2554         B.NO. 122100                 EXIST. COMB.    2553
      YU  86.402  YL  85.655   QF   261   DQ     223   QDLM    0  VNIGHT0.25   DUC  -0.15   DLC   0.44    QLM     240   CAP       21
      SU  89.754  SL  89.678   AF 0.166   DQD    0.1   HDLM 0.01  HNIGHT0.00   DUS  -3.04   DLS  -3.13    RAIN   7MS5   QLM/QF 0.92
      RES     15  A     0.79   VF  1.58   GAMMA 1.00   VDLM 0.25  VNORM 0.0    HUM   0.31   HLM   0.90    QRQLM   240   DY      0.75
      IW     0.0  L     99.4   S 1/ 133   N   0.0130   SCOD  15   DWB   0.0    YUM  86.71   YLM  86.55    VLM    1.45   DH     -0.59

      RD        QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC        DUS             HLM        DLC        DLS           DH
      7MS2      200      200        0     1.43      223       0.09      -0.37      -3.26            0.50       0.04      -3.52        -0.41
      7MS5      240      240        0     1.45      288       0.31      -0.15      -3.04            0.90       0.44      -3.13        -0.59

2554  CIRCULAR           0.46/0.46  INFLOW  2553               OUTFLOW  2555         B.NO. 122100                 EXIST. COMB.    2554
      YU  85.655  YL  85.048   QF   261   DQ     161   QDLM    0  VNIGHT0.25   DUC   0.44   DLC   0.0     QLM     446   CAP     -183
      SU  89.678  SL  89.358   AF 0.166   DQD    0.1   HDLM 0.01  HNIGHT0.00   DUS  -3.13   DLS  -3.85    RAIN   7MS5   QLM/QF 1.70
      RES     15  A     0.57   VF  1.58   GAMMA 1.00   VDLM 0.27  VNORM 0.0    HUM   0.90   HLM   0.46    QRQLM   445   DY      0.61
      IW     0.0  L     80.8   S 1/ 133   N   0.0130   SCOD  15   DWB   0.0    YUM  86.55   YLM  85.51    VLM    2.69   DH      0.44

      RD        QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC        DUS             HLM        DLC        DLS           DH
      7MS2      339      339        0     2.05      161       0.50       0.04      -3.52            0.46       0.0       -3.85         0.04
      7MS5      446      445        0     2.69      208       0.90       0.44      -3.13            0.46       0.0       -3.85         0.44

2555  CIRCULAR           0.46/0.46  INFLOW  2554               OUTFLOW  2556         B.NO. 122100                 EXIST. COMB.    2555
      YU  85.048  YL  83.942   QF   931   DQ       0   QDLM    0  VNIGHT0.87   DUC  -0.24   DLC   0.14    QLM     442   CAP      489
```

```
     SU  89.358  SL  89.416   AF 0.166   DQD    0.0   HDLM 0.00  HNIGHT0.00   DUS  -4.09   DLS  -4.87    RAIN   7MS5   QLM/QF 0.47
     RES     15  A     0.0   VF  5.61   GAMMA 1.00   VDLM 0.87  VNORM 0.0    HUM   0.22   HLM   0.60    QRQLM   442   DY     1.11
     IW     0.0  L    11.6   S 1/  10   N   0.0130   SCOD 102   DWB   0.0    YUM  85.27   YLM  84.55    VLM    4.11   DH    -0.38

     RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS            HLM       DLC       DLS          DH
     7MS2     336      336        0     3.77        0       0.19      -0.27     -4.12           0.48      0.02     -5.00       -0.28
     7MS5     442      442        0     4.11        0       0.22      -0.24     -4.09           0.60      0.14     -4.87       -0.38

2556 EGG               1.27/1.63  INFLOW  2552  2555         OUTFLOW  W941        B.NO. 726700                EXIST. COMB.   2556
     YU  83.485  YL  82.860   QF  5431   DQ      50   QDLM   40  VNIGHT0.68   DUC  -0.56   DLC  -0.56    QLM    3622   CAP    1809
     SU  89.416  SL  88.590   AF 1.582   DQD    0.1   HDLM 0.10  HNIGHT0.03   DUS  -4.86   DLS  -4.66    RAIN   7MS5   QLM/QF 0.67
     RES     35  A    0.17   VF  3.43   GAMMA 1.00   VDLM 1.22  VNORM 0.0    HUM   1.07   HLM   1.07    QRQLM  3581   DY     0.63
     IW     0.0  L    67.1   S 1/ 107   N   0.0130   SCOD 102   DWB   0.0    YUM  84.55   YLM  83.93    VLM    3.54   DH    -0.00

     RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS            HLM       DLC       DLS          DH
     7MS2    2936     2892       44     3.43       50       0.94      -0.69     -4.99           0.94     -0.69     -4.79       -0.00
     7MS5    3622     3581       40     3.54       63       1.07      -0.56     -4.86           1.07     -0.56     -4.66       -0.00

2557 CIRCULAR          0.46/0.46  INFLOW  W941               OUTFLOW    57        B.NO. 726700                EXIST. COMB.   2557
     YU  82.540  YL  80.772   QF  1515   DQ       0   QDLM   40  VNIGHT2.21   DUC   0.39   DLC   1.98    QLM     774   CAP     741
     SU  88.590  SL  88.371   AF 0.166   DQD    0.0   HDLM 0.05  HNIGHT0.02   DUS  -5.20   DLS  -5.16    RAIN   7MS5   QLM/QF 0.51
     RES     15  A     0.0   VF  9.13   GAMMA 1.00   VDLM 4.09  VNORM 0.0    HUM   0.85   HLM   2.44    QRQLM   739   DY     1.77
     IW     0.0  L     7.0   S 1/   4   N   0.0130   SCOD 102   DWB   0.0    YUM  83.39   YLM  83.21    VLM    7.71   DH    -1.58

     RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS            HLM       DLC       DLS          DH
     7MS2     737      692       45     6.43        0       0.74       0.28     -5.31           2.33      1.87     -5.26       -1.60
     7MS5     774      739       36     7.71        0       0.85       0.39     -5.20           2.44      1.98     -5.16       -1.58

2558 EGG               1.27/1.63  INFLOW  W941               OUTFLOW  2563        B.NO. 726700                EXIST. COMB.   2558
     YU  82.835  YL  82.784   QF  5926   DQ       0   QDLM    0  VNIGHT0.0    DUC  -0.55   DLC  -0.52    QLM    2993   CAP    2933
     SU  88.590  SL  88.557   AF 1.582   DQD    0.0   HDLM 0.00  HNIGHT0.00   DUS  -4.68   DLS  -4.67    RAIN   7MS5   QLM/QF 0.51
     RES     15  A     0.0   VF  3.75   GAMMA 1.00   VDLM 0.0   VNORM 0.0    HUM   1.08   HLM   1.11    QRQLM  2959   DY     0.05
     IW     0.0  L     4.6   S 1/  90   N   0.0130   SCOD 102   DWB   0.00   YUM  83.91   YLM  83.89    VLM    3.52   DH    -0.03

     RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS            HLM       DLC       DLS          DH\
     7MS2    2635     2588       47     3.52        0       0.85      -0.78     -4.90           0.85     -0.78     -4.92        0.00
     7MS5    2993     2959       34     3.43        0       1.08      -0.55     -4.68           1.11     -0.52     -4.67       -0.03

2563 EGG               1.27/1.63  INFLOW  2558  2562         OUTFLOW  2564        B.NO. 726600                EXIST. COMB.   2563
     YU  82.784  YL  82.662   QF  5926   DQ       0   QDLM    0  VNIGHT0.74   DUC  -0.52   DLC  -0.44    QLM    3095   CAP    2831
     SU  88.557  SL  88.392   AF 1.582   DQD    0.0   HDLM 0.00  HNIGHT0.00   DUS  -4.67   DLS  -4.54    RAIN   7MS5   QLM/QF 0.52
     RES     15  A     0.0   VF  3.75   GAMMA 1.00   VDLM 0.74  VNORM 0.0    HUM   1.11   HLM   1.19    QRQLM  3062   DY     0.12
     IW     0.0  L    11.0   S 1/  90   N   0.0130   SCOD 102   DWB   0.0    YUM  83.89   YLM  83.85    VLM    3.56   DH    -0.08

     RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS            HLM       DLC       DLS          DH
     7MS2    2700     2653       48     3.56        0       0.85      -0.78     -4.92           0.86     -0.77     -4.87       -0.01
     7MS5    3095     3062       34     3.55        0       1.11      -0.52     -4.67           1.19     -0.44     -4.54       -0.08
```

```
 2564  EGG               1.27/1.63  INFLOW  2563              OUTFLOW  2568        B.NO. 726600                EXIST. COMB.   2564
       YU  82.662  YL  82.570   QF  6911   DQ        0   QDLM    0  VNIGHT0.86   DUC  -0.43   DLC  -0.36    QLM    3082   CAP    3829
       SU  88.392  SL  88.316   AF 1.582   DQD     0.0   HDLM 0.00  HNIGHT0.00   DUS  -4.53   DLS  -4.47    RAIN   7MS5   QLM/QF 0.45
       RES     15  A     0.0    VF  4.37   GAMMA 1.00   VDLM 0.86  VNORM 0.0    HUM   1.20   HLM   1.27    QRQLM  3048   DY      0.09
       IW     0.0  L      6.1   S 1/  66   N   0.0130   SCOD 102   DWB   0.00   YUM  83.86   YLM  83.84    VLM    3.45   DH     -0.07

       RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS           HLM       DLC       DLS          DH
       7MS2    2692     2645       48     3.35        0       0.86      -0.77     -4.87          0.90     -0.73     -4.85       -0.04
       7MS5    3082     3048       33     3.45        0       1.20      -0.43     -4.53          1.27     -0.36     -4.47       -0.07

HLI 57 CIRCULAR          1.98/1.98  INFLOW    56  2557          OUTFLOW    58        B.NO.   3901                EXIST. COMB.     57
       YU  79.861  YL  79.842   QF  3474   DQ        0   QDLM 1417  VNIGHT0.59   DUC   1.37   DLC   1.36    QLM    4284   CAP    -809
       SU  88.371  SL  88.291   AF 3.074   DQD     0.0   HDLM 0.92  HNIGHT0.28   DUS  -5.16   DLS  -5.11    RAIN   7MS5   QLM/QF 1.23
       RES     15  A     0.0    VF  1.13   GAMMA 1.00   VDLM 1.01  VNORM 1.08   HUM   3.35   HLM   3.34    QRQLM  2603   DY      0.02
       IW     0.0  L     34.4   S 1/1811   N   0.0130   SCOD  15   DWB   0.04   YUM  83.21   YLM  83.18    VLM    1.39   DH      0.01

       RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS           HLM       DLC       DLS          DH
       7MS2    4145     2490     1655     1.35        0       3.25       1.27     -5.26          3.24      1.26     -5.21        0.01
       7MS5    4284     2603     1681     1.39        0       3.35       1.37     -5.16          3.34      1.36     -5.11        0.01

 *********************************

 2501  CIRCULAR          0.84/0.84  INFLOW  2500              OUTFLOW  2502        B.NO. 726900                EXIST. STORM   2501
       YU  86.716  YL  86.274   QF  1095   DQ      155   QDLM    0  VNIGHT0.0    DUC  -0.22   DLC  -0.18    QLM     980   CAP     115
       SU  90.584  SL  90.114   AF 0.553   DQD     0.0   HDLM 0.0   HNIGHT0.0    DUS  -3.25   DLS  -3.18    RAIN   7MS5   QLM/QF 0.90
       RES      0  A     0.54   VF  1.98   GAMMA 1.00   VDLM 0.0   VNORM 0.0    HUM   0.62   HLM   0.66    QRQLM   980   DY      0.44
       IW     0.0  L     83.2   S 1/ 188   N   0.0130   SCOD 211   DWB   0.0    YUM  87.34   YLM  86.93    VLM    2.12   DH     -0.04

       RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS           HLM       DLC       DLS          DH
       7MS2     767      767        0     2.10      155       0.50      -0.34     -3.37          0.53     -0.31     -3.31       -0.03
       7MS5     980      980        0     2.12      198       0.62      -0.22     -3.25          0.66     -0.18     -3.18       -0.04

 2502  CIRCULAR          0.84/0.84  INFLOW  2501              OUTFLOW  2503        B.NO. 726900                EXIST. STORM   2502
       YU  86.271  YL  86.194   QF  1224   DQ        0   QDLM    0  VNIGHT0.0    DUC  -0.25   DLC  -0.26    QLM     972   CAP     252
       SU  90.114  SL  90.123   AF 0.553   DQD     0.0   HDLM 0.0   HNIGHT0.0    DUS  -3.26   DLS  -3.35    RAIN   7MS5   QLM/QF 0.79
       RES      0  A     0.0    VF  2.21   GAMMA 1.00   VDLM 0.0   VNORM 0.0    HUM   0.59   HLM   0.58    QRQLM   972   DY      0.08
       IW     0.0  L     11.6   S 1/ 151   N   0.0130   SCOD 211   DWB   0.0    YUM  86.86   YLM  86.78    VLM    2.37   DH      0.00

       RD       QLM    QRQLM    QDQLM      VLM   DQRMAX        HUM        DUC       DUS           HLM       DLC       DLS          DH
       7MS2     760      760        0     2.30        0       0.49      -0.35     -3.36          0.48     -0.36     -3.44        0.00
       7MS5     972      972        0     2.37        0       0.59      -0.25     -3.26          0.58     -0.26     -3.35        0.00

 2503  CIRCULAR          0.84/0.84  INFLOW  2502              OUTFLOW  2504        B.NO. 726800                EXIST. STORM   2503
       YU  86.167  YL  85.600   QF  1323   DQ      129   QDLM    0  VNIGHT0.0    DUC  -0.27   DLC  -0.23    QLM    1085   CAP     238
       SU  90.123  SL  89.334   AF 0.553   DQD     0.0   HDLM 0.0   HNIGHT0.0    DUS  -3.39   DLS  -3.12    RAIN   7MS5   QLM/QF 0.82
       RES      0  A     0.45   VF  2.39   GAMMA 1.00   VDLM 0.0   VNORM 0.0    HUM   0.57   HLM   0.61    QRQLM  1085   DY      0.57
```

IW 0.0	L 73.1	S 1/ 129	N 0.0130	SCOD 211	DWB 0.0	YUM 86.74	YLM 86.21	VLM 2.54	DH -0.04

RD	QLM	QRQLM	QDQLM	VLM	DQRMAX	HUM	DUC	DUS	HLM	DLC	DLS	DH
7MS2	849	849	0	2.50	129	0.47	-0.37	-3.48	0.50	-0.34	-3.24	-0.02
7MS5	1085	1085	0	2.54	165	0.57	-0.27	-3.39	0.61	-0.23	-3.12	-0.04

2504 CIRCULAR 0.84/0.84 INFLOW 2503 OUTFLOW 2505 B.NO. 726700 EXIST. STORM 2504

YU 85.548	YL 85.173	QF 1267	DQ 92	QDLM 0	VNIGHT0.0	DUC -0.18	DLC -0.16	QLM 1169	CAP 98
SU 89.334	SL 88.715	AF 0.553	DQD 0.0	HDLM 0.0	HNIGHT0.0	DUS -3.12	DLS -2.86	RAIN 7MS5	QLM/QF 0.92
RES 0	A 0.32	VF 2.29	GAMMA 1.00	VDLM 0.0	VNORM 0.0	HUM 0.66	HLM 0.68	QRQLM 1169	DY 0.38
IW 0.0	L 52.7	S 1/ 141	N 0.0130	SCOD 211	DWB 0.0	YUM 86.21	YLM 85.86	VLM 2.45	DH -0.02

RD	QLM	QRQLM	QDQLM	VLM	DQRMAX	HUM	DUC	DUS	HLM	DLC	DLS	DH
7MS2	914	914	0	2.44	92	0.52	-0.32	-3.26	0.54	-0.30	-3.00	-0.01
7MS5	1169	1169	0	2.45	118	0.66	-0.18	-3.12	0.68	-0.16	-2.86	-0.02

2505 CIRCULAR 0.84/0.84 INFLOW 2504 OUTFLOW 2506 B.NO. 726700 EXIST. STORM 2505

YU 85.115	YL 84.997	QF 1410	DQ 0	QDLM 0	VNIGHT0.0	DUC -0.23	DLC -0.23	QLM 1169	CAP 241
SU 88.715	SL 88.660	AF 0.553	DQD 0.0	HDLM 0.0	HNIGHT0.0	DUS -2.99	DLS -3.06	RAIN 7MS5	QLM/QF 0.83
RES 0	A 0.0	VF 2.55	GAMMA 1.00	VDLM 0.0	VNORM 0.0	HUM 0.61	HLM 0.61	QRQLM 1169	DY 0.12
IW 0.0	L 13.4	S 1/ 114	N 0.0130	SCOD 211	DWB 0.0	YUM 85.72	YLM 85.60	VLM 2.74	DH 0.00

RD	QLM	QRQLM	QDQLM	VLM	DQRMAX	HUM	DUC	DUS	HLM	DLC	DLS	DH
7MS2	914	914	0	2.67	0	0.50	-0.34	-3.10	0.50	-0.34	-3.16	0.00
7MS5	1169	1169	0	2.74	0	0.61	-0.23	-2.99	0.61	-0.23	-3.06	0.00

2506 MOD.ELLIPSE 1.14/0.74 INFLOW 2505 OUTFLOW 2510 B.NO. 726700 EXIST. STORM 2506

YU 84.911	YL 84.835	QF 1462	DQ 0	QDLM 0	VNIGHT0.0	DUC -0.23	DLC -0.23	QLM 1168	CAP 294
SU 88.660	SL 88.529	AF 0.660	DQD 0.0	HDLM 0.0	HNIGHT0.0	DUS -3.24	DLS -3.19	RAIN 7MS5	QLM/QF 0.80
RES 0	A 0.0	VF 2.22	GAMMA 1.00	VDLM 0.0	VNORM 0.0	HUM 0.51	HLM 0.51	QRQLM 1168	DY 0.08
IW 0.0	L 12.2	S 1/ 161	N 0.0130	SCOD 211	DWB 0.0	YUM 85.42	YLM 85.34	VLM 2.42	DH 0.00

RD	QLM	QRQLM	QDQLM	VLM	DQRMAX	HUM	DUC	DUS	HLM	DLC	DLS	DH
7MS2	914	914	0	2.33	0	0.43	-0.31	-3.32	0.43	-0.31	-3.27	0.00
7MS5	1168	1168	0	2.42	0	0.51	-0.23	-3.24	0.51	-0.23	-3.19	0.00

2507 CIRCULAR 0.46/0.46 INFLOW OUTFLOW 2508 B.NO. 4001 EXIST. STORM 2507

YU 85.701	YL 85.219	QF 221	DQ 149	QDLM 0	VNIGHT0.0	DUC -0.33	DLC 0.06	QLM 161	CAP 60
SU 88.529	SL 88.365	AF 0.166	DQD 0.0	HDLM 0.0	HNIGHT0.0	DUS -2.69	DLS -2.62	RAIN 7MS5	QLM/QF 0.73
RES 0	A 0.52	VF 1.33	GAMMA 1.00	VDLM 0.0	VNORM 0.0	HUM 0.13	HLM 0.52	QRQLM 161	DY 0.48
IW 0.0	L 89.9	S 1/ 187	N 0.0130	SCOD 211	DWB 0.0	YUM 85.84	YLM 85.74	VLM 1.10	DH -0.39

RD	QLM	QRQLM	QDQLM	VLM	DQRMAX	HUM	DUC	DUS	HLM	DLC	DLS	DH
7MS2	137	137	0	1.09	149	0.09	-0.37	-2.74	0.33	-0.13	-2.81	-0.24
7MS5	161	161	0	1.10	191	0.13	-0.33	-2.69	0.52	0.06	-2.62	-0.39

```
2508  CIRCULAR         0.53/0.53  INFLOW  2507              OUTFLOW  2509        B.NO.   4000              EXIST. STORM   2508
      YU  85.207  YL  84.911  QF   247  DQ      109  QDLM    0  VNIGHT0.0   DUC   0.00  DLC   0.10   QLM     263   CAP     -15
      SU  88.365  SL  88.486  AF 0.220  DQD     0.0  HDLM 0.0   HNIGHT0.0   DUS  -2.62  DLS  -2.94   RAIN   7MS5   QLM/QF 1.07
      RES      0  A     0.38  VF  1.12  GAMMA 1.00  VDLM 0.0   VNORM 0.0   HUM   0.53  HLM   0.63   QRQLM   263   DY      0.30
      IW     0.0  L     94.2  S 1/ 318  N   0.0130  SCOD 211   DWB   0.0   YUM  85.74  YLM  85.55   VLM    1.20   DH     -0.10

      RD       QLM   QRQLM   QDQLM     VLM  DQRMAX       HUM      DUC      DUS          HLM     DLC      DLS        DH
      7MS2     216     216       0    1.16     109      0.34    -0.19    -2.81         0.43   -0.10    -3.14     -0.09
      7MS5     263     263       0    1.20     140      0.53     0.00    -2.62         0.63    0.10    -2.94     -0.10

2509  CIRCULAR         0.53/0.53  INFLOW  2508              OUTFLOW  2510        B.NO.   4000              EXIST. STORM   2509
      YU  84.890  YL  84.835  QF   262  DQ        0  QDLM    0  VNIGHT0.0   DUC   0.13  DLC   0.13   QLM     258   CAP       4
      SU  88.486  SL  88.529  AF 0.220  DQD     0.0  HDLM 0.0   HNIGHT0.0   DUS  -2.94  DLS  -3.03   RAIN   7MS5   QLM/QF 0.98
      RES      0  A     0.0   VF  1.19  GAMMA 1.00  VDLM 0.0   VNORM 0.0   HUM   0.66  HLM   0.66   QRQLM   258   DY      0.05
      IW     0.0  L     15.5  S 1/ 282  N   0.0130  SCOD 211   DWB   0.0   YUM  85.55  YLM  85.50   VLM    1.17   DH     -0.01

      RD       QLM   QRQLM   QDQLM     VLM  DQRMAX       HUM      DUC      DUS          HLM     DLC      DLS        DH
      7MS2     210     210       0    1.13       0      0.45    -0.08    -3.14         0.47   -0.06    -3.22     -0.02
      7MS5     258     258       0    1.17       0      0.66     0.13    -2.94         0.66    0.13    -3.03     -0.01

2510  MOD.ELLIPSE     1.14/0.74  INFLOW  2506  2509        OUTFLOW  2511        B.NO. 726600              EXIST. STORM   2510
      YU  84.835  YL  84.576  QF  2073  DQ        0  QDLM    0  VNIGHT0.0   DUC  -0.24  DLC  -0.15   QLM    1411   CAP     661
      SU  88.529  SL  88.310  AF 0.660  DQD     0.0  HDLM 0.0   HNIGHT0.0   DUS  -3.20  DLS  -3.14   RAIN   7MS5   QLM/QF 0.68
      RES      0  A     0.0   VF  3.14  GAMMA 1.00  VDLM 0.0   VNORM 0.0   HUM   0.50  HLM   0.59   QRQLM  1411   DY      0.26
      IW     0.0  L     20.7  S 1/  80  N   0.0130  SCOD 211   DWB   0.0   YUM  85.33  YLM  85.17   VLM    2.53   DH     -0.10

      RD       QLM   QRQLM   QDQLM     VLM  DQRMAX       HUM      DUC      DUS          HLM     DLC      DLS        DH
      7MS2    1113    1113       0    2.50       0      0.39    -0.35    -3.30         0.47   -0.27    -3.26     -0.08
      7MS5    1411    1411       0    2.53       0      0.50    -0.24    -3.20         0.59   -0.15    -3.14     -0.10

2511  CIRCULAR         0.91/0.91  INFLOW  2510              OUTFLOW  2512        B.NO. 726500              EXIST. STORM   2511
      YU  84.542  YL  83.521  QF  1924  DQ      324  QDLM    0  VNIGHT0.0   DUC  -0.28  DLC  -0.03   QLM    1704   CAP     220
      SU  88.310  SL  87.072  AF 0.649  DQD     0.0  HDLM 0.0   HNIGHT0.0   DUS  -3.14  DLS  -2.67   RAIN   7MS5   QLM/QF 0.89
      RES      0  A     1.13  VF  2.96  GAMMA 1.00  VDLM 0.0   VNORM 0.0   HUM   0.63  HLM   0.88   QRQLM  1704   DY      1.02
      IW     0.0  L     95.4  S 1/  93  N   0.0130  SCOD 211   DWB   0.0   YUM  85.17  YLM  84.40   VLM    2.97   DH     -0.25

      RD       QLM   QRQLM   QDQLM     VLM  DQRMAX       HUM      DUC      DUS          HLM     DLC      DLS        DH
      7MS2    1353    1353       0    2.96     324      0.51    -0.40    -3.26         0.60   -0.31    -2.95     -0.10
      7MS5    1704    1704       0    2.97     415      0.63    -0.28    -3.14         0.88   -0.03    -2.67     -0.25

2512  CIRCULAR         0.91/0.91  INFLOW  2511              OUTFLOW  2513        B.NO. 726500              EXIST. STORM   2512
      YU  83.491  YL  83.430  QF  1700  DQ        0  QDLM    0  VNIGHT0.0   DUC   0.00  DLC   0.0    QLM    1703   CAP      -2
      SU  87.072  SL  86.956  AF 0.649  DQD     0.0  HDLM 0.0   HNIGHT0.0   DUS  -2.67  DLS  -2.62   RAIN   7MS5   QLM/QF 1.00
      RES      0  A     0.0   VF  2.62  GAMMA 1.00  VDLM 0.0   VNORM 0.0   HUM   0.91  HLM   0.91   QRQLM  1703   DY      0.06
      IW     0.0  L      7.3  S 1/ 120  N   0.0130  SCOD 211   DWB   0.0   YUM  84.40  YLM  84.34   VLM    2.81   DH      0.00

      RD       QLM   QRQLM   QDQLM     VLM  DQRMAX       HUM      DUC      DUS          HLM     DLC      DLS        DH
```

7MS2	1353	1353	0	2.80	0	0.63	-0.28	-2.95	0.63	-0.28	-2.89	0.00
7MS5	1703	1703	0	2.81	0	0.91	0.00	-2.67	0.91	0.0	-2.62	0.00

2513 MOD.ELLIPSE 1.14/0.74 INFLOW 2512 OUTFLOW 2514 B.NO. 726500 EXIST. STORM 2513

YU	83.351	YL	82.768	QF	2143	DQ	72	QDLM	0	VNIGHT	0.0	DUC	-0.23	DLC	-0.22	QLM	1768	CAP	374
SU	86.956	SL	86.453	AF	0.660	DQD	0.0	HDLM	0.0	HNIGHT	0.0	DUS	-3.09	DLS	-3.16	RAIN	7MS5	QLM/QF	0.83
RES	0	A	0.25	VF	3.25	GAMMA	1.00	VDLM	0.0	VNORM	0.0	HUM	0.51	HLM	0.52	QRQLM	1768	DY	0.58
IW	0.0	L	43.6	S	1/ 75	N	0.0130	SCOD	211	DWB	0.0	YUM	83.86	YLM	83.29	VLM	3.55	DH	-0.01

RD	QLM	QRQLM	QDQLM	VLM	DQRMAX	HUM	DUC	DUS	HLM	DLC	DLS	DH
7MS2	1405	1405	0	3.44	72	0.43	-0.31	-3.17	0.44	-0.30	-3.25	-0.01
7MS5	1768	1768	0	3.55	92	0.51	-0.23	-3.09	0.52	-0.22	-3.16	-0.01

Contractions used in HVM output...

1st line: pipe number, cross-section, pipe size...width/height(m), inflow and outflow pipes, block number, sewer type, pipe no.

2nd line: YU, YL = upper and lower invert elevations (m)
QF = full flow capacity (L/sec)
DQ = maximum storm runoff from tributary area (L/sec)
QDLM = peak DWF at lower end (L/sec)
VNIGHT = night DWF velocity (m/sec)
DUC, DLC = difference between maximum HGL elevation and section crown elevation at upper and lower ends (m)
(-ve means partial fill)
QLM = maximum flow rate at lower end (L/sec) under a 2yr or 5 yr storm
CAP = free capacity at lower end when loaded by QLM

3rd line: SU, SL = upper and lower surface elevations (m)
AF = cross-sectional area (m2)
DQD = DWF from tributary area (L/sec)
HDLM = flow depth corresponding to QDLM (m)
HNIGHT = night DWF depth (m)
RAIN = storm corresponding to QLM... 7MS2 = 7th Study Area, 2yr model storm, 7MS5 = 7th Study Area, 5yr model storm
QLM/QF = ratio of maximum flow rate at lower end to full-flow capacity

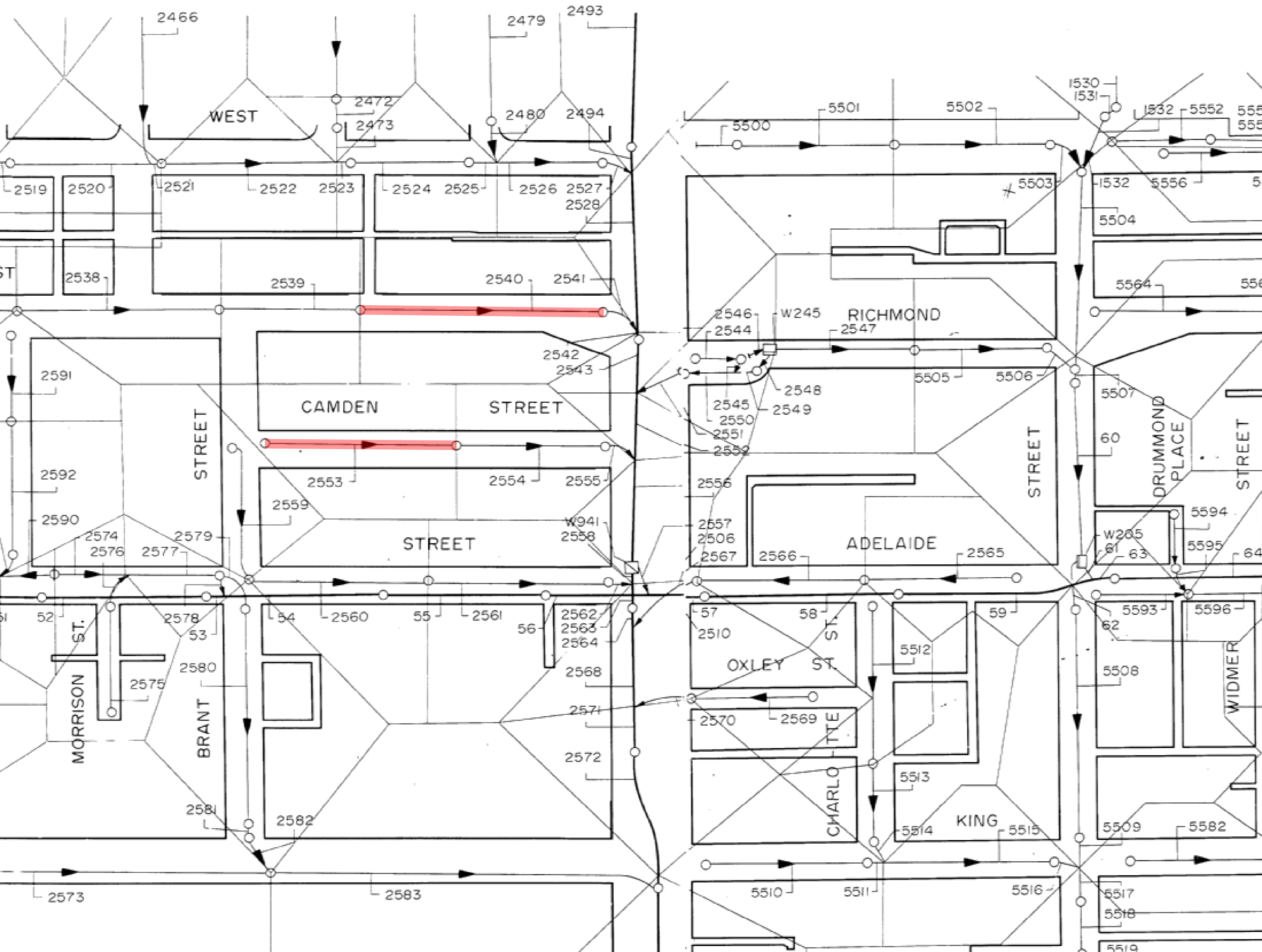
4th line: RES = population density (residents/ha)
A = tributary area (ha)
VF = flow velocity corresponding to QF (m/sec)
GAMMA = imperviousness ratio
VDLM = flow velocity corresponding to QDLM (m/sec)
VNORM = normal flow velocity for QDLM (m/sec)
HUM, HLM = maximum flow depths above invert at upper and lower ends
QRQLM = portion of storm flow within QLM (L/sec)
DY = difference between upper and lower invert elevations (m)

5th line: IW = industrial/large water inflow (L/sec)
L = segment length (m)

S = slope of pipe
N = Manning's n
SCOD = surface code of tributary area
DWB = backwater build-up under QDLM (m)
YUM, YLM = maximum HGL elevations at upper and lower ends
VLM = flow velocity corresponding to QLM (m/sec)
DH = indicator whether HGL is steeper or flatter than pipe slope
= (YUM-YLM) - DY

6th line: headings

7th & 8th lines: summary of results under the headings for additional storms


WEST
CAMDEN
STREET
STREET
STREET
MORRISON
ST.
BRANT
STREET
RICHMOND
ADELAIDE
STREET
DRUMMOND
PLACE
STREET
OXLEY
ST.
CHARLOTTE
ST.
KING
WIDMER
2466
2479
2493
2472
2473
2480
2494
2519
2520
2521
2522
2523
2524
2525
2526
2527
2528
2538
2539
2540
2541
2542
2543
2544
2545
2546
2547
2548
2549
2550
2551
2552
2553
2554
2555
2556
2557
2558
2559
2560
2561
2562
2563
2564
2565
2566
2567
2568
2569
2570
2571
2572
2573
2574
2575
2576
2577
2578
2579
2580
2581
2582
2583
2590
2591
2592
2506
2510
W245
W941
W205
52
53
54
55
56
57
58
59
60
61
62
63
1530
1531
1532
5500
5501
5502
5503
5504
5505
5506
5507
5508
5509
5510
5511
5512
5513
5514
5515
5516
5517
5518
5519
5552
5556
5564
5582
5593
5594
5595
5596

APPENDIX D

Existing Sanitary and Storm Flow Rates Calculations

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	D.P.	Page No.	D-01
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	22-Apr-19		

Existing Building at 471 Richmond Street West

Location	Area (ha)	C	Composite "C"
Existing Building	0.036	0.90	
Paved Area	0.048	0.90	
Total Site Area:	**0.085**		**0.90**

Rational Formulae: Q = 2.78 CIA (L/s)

Time of Concentration 10 minutes as per WWFM Guidelines

Rainfall Intensity: $I = aT^c$ (City of Toronto Design Criteria for Sewers and Watermains)

Return Period:	2-yr	10-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	88.19	162.27	224.32	250.32

Peak Flow Rate (L/s):

Return Period:	2-yr	10-yr	50-yr	100-yr
Under existing site conditions (L/s):	18.70	34.40	47.56	53.07

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	D.P.	Page No.	D-02
	Checked:	C.I.		
Project: 471 Richmond Street West **38 Camden Street**	Proj. #	19114		
	Date:	22-Apr-19		

Existing Building at 471 Richmond Street West

POPULATION CALCULATION

Site Area 847.4 m^2

Proposed Land Use		Density		Population
Type	GFA (m^2)			
Commercia	364.3	1.1	person/100m^2	4
Office	364.3	3.3	person/100m^2	12
Total	**728.68**			**16**

SANITARY FLOW CALCULATION

Harmon Peaking Factor: $M=1+14/(4+(P/1000)^{0.5})$

Peaking Factor	4.39	
Average Daily Wastewater Flow	250	L/cap/day
Total Domestic Flow	0.20	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.02	L/sec
Design Flow	**0.23**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation		
	Prepared: D.P.	Page No.	D-03
	Checked: C.I.		
Project: 471 Richmond Street West **38 Camden Street**	Proj. # 19114		
	Date: 22-Apr-19		

Existing Building at 38 Camden Street

Location	Area (ha)	C	Composite "C"
Existing Building	0.039	0.90	
Paved Area	0.009	0.90	
Total Site Area:	**0.049**		**0.90**

Rational Formulae: Q = 2.78 CIA (L/s)

Time of Concentration 10 minutes as per WWFM Guidelines

Rainfall Intensity: $I = aT^c$ (City of Toronto Design Criteria for Sewers and Watermains)

Return Period:	2-yr	10-yr	50-yr	100-yr
Rainfall Intensity (mm/hr):	88.19	162.27	224.32	250.32

Peak Flow Rate (L/s):

Return Period:	2-yr	10-yr	50-yr	100-yr
Under existing site conditions (L/s):	10.75	19.77	27.33	30.50

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation		
	Prepared: D.P.	Page No.	D-04
	Checked: C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. # 19114		
	Date: 22-Apr-19		

Existing Building at 38 Camden Street

POPULATION CALCULATION

Site Area 487.0 m^2

Proposed Land Use		Density		Population
Type	GFA (m^2)			
Office	1180.6	3.3	person/100m^2	39
Total	**1180.62**			**39**

SANITARY FLOW CALCULATION

Harmon Peaking Factor: $M=1+14/(4+(P/1000)^{0.5})$

Peaking Factor	4.34	
Average Daily Wastewater Flow	250	L/cap/day
Total Domestic Flow	0.49	L/sec
Infiltration Allowance (@ 0.26 L/sec/ha)	0.01	L/sec
Design Flow	**0.50**	L/sec

APPENDIX E

Water Demand Calculations

LEA Consulting Ltd. Consulting Engineers and Planners	Water Demand Calculation			
	Prepared:	D.P.	Page No.	E-01
	Checked:	C.I.		
Project: 471 Richmond Street West **38 Camden Street**	Proj. #	19114		
	Date:	22-Apr-19		

471 Richmond Street West (Hotel)

This calculation is following the "Water Supply for Public Fire Protection" by Fire Underwriters Survey.

Formula: $F = 220C\sqrt{A}$

where F = the required fire flow in litres per minute

C = coefficient related to the type of construction.

= 0.6 for fire resistive construction

A = the total floor area in square metres. For fire resistive buildings, consider only the area of the largest floor plus 25% of each of the two immediately adjoining floors.

According the building stats,		Area (m2)
Level 1	largest	722
Level 1 Mezz	adjoining	592
A		870

Therefore, F = 4000 **l/min**

Occupancy reduction:

For occupancies with a low contents fire hazard, the reduction rate is 25%,

Therefore: F = 3000 l/min

Reduction for sprinkler protection:

Using the NFPA sprinkler system, a reduction rate of 30% is used.

Therefore: F = 2100 l/min

Separation charge:

Charge for the separations on each side:

Separation	Charge	
10.1 to 20 m	15%	South
10.1 to 20 m	15%	North
0 to 3m	25%	East
0 to 3m	25%	West

Total charge in %	75%	
Total charge in l/min	2250	

Required Fire Flow:		4000	l/min
	or	66.67	l/s
	or	1057	US GPM

LEA Consulting Ltd. Consulting Engineers and Planners	**Water Demand Calculation**			
	Prepared:	D.P.	Page No.	E-02
	Checked:	C.I.		
Project: 471 Richmond Street West 38 Camden Street	Proj. #	19114		
	Date:	22-Apr-19		

471 Richmond Street West (Hotel)

Total Population: **387** (See Page B-01)

Peak Hour Demand Calculation:

Residential Per Capita Demand (multi-unit)	191	L/cap/day
Peaking Factor (Institutional - Hotel)	0.90	
Peak Hour Demand	**0.77**	L/sec

Maximum Day Demand Calculation:

Residential Per Capita Demand (multi-unit)	191	L/cap/day
Peaking Factor (Institutional - Hotel)	1.10	
Maximum Day Demand	**0.94**	L/sec
Fire Flow for High Rise Residential:	66.7	L/sec
Max. Day Demand plus Fire Flow:	**67.6**	L/sec
Design Water Demand	**67.6**	L/sec
	1071.6	**US GPM**

APPENDIX F

Hydrant Flow Test Data and Watermain Adequacy Assessment Data

LEA Consulting Ltd. Consulting Engineers and Planners	Residual Pressure			
	Prepared:	D.P.	Page No.	F-01
	Checked:	C.I.		
Project: 471 Richmond Street West	Proj. #	19114		
38 Camden Street	Date:	22-Apr-19		

Hydrant Test Readings (150mm watermain, Richmond Street West) undertaken on August 8, 2018 by Glassic Fire Protection Inc.

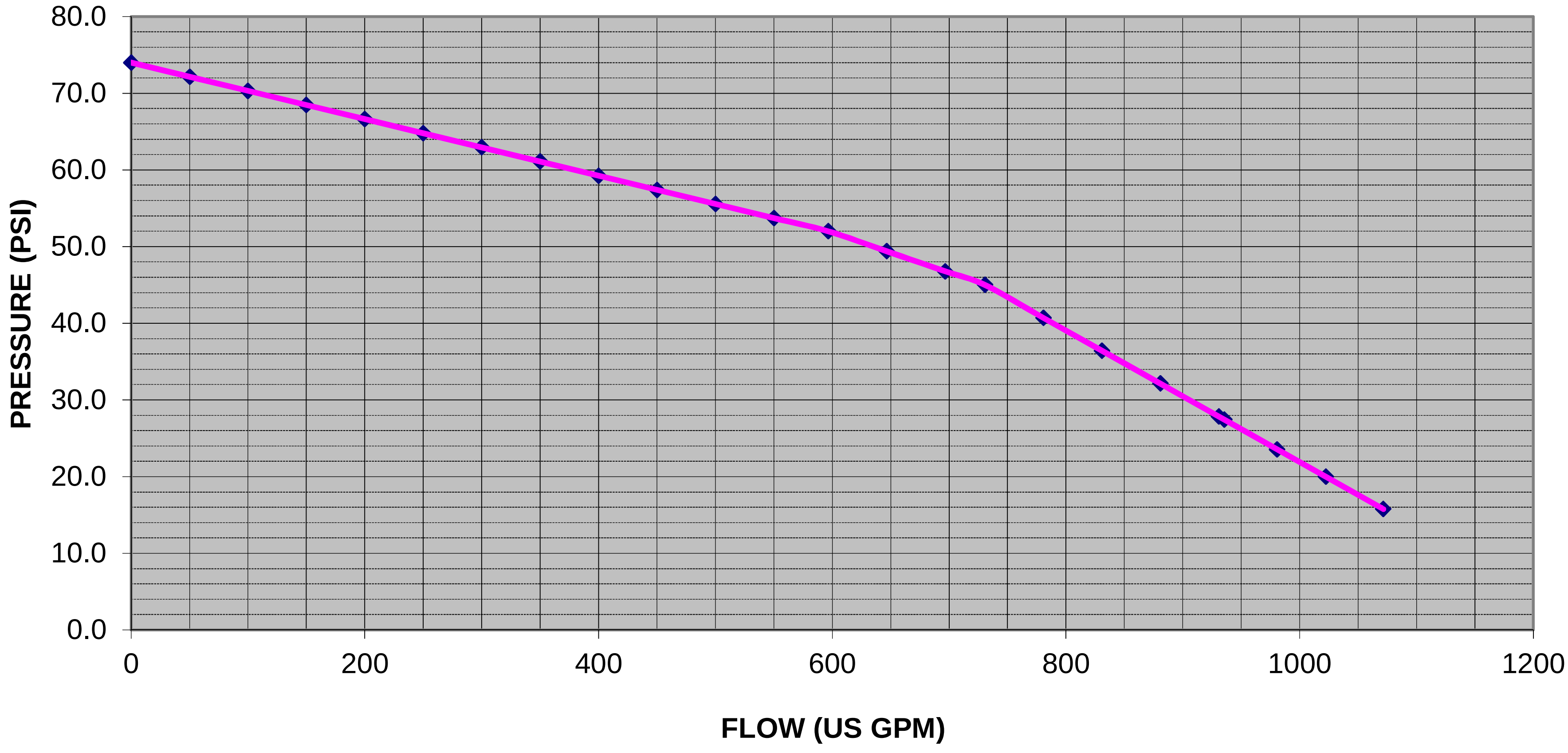
Flow		**Residual Pressure**		
0.0	US GPM	74	psi	
596.6	US GPM	52	psi	
730.7	US GPM	45	psi	
1022.2	US GPM	20	psi	Estimate by Classic Fire Protection

Interpolated

Flow (US GPM)	**Residual Pressure (psi)**
0	**74.0**
50	72.2
100	70.3
150	68.5
200	66.6
250	64.8
300	62.9
350	61.1
400	59.2
450	57.4
500	55.6
550	53.7
596.6	**52.0**
646.6	49.4
696.6	46.8
730.7	**45.0**
780.7	40.7
830.7	36.4
880.7	32.1
930.7	27.8
935.6	27.4
980.7	23.6
1022.2	**20.0**
1071.6	15.8

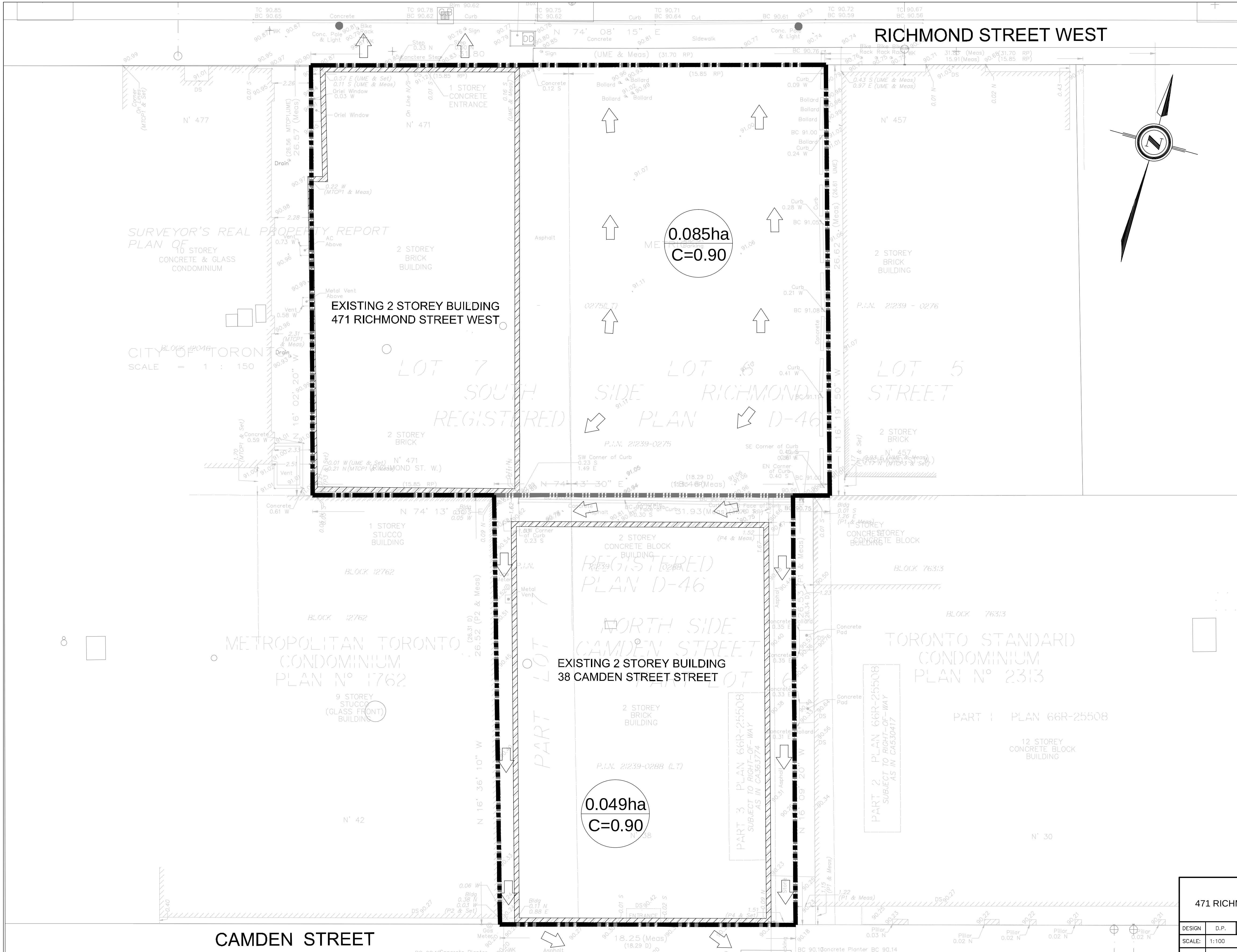
Existing 150mm Watermain on Richmond Street West

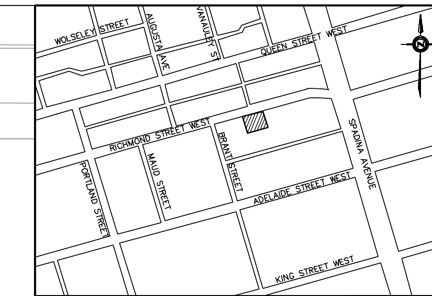
FLOW TEST CHART (BASED ON CLASSIC FIRE PROTECTION TEST, AUG. 8, 2018)
Page: F-02



APPENDIX G

Figures and Drawings





LEGEND:

- PROPERTY LINE
- OUTLINE OF UNDERGROUND PARKING GARAGE
- EXISTING CATCHBASIN
- EXISTING MANHOLE
- EXISTING TREE
- EXISTING LIGHT POLE
- OVERLAND FLOW DIRECTION
- 0.00 ha / C=0.00 — DRAINAGE AREA / RUNOFF COEFFICIENT
- DRAINAGE AREA BOUNDARY

BEARING

BEARINGS ARE GRID AND ARE REFERRED TO THE SOUTHERLY LIMIT OF RICHMOND STREET WEST HAVING A BEARING OF N 74° 08' 15" E AS SHOWN ON METROPOLITAN TORONTO CONDOMINIUM PLAN 1046.

ELEVATION

ELEVATIONS SHOWN HEREON ARE GEODETIC AND IN METERS AND ARE RELATED TO CITY OF TORONTO BENCH MARK No. CT562 HAVING A PUBLISHED ELEVATION OF 89.179 METRES. (CGVD 1928:PRE-1978).

IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER - ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO MUNICIPAL SEWER SYSTEMS AND WATERCOURSES. THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE WITH RESPECT TO ANY PROPOSED DEWATERING

BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL

TORONTO Engineering & Construction Services

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS. THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

MANAGER, DEVELOPMENT ENGINEERING

DATE ______________

DIGITAL INFORMATION

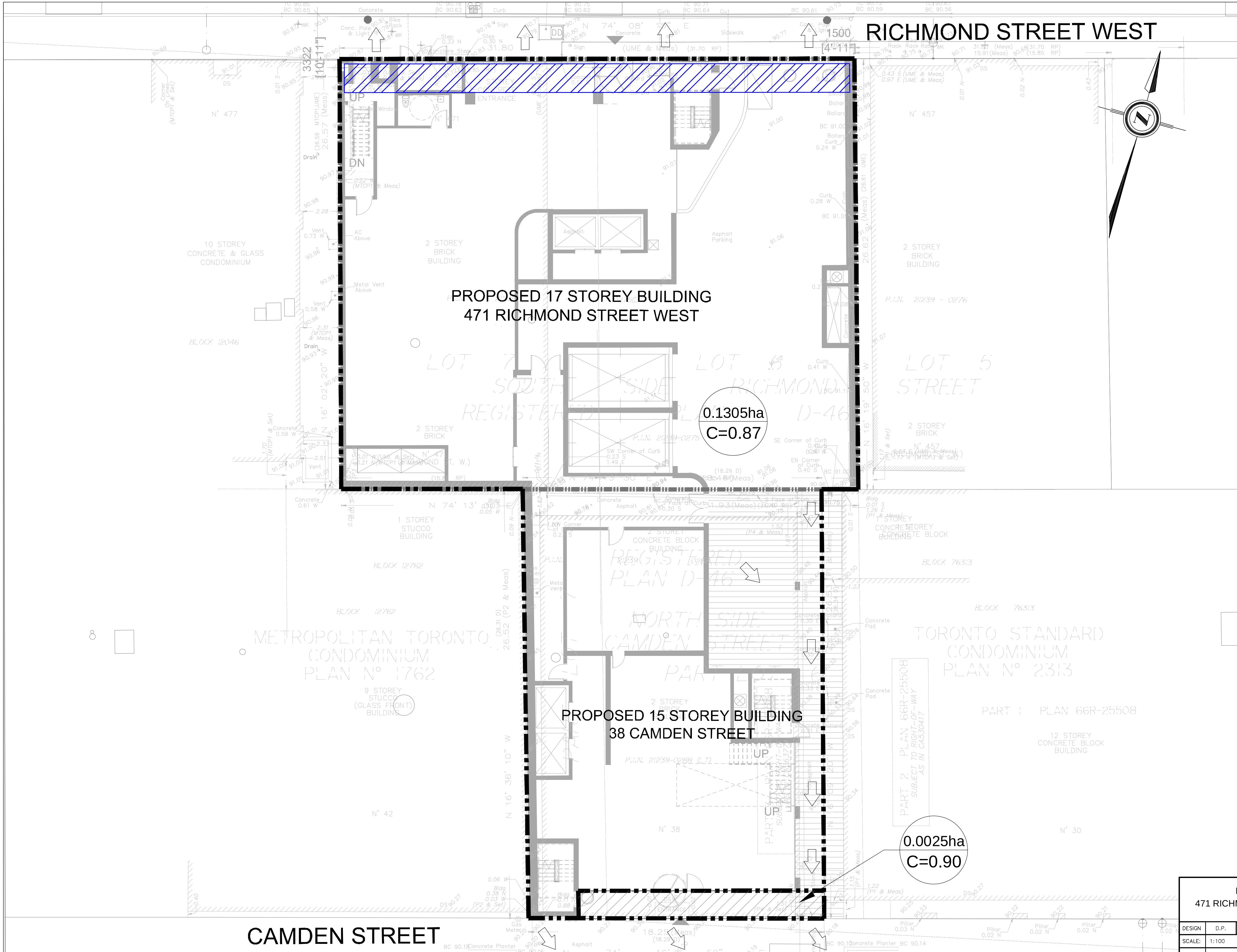
No.	DATE	REVISIONS	INITIAL	SIGNED
1	23/04/19	ISSUED FOR REZONING APPLICATION		

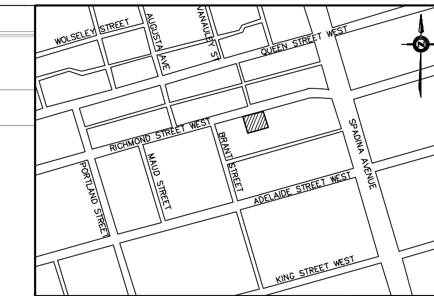
625 Cochrane Drive, Suite 900
Markham, Ontario
L3R 9R9, Canada
Tel: (905)470-0015. Fax: (905)470-0030

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

EXISTING DRAINAGE AREA PLAN
471 RICHMOND STREET WEST & 38 CAMDEN STREET

DESIGN	D.P.	DRAWN	J.W.	CHECKED	C.I.	CONTRACT No. 19114
SCALE:	1:100	DRAWING NUMBER	FIG-01			
DATE:	AUGUST 22, 2018					





LEGEND:

- PROPERTY LINE
- OUTLINE OF UNDERGROUND PARKING GARAGE
- EXISTING CATCHBASIN
- EXISTING MANHOLE
- EXISTING TREE
- EXISTING LIGHT POLE
- OVERLAND FLOW DIRECTION
- DRAINAGE AREA RUNOFF COEFFICIENT (0.00 ha C=0.00)
- DRAINAGE AREA BOUNDARY
- GREEN ROOF

BEARING

BEARINGS ARE GRID AND ARE REFERRED TO THE SOUTHERLY LIMIT OF RICHMOND STREET WEST HAVING A BEARING OF N 74° 08' 15" E AS SHOWN ON METROPOLITAN TORONTO CONDOMINIUM PLAN 1046.

ELEVATION

ELEVATIONS SHOWN HEREON ARE GEODETIC AND IN METERS AND ARE RELATED TO CITY OF TORONTO BENCH MARK No. CT562 HAVING A PUBLISHED ELEVATION OF 89.179 METRES. (CGVD 1928:PRE-1978).

IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER - ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO MUNICIPAL SEWER SYSTEMS AND WATERCOURSES. THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE WITH RESPECT TO ANY PROPOSED DEWATERING

BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL

TORONTO Engineering & Construction Services

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS. THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

MANAGER, DEVELOPMENT ENGINEERING

DATE

DIGITAL INFORMATION

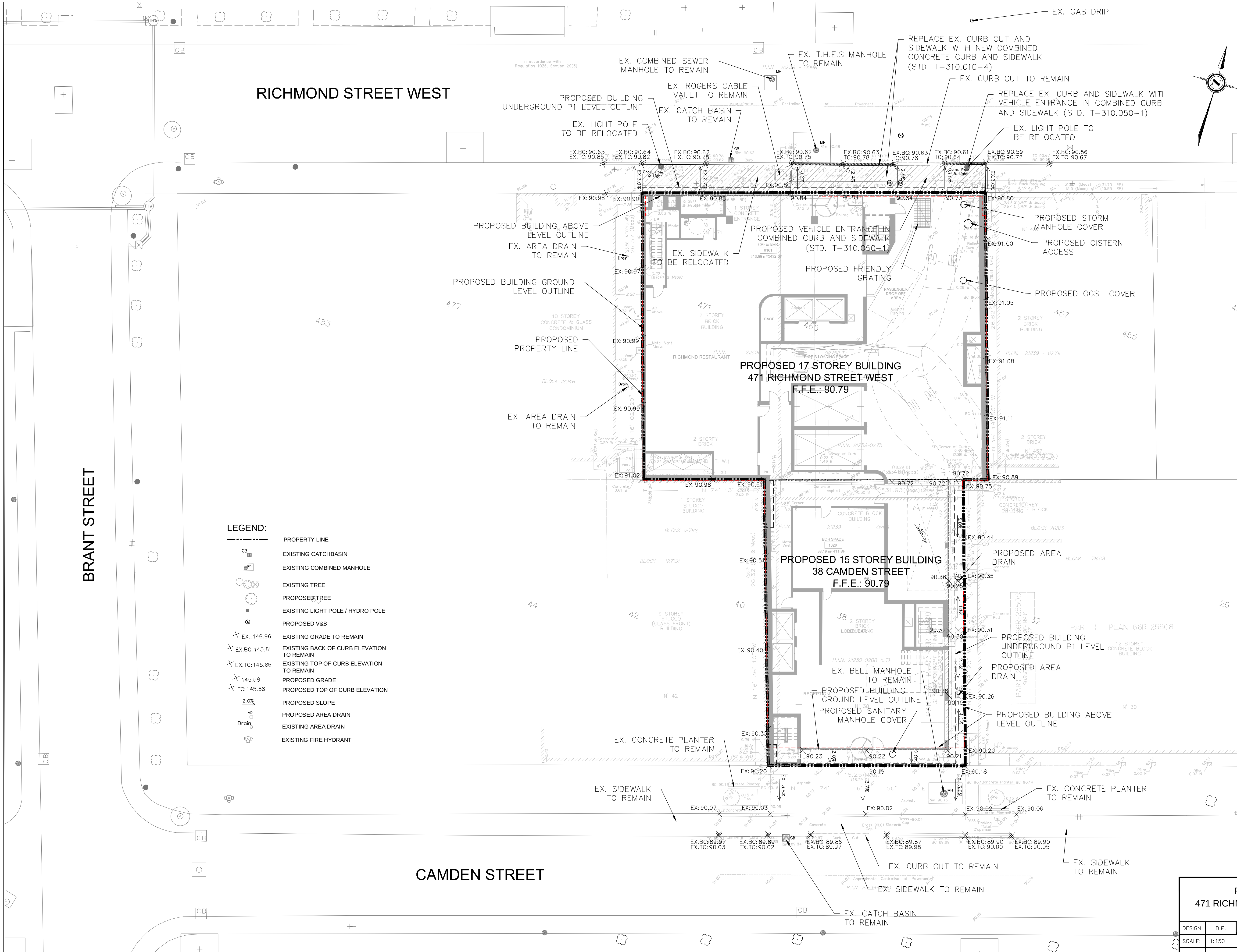
No.	DATE	REVISIONS	INITIAL	SIGNED
1	23/04/19	ISSUED FOR REZONING APPLICATION		

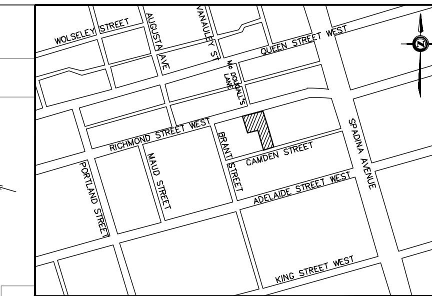
625 Cochrane Drive, Suite 900
Markham, Ontario
L3R 9R9, Canada
Tel: (905)470-0015. Fax: (905)470-0030

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

PROPOSED DRAINAGE AREA PLAN
471 RICHMOND STREET WEST & 38 CAMDEN STREET

DESIGN	D.P.	DRAWN	J.W.	CHECKED	C.I.	CONTRACT No. 19114
SCALE:	1:100			DRAWING NUMBER		FIG-02
DATE:	AUGUST 22, 2018					





GENERAL NOTES

CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.

DO NOT SCALE DRAWINGS.

ALL DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS ARE THE COPYRIGHT PROPERTY OF THE ARCHITECT AND MUST BE RETURNED UPON REQUEST. REPRODUCTION OF DRAWINGS, SPECIFICATIONS AND RELATED DOCUMENTS IN PART OR IN WHOLE IS FORBIDDEN WITHOUT THE WRITTEN PERMISSION OF THE ENGINEER.

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ENGINEER.

PART OF LOT 6 & 7 SOUTH SIDE OF RICHMOND STREET AND NORTH SIDE OF CAMDEN STREET REGISTERED PLAN D - 46, CITY OF TORONTO.

471 RICHMOND ST.W : BEARINGS ARE GRID AND ARE REFERRED TO THE SOUTHERLY LIMIT OF RICHMOND STREET WEST HAVING A BEARING OF N 74° 08' 15" E AS SHOWN ON METROPOLITAN TORONTO CONDOMINIUM PLAN 1046.
38 CAMDEN ST. : BEARINGS ARE GRID AND ARE REFERRED TO THE NORTHERLY LIMIT OF CAMDEN ST. HAVING A BEARING OF N 74° 16' 50" W AS SHOWN ON TORONTO CONDOMINIUM PLAN N° 2313.

ELEVATIONS SHOWN HEREON ARE GEODETIC AND IN METERS AND ARE RELATED TO CITY OF TORONTO BENCH MARK NO. CT - 562 HAVING A PUBLISHED ELEVATION OF 89.179 METRES (CGVD 1928:PRE-1978).

DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SURVEYING INFORMATION IS REFERENCED FROM LAND SURVEY GROUP. PLAN NO. LSG-4350 & PLAN NO. LSG-4656.

IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER - ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO MUNICIPAL SEWER SYSTEMS AND WATERCOURSES. THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE WITH RESPECT TO ANY PROPOSED DEWATERING

BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL

TORONTO Engineering & Construction Services

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS. THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

MANAGER, DEVELOPMENT ENGINEERING

DATE

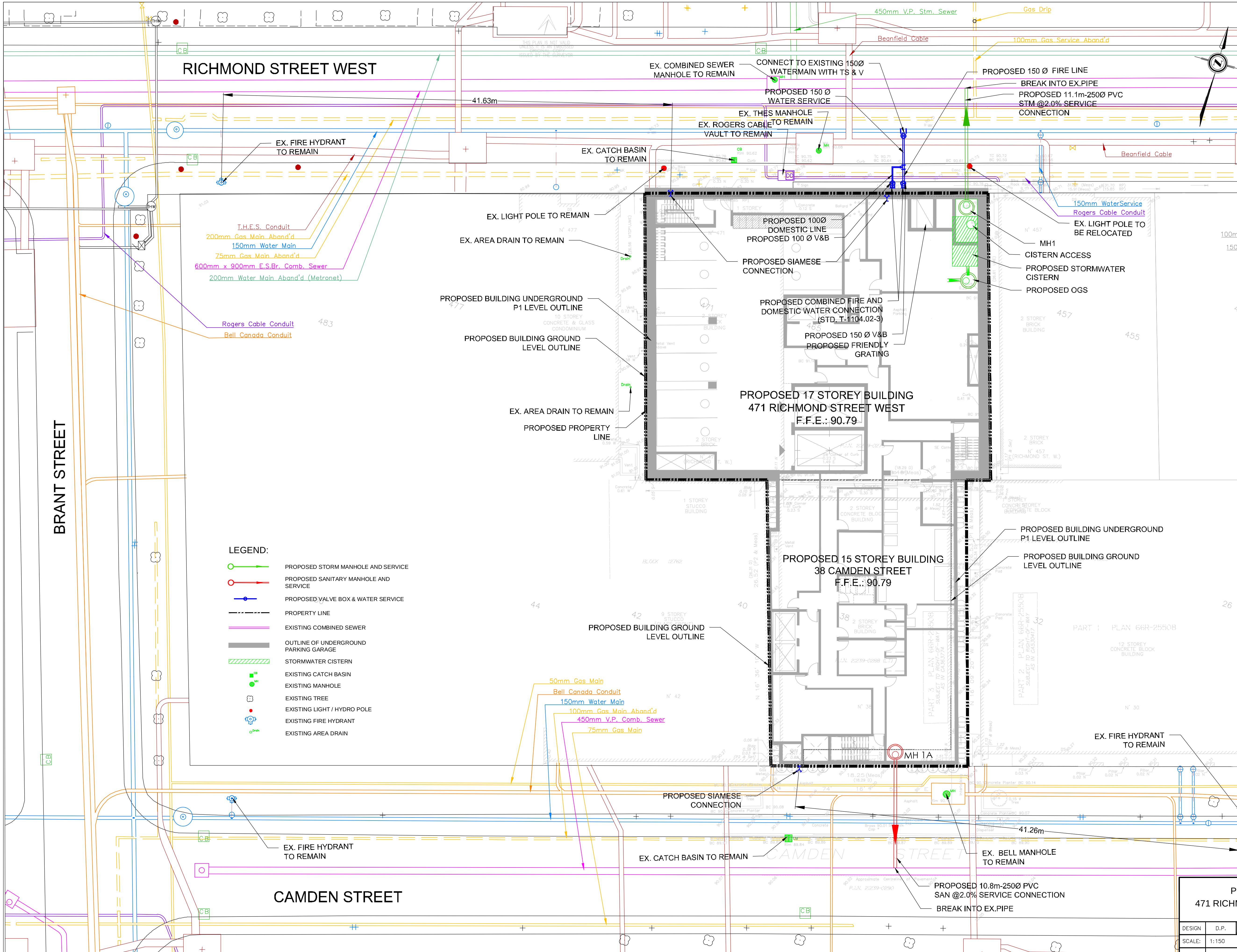
DIGITAL INFORMATION

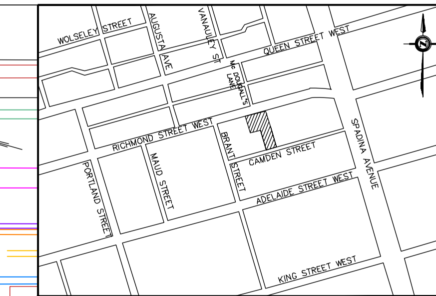
No.	DATE	REVISIONS	INITIAL	SIGNED
2	23/04/19	ISSUED FOR REZONING APPLICATION		
1	17/07/18	ISSUED FOR COORDINATION		

LEA Consulting Ltd.

PRELIMINARY SITE GRADING PLAN
471 RICHMOND STREET WEST & 38 CAMDEN STREET

DESIGN	D.P.	DRAWN	J.W.	CHECKED	C.I.	CONTRACT No. 19114	
SCALE:	1:150			DRAWING NUMBER		C-01	
DATE:	JULY 17, 2018						





GENERAL NOTES

CONTRACTOR MUST CHECK & VERIFY ALL DIMENSIONS ON THE JOB.

DO NOT SCALE DRAWINGS.

THIS DRAWING IS NOT TO BE USED FOR CONSTRUCTION UNTIL SIGNED BY THE ENGINEER.

PART OF LOT 6 & 7 SOUTH SIDE OF RICHMOND STREET AND NORTH SIDE OF CAMDEN STREET REGISTERED PLAN D - 46, CITY OF TORONTO.

471 RICHMOND ST.W : BEARINGS ARE GRID AND ARE REFERRED TO THE SOUTHERLY LIMIT OF RICHMOND STREET WEST HAVING A BEARING OF N 74° 08' 15" E AS SHOWN ON METROPOLITAN TORONTO CONDOMINIUM PLAN 1046.
38 CAMDEN ST. : BEARINGS ARE GRID AND ARE REFERRED TO THE NORTHERLY LIMIT OF CAMDEN ST. HAVING A BEARING OF N 74° 16' 50" W AS SHOWN ON TORONTO CONDOMINIUM PLAN N' 2313.

ELEVATIONS SHOWN HEREON ARE GEODETIC AND IN METERS AND ARE RELATED TO CITY OF TORONTO BENCH MARK NO. CT - 562 HAVING A PUBLISHED ELEVATION OF 89.179 METRES (CGVD 1928:PRE-1978).

DISTANCES SHOWN HEREON ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

SURVEYING INFORMATION IS REFERENCED FROM LAND SURVEY GROUP. PLAN NO. LSG-4350 & PLAN NO. LSG-4656.

IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER - ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO MUNICIPAL SEWER SYSTEMS AND WATERCOURSES. THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT AND CLIMATE CHANGE WITH RESPECT TO ANY PROPOSED DEWATERING

BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL

TORONTO Engineering & Construction Services

ACCEPTED TO BE IN ACCORDANCE WITH THE CITY OF TORONTO STANDARDS. THIS ACCEPTANCE IS NOT TO BE CONSTRUED AS VERIFICATION OF ENGINEERING CONTENT.

MANAGER, DEVELOPMENT ENGINEERING

DATE

DIGITAL INFORMATION

No.	DATE	REVISIONS	INITIAL	SIGNED
2	23/04/19	ISSUED FOR REZONING APPLICATION		
1	17/07/18	ISSUED FOR COORDINATION		

625 Cochrane Drive, Suite 900
Markham, Ontario
L3R 9R9, Canada
Tel: (905)470-0015. Fax: (905)470-0030

LEA Consulting Ltd.
Consulting Engineers and Planners
www.LEA.ca

LICENSED PROFESSIONAL ENGINEER
D. C. ILIESCU
100184484
Apr 23/2019
PROVINCE OF ONTARIO

PRELIMINARY SITE SERVICING PLAN
471 RICHMOND STREET WEST & 38 CAMDEN STREET

DESIGN	D.P.	DRAWN	J.W.	CHECKED	C.I.	CONTRACT No. 19114
SCALE:	1:150			DRAWING NUMBER		C-02
DATE:	JULY 17, 2018					

LEA