City of Mississauga

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

NYX Capital Corp.

3016-3032 Kirwin Ave & 3031 Little John Lane

March 2019

17347

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1 INTRODUCTION

1.1 SCOPE OF THE SWM AND SERVICING BRIEF

LEA Consulting Ltd has been retained by NYX Capital Corp. to prepare a Servicing Stormwater Management Report for the proposed residential development project in the City of Mississauga. This Servicing and stormwater management and servicing report shall:

- Examine the potential water quality and quantity impacts of the proposed townhouses and summarize how each will be addressed in accordance with the City of Mississauga and Credit Valley Conservation (CVC) stormwater management requirements.
- Review the existing water supply, storm and sanitary services, and propose a site servicing plan.

1.2 SITE LOCATION

The proposed development site is located at the southwest quadrant of Kirwin Avenue and Dundas Street East, contributory to Cooksville Creek watershed, and under the jurisdiction of Credit Valley Conservation (CVC).

The site is approximately 0.64 ha in area.

1.3 STORMWATER MANAGEMENT PLAN OBJECTIVES

The objectives of the stormwater management plan is to review the stormwater environment impact by the proposed residential development and address the City's requirements for stormwater quantity control and quality control as required;

1.4 SWM DESIGN CRITERIA – CREDIT VALLEY CONSERVATION AUTHORITY

Credit Valley Conservation Authority (CVC), in partnership with the Toronto and Region Conservation Authority, has issued the Storm Water Management Criteria (August 2012) to provide direction on how to manage rainfall and runoff inside CVC's jurisdiction. A summary of the storm water management criteria applied for this project, is provided below:

- Storm Water Quality Control – Cooksville Creek is classified as requiring an Enhanced level of protection (80% TSS removal) by CVC quality control criteria.
- Flood Control (Water Quantity Control) – all storm events up to 100-year post-development peak flow to 2-year pre-development control is required by CVC within Cooksville Creek watershed.
- Water Balance Control – Maintain pre-development groundwater recharge rates and appropriate distribution ensuring the protection of related hydrologic and ecologic functions.
- Erosion Control – On-site detention of 5mm within Cooksville Creek watershed.

2 EXISTING CONDITIONS

2.1 GENERAL

The existing site is between Kirwin Avenue and Little john Lane and consists of four single family houses and 0.53 ha of lawn and treed area

During more frequent rainfall events, surface rainfall runoff of houses is conveyed to Kirwin Avenue and runoff of the rest of the site is conveyed to the Cooksville Creek. The total drainage area is approximately 0.64 ha.

Based on the existing land use, the site is divided into two sub-catchment areas in order to be consistent with the division of drainage areas of post-development condition, i.e.

- C1 – Proposed buildings area;
- C2 – The land to be dedicated to parkland and to remain as existing condition.

Figure 1 in Appendix G illustrates the existing drainage condition.

The composite runoff coefficients of two sub-catchment areas are, as estimated in Appendix A and B, listed in Table 1.

Table 1: Pre-Development Runoff Coefficient

Sub-catchment No	Catchment Description	Catchment Area (ha)	Runoff Coefficient
C1	Prop Townhouses Area	0.365	0.45
C2	The land to be dedicated to parkland	0.274	0.25

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

2.2 RAINFALL INFORMATION

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

$$I = A / (T_c + B)^{0.78}$$

Where; I = rainfall intensity in mm/hr,

T_c = time of concentration in minutes,

A, B = constant parameters (see below)

The parameters (A and B) recommended for use in the City of Mississauga are defined in City Standard Drawing No. 2111.010, and are summarized in Table 2.

Table 2: Rainfall Parameters

Return Period (Year)	2 - Yr	5 - Yr	10 - Yr	25 - Yr	50 - Yr	100 - Yr
A	610	820	1010	1160	1300	1450
B	4.6	4.6	4.6	4.6	4.7	4.9

An initial time of concentration, TC, of 15 minutes is recommended in the City's Development Requirements Manual.

2.3 PEAK FLOW RATES UNDER EXISTING CONDITION

Based on the existing site condition and rainfall parameters, the Rational Method is adopted to calculate peak flows at different design storm events.

The calculated peak flow rates for sub-catchment C1 in the pre-development condition are summarized below in Table 3. Detailed calculations are provided in Appendix A.

Table 3: Pre-Development Peak Flow Rates (L/s)

Sub-catchment No	Catchment Description	2 - Yr	5 - Yr	10-- Yr	100 - Yr
C1	Prop Townhouses Area	27.42	36.86	45.40	64.41

2.4 ALLOWABLE FLOW RATE

Based on the City's record drawings, storm drainage area plan design sheets, under existing condition the flow from the proposed site to the Kirwin Avenue includes only the rainfall runoff from the existing houses.

The calculated peak flow rates for the site to the Kirwin Avenue under existing condition and in accordance to the City's drainage area with updated runoff coefficient is calculated and summarized below in Table 4. Detailed calculations are provided in Appendix B.

Table 4: Existing Condition Flow Rate to The Kirwin Ave. (L/s)

Sub-catchment	Catchment Description	2 - Yr	5 - Yr	10 - Yr	100 - Yr
C	Existing Houses	20.24	27.20	33.51	47.54

In order to maintain the existing drainage condition of the Kirwin Avenue, the allowable discharge flow rate from the proposed site to the existing municipal sewer on the Kirwin Avenue under proposed condition will be 20.24 l/s which is equal to the 2-yr existing flow.

3 POST-DEVELOPMENT CONDITIONS

3.1 GENERAL

The proposed project consists of 63 new townhouses in three blocks with underground parking. The proposed storm drainage pattern is designed as follow.

Surface rainfall runoff is collected by area drains, conveyed through proposed internal storm pipes from the surface parking lot and landscape areas to the proposed storage tank and storm manhole, and outlets to municipal storm sewer in the Kirwin Ave. Refer to Figure 2 in Appendix G for details of proposed development drainage condition.

The rainfall runoff in excess of major flow will spill onto Kirwin Avenue right-of-way, as shown on Appendix G and Dwg. C01–Site Grading Plan.

Based on the proposed land-use, the composite runoff coefficients are estimated at 0.80 for C1 sub-catchment area. Refer to Appendix A for details.

There are no changes in sub-catchment C2 and it remains same as the existing condition.

The land-use is provided below in Table 5 for comparison between existing and proposed condition.

Table 5: Land-Use Area Breakdown

Sub-Catchment No.	Sub-Catchment	Impervious Area (m^2)		Pervious Area (m^2)	
		Existing	Proposed	Existing	Proposed
C1	Prop Townhouses Area	1132.7	3114.0	2514.3	533

Table 4 demonstrates that the impervious area will be increased by 175% in C1 catchment area after construction of new townhouses.

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 flows at different design storm events.

The calculated peak flow rates for sub-catchment C1 under the post-development condition are summarized below in Table 6. Detailed calculations are provided in Appendix A.

Table 6: Post-Development Peak Flow Rates (L/s)

Sub-Catchment No.	Sub-Catchment	2 - Yr	5 - Yr	10 - Yr	100 – Yr*
C1	Prop Townhouses Area	48.85	65.71	80.94	143.53

* The adjusted runoff coefficient (1.25*C) is used to calculate 100 year flow under proposed condition.

3.3 IMPACT ON WATER ENVIRONMENT

Based on the review and analysis for existing and proposed site conditions, Table 7 summarizes the key hydrologic parameters of the site under proposed condition.

Table 7: Key Hydrologic Parameters

Sub-Catchment Area	Imperviousness (%)		Runoff Coefficient		100-year Peak Flow Rate (L/s)	
	Pre-Dev	Post-Dev	Pre-Dev	Post-Dev	Pre-Dev	Post-Dev
Prop Townhouses Area (C1)	31.1	85.4	0.45	0.81	64.41	143.53

According to the City of Mississauga Development Requirements Manual, 2016, in order to account for the increase in runoff due to saturation of the catchment surface, the adjacent factor of 1.25 is used for runoff coefficient to calculate the 100-yr flow under proposed condition.

The hydrologic parameters show the changes before and after the proposed development. Mitigation measures are required for sub-catchment C1 in accordance with the CVC's design criteria. Since the sub-catchment C2 will not be changed, no mitigation measures are required.

4 PROPOSED SWM PLAN – SUB-CATCHMENT C1

4.1 WATER BALANCE REQUIREMENT

Based on the water balance criteria, the minimum on-site runoff retention requires retaining all runoff of the first 5mm from each rainfall through infiltration, evapo-transpiration, etc. To satisfy the water balance criteria, an on-site storage volume of approximate 14.68 m^3 is required (Refer to Appendix A).

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

- Rainwater harvesting: Re-use of rainwater for toilet flushing.
- 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.

4.2 WATER QUANTITY CONTROL REQUIREMENT

According to the CVC's stormwater quantity control criteria it is required to control all storm events up to 100-year post-development to 2-year pre-development. Since the existing 375mm storm sewer in Kirwin Ave. does not have enough capacity, the Sub-catchment C1 will be overcontrolled to maintain the existing 2-yr flow rate from the site to Kirwin Ave. The required and provided on-site stormwater storage volumes are calculated as shown in Appendix A, and summarized in Table 8 below.

Table 8: Required On-Site Storage Volumes (m^3)

Sub-Catchment No.	Required 5mm on-site retention	Required stormwater Detention volume				Provided volume (total)
		2 - Yr	5 - Yr	10 - Yr	100 - Yr	
C1	14.68	25.74	41.71	57.60	134.41	170.0

Based on the proposed site condition, a stormwater storage tank, located in the underground parking, will provide a total storage volume of 170 m^3. Refer to Dwg. C-02 for the tank location and dimensions. Related pump and orifice control device will be determined by the mechanical design team in the next design stage.

4.3 WATER QUALITY CONTROL REQUIREMENT

In order to achieve the long-term average removal of 80% of Total Suspended Solids (TSS) on an annual basis from all runoff leaving the site, the following quality control measures will be provided:

Sub-catchment #1: Based on the SWM design criteria, the residential blocks rooftop area is not subject to vehicular traffic, and the application of sand and de-icing salt constituents, petroleum hydrocarbons and heavy metals. As such, runoff from the roof surface is generally considered to be clean. Table 9 provides a preliminary estimate of TSS removal level of stormwater leaving the site.

Table 9: TTS Removal Assessment Sub-Catchment C1

Land Use	Area (m^2)	TSS Removal Efficiency (%)	Composite TSS Removal Efficiency (%)
Roof	1577.0	80	34.6
Visitor Parking and Courtyard	1537.0	0	0
landscape	533.0	80	11.7
Oil/Grit Separator	3647.0	50	50.0
Total	3647.0	-	>80.0

To achieve a TSS removal of 80%, a stormwater quality treatment facility (CDS model PMSU2015-4) is proposed. Sizing details are provided in Appendix A.

This quality treatment unit will be installed at the inlet of storage tank within the parking lot. The exact location will be determined by the project team mechanical engineer and architect.

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 constructed and maintained in accordance with the Greater Golden Horseshoe Area Conservation Authorities' (GGHA CAs) Erosion & Sediment Control Guidelines for Urban Construction (December 2006). In brief, the measures below are proposed 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 catch basins;
- Granular mud-mats at all construction egress locations (see mud-mat details);
- An inspection and monitoring program following the GGHA CA's Erosion and Sediment Control Guidelines for Urban Construction (December 2006).

An erosion and sediment control plan is provided and shown on Appendix G and Dwg. C01.

5 FLOODPLAIN ANALYSIS SUMMARY

A floodplain analysis is provided for proposed residential development and the CVC's Hydraulic Hec-Ras Model has been updated according to the new site plan. Based on the future100-yr (210 m^3/s) and future Regional storm (280 m^3/s), water surface elevation and average velocity of flow for existing and proposed conditions are summarized in Table 10. The summary, Cross sections and the model results based on the 100-yr and regional storm are provided in Appendix F.

Table 10: Site Servicing Requirement

HEC-Ras River Station	Existing Condition		Proposed Condition	
	Future 100-yr storm	Future Regional Storm	Future 100-yr storm	Future Regional Storm
5.120	111.94	112.13	111.93	112.13
5.101	111.89	112.06	111.89	112.06
5.082	111.89	112.06	111.88	112.05
5.059	111.84	111.99	111.84	111.99
5.053	111.44	111.03	111.44	111.03
4.960	108.50	109.10	108.5	109.10

As shown in the Table 10, the proposed development doesn't have any significant impact on the Cooksville Creek water surface elevations.

It should be noted that, the City of Mississauga and Credit Valley Conservation (CVC) approved and executed a Site Plan Agreement to permit the development of Hotel Mississauga Royale on 27th of November 2012 for the proposed site. This previous approval, designed by MSAI Architects, included a northern 22-storey tower (Tower B), a southern 40-storey tower (Tower A) and a 2-storey building as a connection between towers.

The previously approved regulatory floodlines, prepared by AMEC, dated Feb. 11, 2011 are delineated on the grading plan that is presented in Appendix G. the original floodline drawing is provided in Appendix F.

6 SITE SERVICING

The purpose of this site servicing study is to review the site servicing requirement of the proposed new townhouse 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.

6.1 EXISTING MUNICIPAL SERVICES

The proposed development will require new service connections to the existing municipal services, i.e. storm sewers, sanitary sewers and watermains, located on Kirwin Avenue adjacent to the site. Existing underground municipal services/utilities are summarized below:

a) 375mm dia. concrete storm sewer;

b) 250mm dia. concrete sanitary sewer;

c) 300mm dia. Ductile iron watermain on the North side of Kirwin Ave.;

6.2 PROPOSED SITE SERVICE CONNECTIONS

Based on the project statistics of proposed development provided by the architect, and design criteria of City and Region, sanitary flow and water demand are estimated in Appendix C and summarized in Table 11. Site storm flow discharge rate have been provided in the previous section of this report.

Table 11: Site Servicing Requirement

Site	Storm Discharge Rate (L/s)	Sanitary Discharge Rate (L/s)	Water Demand (L/s)
Townhouses	20.24	13.13	101.10

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

1. Sanitary Service: A 150mm dia. sanitary service connection will be installed to service the proposed townhouses and discharge to proposed manhole No. MH1A on the exiting 250mm concreate sanitary sewer on Kirwin Avenue.
2. Storm Service: A 200mm dia. storm service connection will be installed to drain townhouses area to proposed manhole No. MH.1 on the existing 375mm storm sewer on Kirwin Avenue.
3. Water service:
   - Domestic Water Service: A 100mm dia. domestic water service connection will be installed to service the proposed townhouses and connected to the proposed 150mm dia. fire protection water service with a cut-in Tee.
   - Fire Protection Service: A 150mm fire protection PVC water service will be provided.

The existing 300mm diameter water main on Kirwin Avenue will be utilized to service the proposed development site.

Based on the proposed parking floor elevation of 108 m, storm and sanitary flow from the site will not be able to discharge to the City's storm (Inv. 109.9m) and sanitary sewer (Inv. 109.23m) by gravity, and therefore, sump pumps will be required. Pumps, piping and backflow preventer will be designed by mechanical engineer

in the next design phase.

Refer to Dwg. C-02 for details of proposed service connections.

6.3 ADEQUACY OF EXISTING MUNICIPAL SERVICES

Sanitary

The full flow capacity of the existing 250mm sanitary sewers on the Kirwin Ave. is estimated 39L/s based on Region's record drawings, and anticipated to be adequate to accommodate the actual sanitary flow (2.62 L/s) from the proposed development.

Storm

Based on the City's design criteria, drainage area plan and record drawing, assessment of the existing storm sewers from the site in KIrwin Ave. to the existing culvert in Dundas St. E. are reviewed below:

The existing 375mm storm sewer in Kirwin Ave., as shown on the storm drainage areas plan, is designed based on 10-year design storm and a runoff coefficient of C=0.45. The review of the drainage plan shows that the existing plaza (157 Dundas St. E.) at the northeast quadrant of Kirwin Avenue and Dundas Street East has been developed later. Since there is no information regarding the on-site stormwater management facility and storm service connection, it is assumed that the storm flow from above-mentioned property discharges to the existing 375mm storm sewer on Kirwin Ave. without any control.

Based on the above assumption, the runoff coefficient is updated according to the existing land use. The flow is calculated and summarized below in the Table 12.

Table 12: Site Servicing Requirement

Drainage Area Plan	Area (ha)	Runoff Coefficient	10-yr Flow (L/S)	375mm storm pipe Full Capacity (L/S)
City's Drainage Area Plan	1.37	0.40	150.96	167.0
Updated Drainage Area Plan	1.31	0.74	280.0	167.0

As shown in the Table 11, the 375mm storm sewer on Kirwin Avenue is surcharged under existing condition.

Based on the City's drainage area plan, only 0.19 ha of the proposed site drains to the Kirwin Avenue which includes the existing four houses. The 2-yr discharge flow from proposed site to the Kirwin Avenue is 20.24 l/s under existing condition. The flow calculation and updated runoff coefficient and design sheets are provided in Appendix D.

Under post-development condition, the Sub-catchment C1 will be overcontrolled and discharge flow from the site to the existing 375mm storm sewer on the Kirwin Avenue rate will be 20.24 l/s to maintain the existing condition.

Watermain

The design water demand is estimated as 101.10 L/s (1602.47 US GPM) based on the project statistics. In

order to evaluate the adequacy of the 300mm watermain located on Kirwin Avenue, a hydrant flow test was conducted on June 15, 2017 by Focus Fire Protection. Test results are included in Appendix D.

As shown by the test readings, the available water pressure ranges from 74 psi with a flow of 1521 US GPM to 76 psi with a flow of 1000 US GPM during the flow test with a static pressure of 80 psi. At the design water demand of 101.10 L/s (1602.47 US GPM) generated from the development, the flow test results show a residual pressure of 72.8 psi, which is greater than the minimum requirement of 20 psi (150 kPa). Therefore, adequate water supply and pressure are available to serve the proposed development

7 CONCLUSIONS

Stormwater Management Plan

- Under existing condition, there are no existing on-site stormwater management facilities.
- On-site storage volume of approximate 14.68 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 170 m^3 in volume will be provided in order to control the post-development 100-year stormwater flows to 2-year pre-development level.
- To satisfy the City's 80% TSS removal, a stormwater quality treatment facility (CDS model PMSU2015-4) is proposed. for Sub-Catchment Area C1.
- The impact of proposed amenity area and walkways is negligible, no SWM measures are necessary, and therefore not proposed.
- Sub-catchment C2 includes the land to be dedicated to parkland and to remain as existing condition. Therefore, no any stormwater management plan is required.

Temporary Erosion & Sediment Control Measures

- Temporary erosion and sediment control measures will be provided before construction and maintained during construction in accordance with CVC CA's "Stormwater Management Criteria"

Site Servicing

Proposed site service connections for the proposed development site:

- Storm service: 200mm dia. PVC pipes
- Sanitary service: 150mm dia. PVC pipes
- Water service: 100mm dia. PVC pipe for domestic water supply
  150mm dia. PVC pipe for fire water supply

Prepared By:
LEA Consulting Ltd.

Farshid Morshedi, P.Eng.
Project Engineer

APPENDIX A

Stormwater Peak Flow and Storage Calculation for Sub-Catchment Area C1

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M	Page No.	A-01
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

EXISTING CONDITIONS:

Existing Land Use	Area (m^2)
Lawn & Tree	2514.3
Building	374.4
Asphalt	758.3
Total Site Area:	**3647.0**

PROPOSED DEVELOPMENT:

Proposed Land Use	Area (m^2)
Building Cool Roof Area	1577.0
Total Paved Area	1537.0
Total Landscaped Area	533.0
Total Site Area	**3647.0**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M	Page No.	A-02
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

Pre-Development Composite Runoff Coefficient "C"

Location	Area (ha)	C	Composite "C"
Lawn & Tree	0.251	0.25	
Building	0.037	0.90	
Asphalt	0.076	0.90	
Total Site Area:	**0.365**		**0.45**
Imperviousness Percent:			**31.1**

Post-Development Composite Runoff Coefficient "C"

Location	Area (ha)	C	Composite "C"
Building Cool Roof Area	0.158	0.90	
Total Paved Area	0.154	0.90	
Total Landscaped Area	0.053	0.25	
Total Site Area	**0.365**		**0.81**
Imperviousness Percent:			**85.4**

	5mm Rainfall Retention Volume (Water Balance)			
	Prepared:	F.M	Page No.	A-03
	Checked:	M.D.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17246		
	Date:	26-Mar-19		

According to the CVC 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: 0.365 ha
Runoff Coefficient : 0.81 Post-development site conditions

Runoff volume from 5mm rainfall event on site:

$V = 0.365 \times 10 \times 5 = 18.24 \ m^3$

Required on-site retention volume for 5mm rainfall event: 18.24 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M	Page No.	A-04
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

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

Site Area:	0.365	ha
Time of Concentration:	15	minutes as per City Guidelines
Runoff Coefficient :	0.45	Pre-development condition

Rainfall Intensity: $I = a/(Tc+b)^c$ (City Std. 2111.010)

Return Period:	2-yr	5-yr	10-yr	100-yr
Rainfall Intensity (mm/hr):	59.89	80.51	99.17	140.69

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	100-yr
Under existing site conditions (L/s):	27.42	36.86	45.40	64.41

Since the existing area which drains to the Kirwin Ave. is less than proposed development area (sub-catchment C1), the stormwater discharge from sub-catchment C1 will be overcontrilled to provide a 2-yr flow rate same as the existing condition as the allowable flow rate: 20.24 L/s

LEA Consulting Ltd. Consulting Engineers and Planners	Post-Development Peak Flow Rates Calculation (Uncontrolled)			
	Prepared:	F.M	Page No.	A-05
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

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

Site Area:	0.365	ha
Time of Concentration:	15	minutes as per City Guidelines
Runoff Coefficient :	0.81	Post-development (2-yr to 10-yr)
Adjusted Runoff Coeffi	1.01	Post-development (1.25*C for 100-yr)

Rainfall Intensity: $I = a/(Tc+b)^c$ (City Std. 2111.010)

Return Period:	2-yr	5-yr	10-yr	100-yr
Rainfall Intensity (mm/hr):	59.89	80.51	99.17	140.69

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	10-yr	100-yr
Under post-development conditions (L/s):	48.85	65.71	80.94	143.53

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (2-Year Storm)			
	Prepared:	F.M	Page No.	A-06
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

Total Drainage Area (ha) = 0.365 ha
Drainage Area Composite C = 0.81
Allowable Release Rate (2-year) = 20.24 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)
15	59.89	48.85	43.96	20.24	18.22	25.74
20	50.16	40.91	49.10	20.24	24.29	24.81
25	43.42	35.42	53.12	20.24	30.36	22.76
30	38.45	31.36	56.44	20.24	36.43	20.01
35	34.60	28.22	59.27	20.24	42.50	16.77
40	31.54	25.72	61.73	20.24	48.58	13.15
45	29.03	23.68	63.93	20.24	54.65	9.28
50	26.94	21.97	65.90	20.24	60.72	5.18
55	25.16	20.52	67.70	20.24	66.79	0.91
60	23.62	19.27	69.36	20.24	72.86	-3.50
65	22.29	18.18	70.90	20.24	78.94	-8.04
70	21.12	17.22	72.33	20.24	85.01	-12.68
75	20.07	16.37	73.67	20.24	91.08	-17.41
80	19.14	15.61	74.94	20.24	97.15	-22.21
85	18.30	14.93	76.13	20.24	103.22	-27.09
90	17.54	14.31	77.27	20.24	109.30	-32.03
95	16.85	13.75	78.35	20.24	115.37	-37.02
100	16.22	13.23	79.38	20.24	121.44	-42.06
105	15.64	12.76	80.37	20.24	127.51	-47.14
110	15.11	12.32	81.32	20.24	133.58	-52.26

Required Storage Volume = 25.74 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (5-Year Storm)			
	Prepared:	F.M	Page No.	A-07
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

Total Drainage Area (ha) = 0.365 ha
Drainage Area Composite C = 0.81
Allowable Release Rate (2-year) = 20.24 L/s
Return Period = 5 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)
15	80.51	65.66	59.10	20.24	18.22	40.88
20	67.43	55.00	66.00	20.24	24.29	41.71
25	58.37	47.61	71.41	20.24	30.36	41.05
30	51.68	42.15	75.87	20.24	36.43	39.44
35	46.52	37.94	79.67	20.24	42.50	37.17
40	42.40	34.58	82.99	20.24	48.58	34.41
45	39.02	31.83	85.93	20.24	54.65	31.28
50	36.21	29.53	88.59	20.24	60.72	27.87
55	33.82	27.58	91.01	20.24	66.79	24.22
60	31.76	25.90	93.24	20.24	72.86	20.38
65	29.96	24.44	95.30	20.24	78.94	16.36
70	28.38	23.15	97.23	20.24	85.01	12.22
75	26.98	22.01	99.03	20.24	91.08	7.95
80	25.73	20.99	100.73	20.24	97.15	3.58
85	24.60	20.07	102.34	20.24	103.22	-0.88
90	23.58	19.23	103.87	20.24	109.30	-5.43
95	22.66	18.48	105.32	20.24	115.37	-10.05
100	21.81	17.78	106.71	20.24	121.44	-14.73
105	21.03	17.15	108.04	20.24	127.51	-19.47
110	20.31	16.56	109.31	20.24	133.58	-24.27

Required Storage Volume = 41.71 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (5-Year Storm)			
	Prepared:	F.M	Page No.	A-07
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

Total Drainage Area (ha) = 0.365 ha
Drainage Area Composite C = 0.81
Allowable Release Rate (2-year) = 20.24 L/s
Return Period = 5 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)
15	99.17	80.88	72.79	20.24	18.22	54.57
20	83.06	67.74	81.29	20.24	24.29	57.00
25	71.90	58.64	87.96	20.24	30.36	57.60
30	63.66	51.92	93.45	20.24	36.43	57.02
35	57.30	46.73	98.13	20.24	42.50	55.63
40	52.22	42.59	102.22	20.24	48.58	53.64
45	48.07	39.20	105.85	20.24	54.65	51.20
50	44.60	36.37	109.12	20.24	60.72	48.40
55	41.65	33.97	112.10	20.24	66.79	45.31
60	39.11	31.90	114.84	20.24	72.86	41.98
65	36.91	30.10	117.39	20.24	78.94	38.45
70	34.96	28.51	119.76	20.24	85.01	34.75
75	33.24	27.11	121.98	20.24	91.08	30.90
80	31.69	25.85	124.07	20.24	97.15	26.92
85	30.31	24.72	126.05	20.24	103.22	22.83
90	29.05	23.69	127.93	20.24	109.30	18.63
95	27.90	22.76	129.72	20.24	115.37	14.35
100	26.86	21.91	131.43	20.24	121.44	9.99
105	25.90	21.12	133.07	20.24	127.51	5.56
110	25.01	20.40	134.64	20.24	133.58	1.06

Required Storage Volume = 57.60 m^3

LEA Consulting Ltd. Consulting Engineers and Planners	On-Site Storage Calculation (100 - Year Storm)			
	Prepared:	F.M	Page No.	A-08
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE SUB-CATCHMENT C1	Proj. #	17347		
	Date:	26-Mar-19		

Total Drainage Area (ha) = 0.365 ha
Drainage Area Adjusted Composite C = 1.01 (with1.25 Adjustment Factor)
Allowable Release Rate (2-year) = 20.24 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)
15	140.69	143.43	129.09	20.24	18.22	110.87
20	118.12	120.42	144.51	20.24	24.29	120.22
25	102.41	104.40	156.61	20.24	30.36	126.25
30	90.77	92.54	166.58	20.24	36.43	130.15
35	81.77	83.37	175.07	20.24	42.50	132.57
40	74.58	76.03	182.47	20.24	48.58	133.89
45	68.68	70.02	189.06	20.24	54.65	134.41
50	63.75	64.99	194.98	20.24	60.72	134.26
55	59.56	60.72	200.38	20.24	66.79	133.59
60	55.95	57.04	205.35	20.24	72.86	132.49
65	52.81	53.83	209.95	20.24	78.94	131.01
70	50.03	51.01	214.24	20.24	85.01	129.23
75	47.58	48.50	218.26	20.24	91.08	127.18
80	45.38	46.26	222.04	20.24	97.15	124.89
85	43.39	44.24	225.62	20.24	103.22	122.40
90	41.60	42.41	229.02	20.24	109.30	119.72
95	39.97	40.75	232.25	20.24	115.37	116.88
100	38.47	39.22	235.34	20.24	121.44	113.90
105	37.10	37.82	238.29	20.24	127.51	110.78
110	35.84	36.53	241.12	20.24	133.58	107.54

Required Storage Volume = 134.41 m^3

CDS ESTIMATED NET ANNUAL SOLIDS LOAD REDUCTION
BASED ON THE RATIONAL RAINFALL METHOD
BASED ON A FINE PARTICLE SIZE DISTRIBUTION

Project Name:	3016 Kirwin Avenue	**Engineer:**	**LEA Consulting Ltd.**
Location:	Mississauga, ON	**Contact:**	Farshid Morshedi, P.Eng.
OGS #:	OGS	**Report Date:**	28-Jan-19

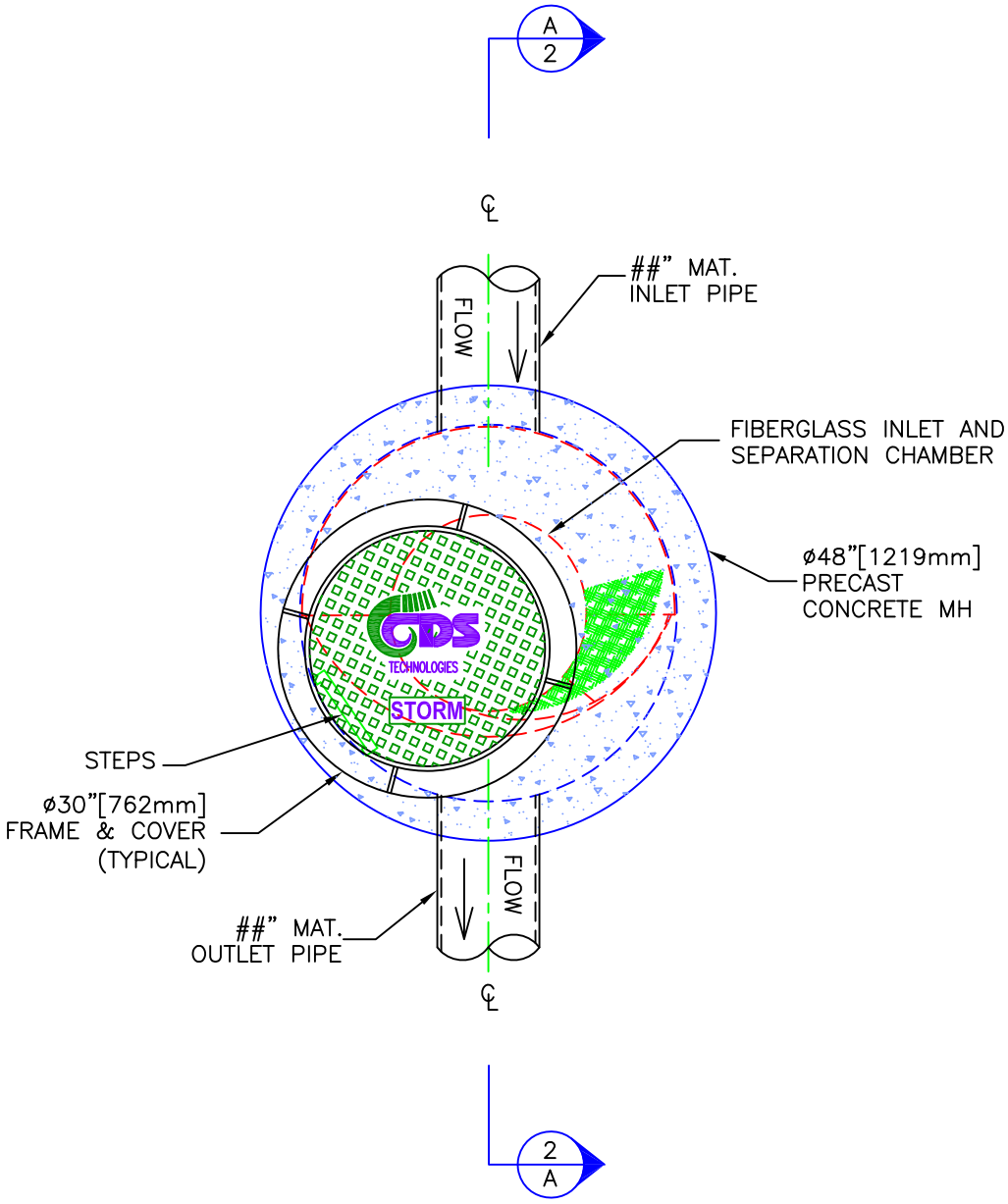
Area	0.3647	ha	**Rainfall Station #**	206	
Weighted C	0.81		**Particle Size Distribution**	FINE	
CDS Model	2015-4		**CDS Treatment Capacity**	20	l/s

Rainfall Intensity[1] (mm/hr)	Percent Rainfall Volume[1]	Cumulative Rainfall Volume	Total Flowrate (l/s)	Treated Flowrate (l/s)	Operating Rate (%)	Removal Efficiency (%)	Incremental Removal (%)
0.5	9.9%	9.9%	0.4	0.4	2.1	98.3	9.7
1.0	10.7%	20.6%	0.8	0.8	4.1	97.7	10.4
1.5	9.8%	30.4%	1.2	1.2	6.2	97.1	9.5
2.0	8.9%	39.3%	1.6	1.6	8.2	96.5	8.6
2.5	7.2%	46.4%	2.0	2.0	10.3	95.9	6.9
3.0	6.1%	52.5%	2.4	2.4	12.4	95.3	5.8
3.5	3.4%	55.9%	2.9	2.9	14.4	94.7	3.2
4.0	5.0%	60.9%	3.3	3.3	16.5	94.1	4.7
4.5	4.2%	65.1%	3.7	3.7	18.5	93.5	3.9
5.0	3.2%	68.3%	4.1	4.1	20.6	93.0	3.0
6.0	5.4%	73.8%	4.9	4.9	24.7	91.8	5.0
7.0	4.2%	77.9%	5.7	5.7	28.8	90.6	3.8
8.0	4.0%	81.9%	6.5	6.5	32.9	89.4	3.6
9.0	2.4%	84.3%	7.3	7.3	37.1	88.2	2.1
10.0	2.7%	87.0%	8.2	8.2	41.2	87.1	2.3
15.0	6.1%	93.0%	12.2	12.2	61.8	81.2	4.9
20.0	2.8%	95.8%	16.3	16.3	82.3	75.3	2.1
25.0	1.8%	97.7%	20.4	19.8	100.0	68.2	1.3
30.0	1.0%	98.7%	24.5	19.8	100.0	56.8	0.6
35.0	0.3%	99.0%	28.6	19.8	100.0	48.7	0.1
40.0	0.6%	99.6%	32.6	19.8	100.0	42.6	0.2
45.0	0.0%	99.6%	36.7	19.8	100.0	37.9	0.0
50.0	0.0%	99.6%	40.8	19.8	100.0	34.1	0.0
							91.8

Removal Efficiency Adjustment[2] =	6.5%
Predicted Net Annual Load Removal Efficiency =	**85.3%**
Predicted % Annual Rainfall Treated =	**99.0%**

1 - Based on 65 years of hourly rainfall data from Canadian Station 6158350, Toronto ON (Bloor)
2 - Reduction due to use of 60-minute data for a site that has a time of concentration less than 30-minutes.
3 - CDS Efficiency based on testing conducted at the University of Central Florida
4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

PLAN VIEW

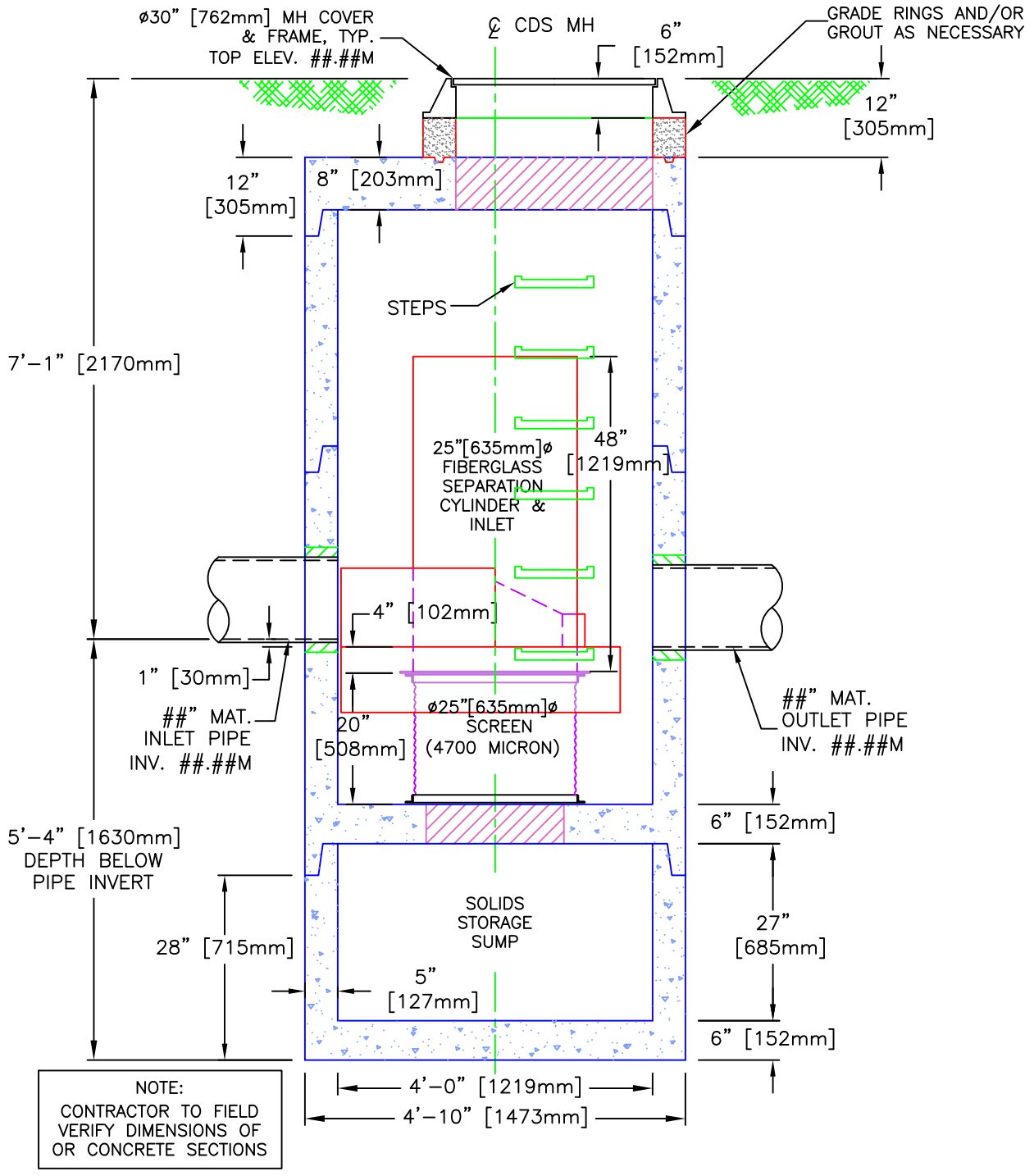


CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX-##-###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 1
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

SECTION A–A
ELEVATION VIEW



CDS MODEL PMSU20_15_4m
STORMWATER TREATMENT UNIT

CONTECH STORMWATER SOLUTIONS	PROJECT NAME CITY, STATE	JOB# XX–##–###	SCALE 1" = 2'
		DATE ##/##/##	SHEET 2
		DRAWN INITIALS	
		APPROV.	

Echelon Environmental 505 Hood Road, Unit 26, Markham, Ontario L3R 5V6 Tel: (905) 948-0000 Fax: (905) 948-0577
CONTECH Stormwater Solutions Inc. 930 Woodcock Road, Suite 101, Orlando, Florida 32803 Tel: (800) 848-9955

APPENDIX B

Allowable Peak Flow Rate Calculation

City of Mississauga

Design Sheet (1979)

Note: 2.11 ha up to the tracks

Proposed development site

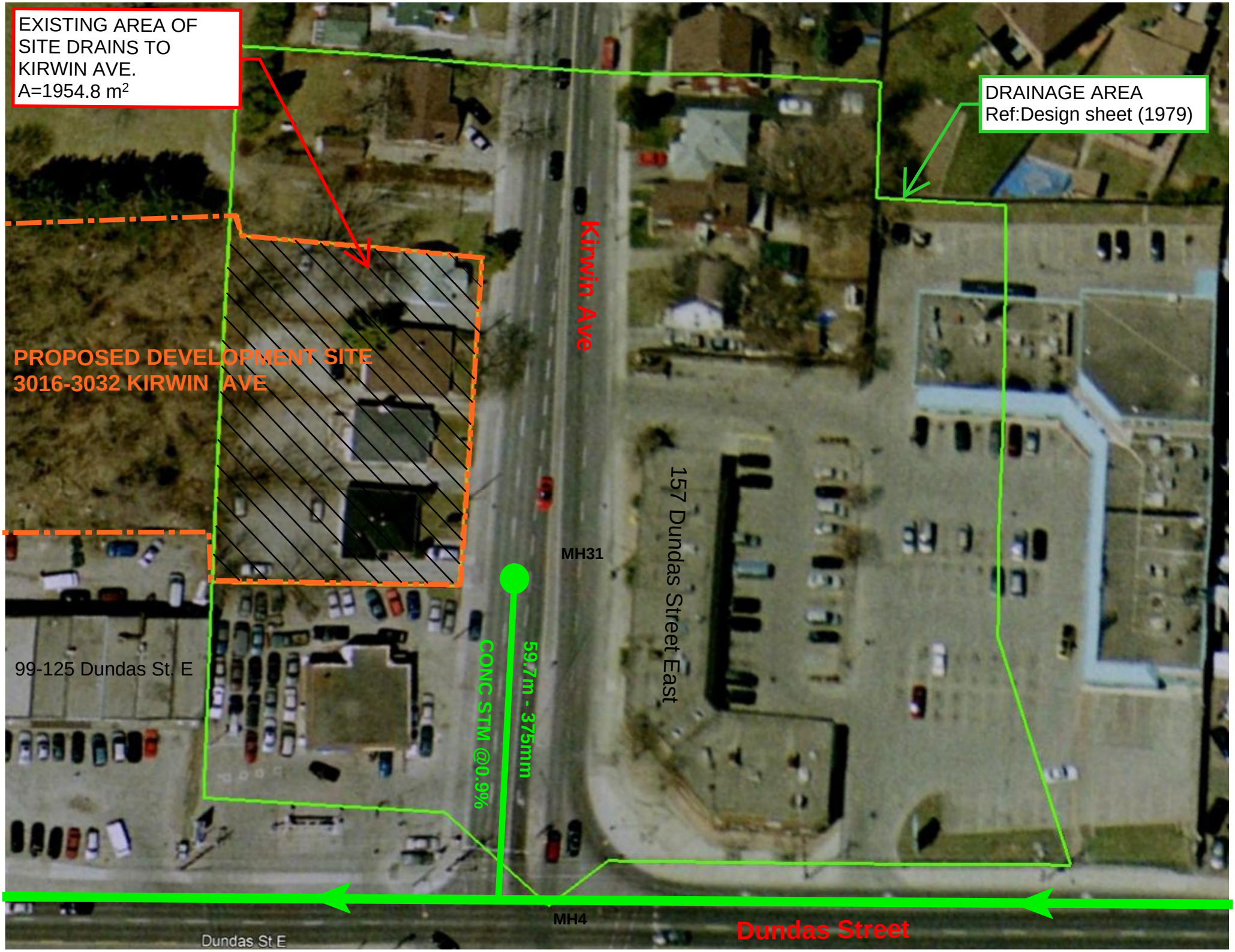
Little John Lane

Kirwin Ave

Jaguar Valley Dr.

EXISTING AREA OF PROP. SITE DRAINS TO KIRWIN AVE.

ARKENDO DEV.
T 79041
111 - 79079


EXISTING AREA OF SITE DRAINS TO KIRWIN AVE.
A=1954.8 m2
DRAINAGE AREA
Ref:Design sheet (1979)
PROPOSED DEVELOPMENT SITE
3016-3032 KIRWIN AVE
Kirwin Ave
157 Dundas Street East
MH31
99-125 Dundas St. E
CONC STM @0.9%
59.7m - 375mm
MH4
Dundas Street
Dundas St E

LEA Consulting Ltd. Consulting Engineers and Planners	Land Use			
	Prepared:	F.M	Page No.	B-01
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE EXISTING CONDITION TO THE KIRWIN AVE.	Proj. #	17347		
	Date:	26-Mar-19		

EXISTING CONDITIONS:

Existing Land Use	Area (m^2)
Lawn & Tree	835.4
Building	360.0
Asphalt	759.4
Total Site Area:	**1954.8**

LEA Consulting Ltd. Consulting Engineers and Planners	Composite "C" Calculation			
	Prepared:	F.M	Page No.	B-02
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE EXISTING CONDITION TO THE KIRWIN AVE.	Proj. #	17347		
	Date:	26-Mar-19		

Pre-Development Composite Runoff Coefficient "C"

Location	Area (ha)	C	Composite "C"
Lawn & Tree	0.084	0.25	
Building	0.036	0.90	
Asphalt	0.076	0.90	
Total Site Area:	**0.195**		**0.62**
Imperviousness Percent:			**57.3**

LEA Consulting Ltd. Consulting Engineers and Planners	Pre-Development Peak Flow Rates Calculation			
	Prepared:	F.M	Page No.	B-03
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE EXISTING CONDITION TO THE KIRWIN AVE.	Proj. #	17347		
	Date:	26-Mar-19		

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

Site Area:	0.195	ha
Time of Concentration:	15	minutes as per City Guidelines
Runoff Coefficient :	0.62	Pre-development condition

Rainfall Intensity: $I = a/(Tc+b)^c$ (City Std. 2111.010)

Return Period:	2-yr	5-yr	5-yr	100-yr
Rainfall Intensity (mm/hr):	59.89	80.51	99.17	140.69

Peak Flow Rate (L/s):

Return Period:	2-yr	5-yr	5-yr	100-yr
Under existing site conditions (L/s):	20.24	27.20	33.51	47.54

2-yr flow rate form prop. Site to Kirwin Ave. under existing condition:
(Allowable flow rate): 20.24 L/s

APPENDIX C

Sanitary and Water Demand Calculations

LEA Consulting Ltd. Consulting Engineers and Planners	Sanitary Flow Rate Calculation			
	Prepared:	F.M.	Page No.	C-01
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE	Proj. #	17347		
	Date:	18-Mar-19		

POPULATION CALCULATION

Site Area	6385	m^2
Number of Townhoses	64	units

Proposed Building Type	**Density** (P.P.U)	**Population**
Residential	2.7	172.80
Total		**172.80**

SANITARY FLOW CALCULATION

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

Peaking Factor	4.17	
Average Daily Wastewater Flow	302.8	L/cap/day
Total Actual Domestic Flow	2.53	L/sec
Total Domestic Flow (For less than 1000 person shall be 13.0 L/sec-STD.DWG. 2-5-2, Region of Peel)	13.00	L/sec
Infiltration Allowance (@ 0.2 L/sec/ha)	0.13	L/sec
Actual Design flow	**2.65**	L/sec
Standard Design Flow	**13.13**	L/sec

LEA Consulting Ltd. Consulting Engineers and Planners		**Water Demand Calculation**		
	Prepared:	F.M.	Page No.	C-02
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE	Proj. #	17347		
	Date:	18-Mar-19		

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.
= 0.8 for fire non-combastable 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.

STEP 1

According the building stats,

		Area (m2)
Ground Floor	adjoining	1488
2nd Floor	largest	1541
3rd Floor	adjoining	1520
A		2293

Therefore, F = 8000 **l/min**

STEP 2

Occupancy reduction:

For occupancies with a low contents fire hazard, the reduction rate is 25%,
Therefore: F = 6000 l/min

Reduction for sprinkler protection:
Using the NFPA sprinkler system, a reduction rate of 30% is used.
Therefore: F = 4200 l/min

STEP 3

Separation charge:
Charge for the separations on each side:

Separation	Charge	
10.1 to 20 m	15%	West
30.1 to 45 m	5%	North
87m	0%	South
10.1 to 20 m	15%	East

Total charge in % 35%
Total charge in l/min 1500

STEP 4

Required Fire Flow: 6000 l/min
or 100.00 l/s
or 1585 US GPM

LEA Consulting Ltd. Consulting Engineers and Planners	Water Demand Calculation			
	Prepared:	F.M.	Page No.	C-03
	Checked:	R.B.		
Project: 3016-3032 KIRWIN AVE & 3031 LITTLE JOHN LANE	Proj. #	17347		
	Date:	18-Mar-19		

Total Population: **173** (See Page D-01)

Average Day Demand Calculation:

Residential Per Capita Demand	280	L/cap/day
Average Day Flow	**0.56**	L/sec

Peak Hour Demand Calculation:

Residential Per Capita Demand	280	L/cap/day
Peaking Factor	3	
Peak Hour Demand	**1.68**	L/sec

Maximum Day Demand Calculation:

Residential Per Capita Demand	280	L/cap/day
Peaking Factor	2	
Maximum Day Demand	**1.12**	L/sec

Fire Flow for Residential:	100.00	L/sec
Max. Day Demand plus Fire Flow:	**101.12**	L/sec
Design Water Demand	**101.12**	L/sec
or	**1602.75**	**US GPM**

APPENDIX D

Strom Sewer Capacity Assessment

Note: 2.11 ha up to the tracks

Little John Lane

Kirwin Ave

Regional Valley Dr

ARKENDO DEV.
T 79041
111 - 79079

DRAINAGE AREA
(AS PER DESIGN SHEET (1979))

Residential (1979)

Plaza and Parking
(Existing)

PROPOSED
DEVELOPMENT SITE
3016-3032 Kirwin Ave

99-125 Dundas St. E

Dundas Street

1.37
0.40
1.31

59.7m - 375mm
CONC STM @ 0.5%

1.79
0.75

0.59
0.75

1.02
0.75

0.92
0.75

0.80
0.75

0.84
0.75

10.01
0.40
PILE

0.18
0.75

0.36
0.75

0.44
0.75

0.25
0.75

0.15
0.75

PARKING

TENNIS COURT

POOL

RUINS

ORCHARD

DUNDAS W.

P/A

DESIGN SHEET (1979)

SUBDIVISION _____
CONSULTANT _____
MAJOR DRAINAGE AREA _____

CITY OF MISSISSAUGA
STORM DRAINAGE DESIGN CHART
FOR CIRCULAR DRAINS FLOWING FULL

SHEET No. 2 OF 3 DATE _____
PROJECT No. _____
DESIGNED BY _____

LOCATION OF SECTION	FROM UPSTREAM	TO DOWNSTREAM	ADJACENT CONTRIBUTARY AREA	RUNOFF COEFFICIENT		ACCUMULATIVE AREA DRAINED BY SECTION	ACCUMULATIVE AREA TIMES RUNOFF COEFFICIENT FOR SECTION	FLOW TIME TO SECTION (FROM EXTREME UPSTREAM INLET)	INITIAL TIME OF CONCENTRATION AT EXTREME UPSTREAM INLET	TIME OF CONCENTRATION AT UPSTEAM END OF SECTION	INTENSITY OF RAINFALL	QUANTITY OF FLOW TO BE ACCOMMODATED IN SECTION.	TYPE OF PIPE	MANNINGS ROUGHNESS COEFFICIENT	SLOPE	DIAMETER	LENGTH OF SECTION	VELOCITY OF FLOW WITH PIPE FLOWING FULL	CAPACITY OF PIPE FLOWING FULL	PIPE INVERT AT UPSTREAM M.H.	PIPE INVERT AT DOWNSTREAM MH.	TIME OF FLOW IN SECTION
	MH#	MH#	A_A	C_A	$A_A C_A$	$A = \Sigma A_A$	$A C = \Sigma A_A C_A$	t_{cf}	t_{ci}	$t_c = t_{cf} + t_{ci}$	I	$Q = \frac{IAC}{360}$		n	S	D	L	V	Q			$t = \frac{L}{V \times 60}$
			(ha)			(ha)		(min)	(min)	min	mm/hr	m^3/SEC			%	mm	m	m/SEC	m^3/SEC	m	m	min
DUNDAS ST	9	8	10.01	0.40	4.00																	
			0.92	0.75	0.69	31.79	17.00			23.50	75	3.54			0.44	1050	105	2.11	1.87			0.83
								PBS							0.45	1050	91	2.14	1.90			
																			3.79			
	8	7	1.02	0.75	0.77	32.81	17.77			24.33	73	3.60			0.49	1050	65	2.23	1.99			0.49
								PBS							0.45	1050	91	2.14	1.90			
																			3.89			
	7	6	0.59	0.75	0.44	33.40	18.21			24.82	72	3.64			0.29	1050	47	1.73	1.55			0.45
	6	5	1.70	0.75	1.28	35.10	19.49			25.27	71	3.84			0.63	1050	76	2.55	2.26			0.50
								PSS							0.63	1050	91	2.55	2.26			
																			4.52			
	5	4	0.25	0.75	0.19	35.35	19.68			25.77	70	3.84			0.81	1050	74	2.87	2.56			0.43
								PSS							0.80	975	91	2.71	2.09			
																			4.65			
	4	3	1.37	0.40	0.55																	
			0.29	0.75	0.22	37.01	20.45			26.20	69	3.92			0.79	1050	86	2.87	2.53			0.50
								PSS							0.80	975	91	2.71	2.09			
																			4.62			

EFFECTIVE DATE: 79 08 PLAN Nº 2-1-5
REVISED DATE: 79 09

SUBDIVISION _____
CONSULTANT _____
MAJOR DRAINAGE AREA _____

CITY OF MISSISSAUGA

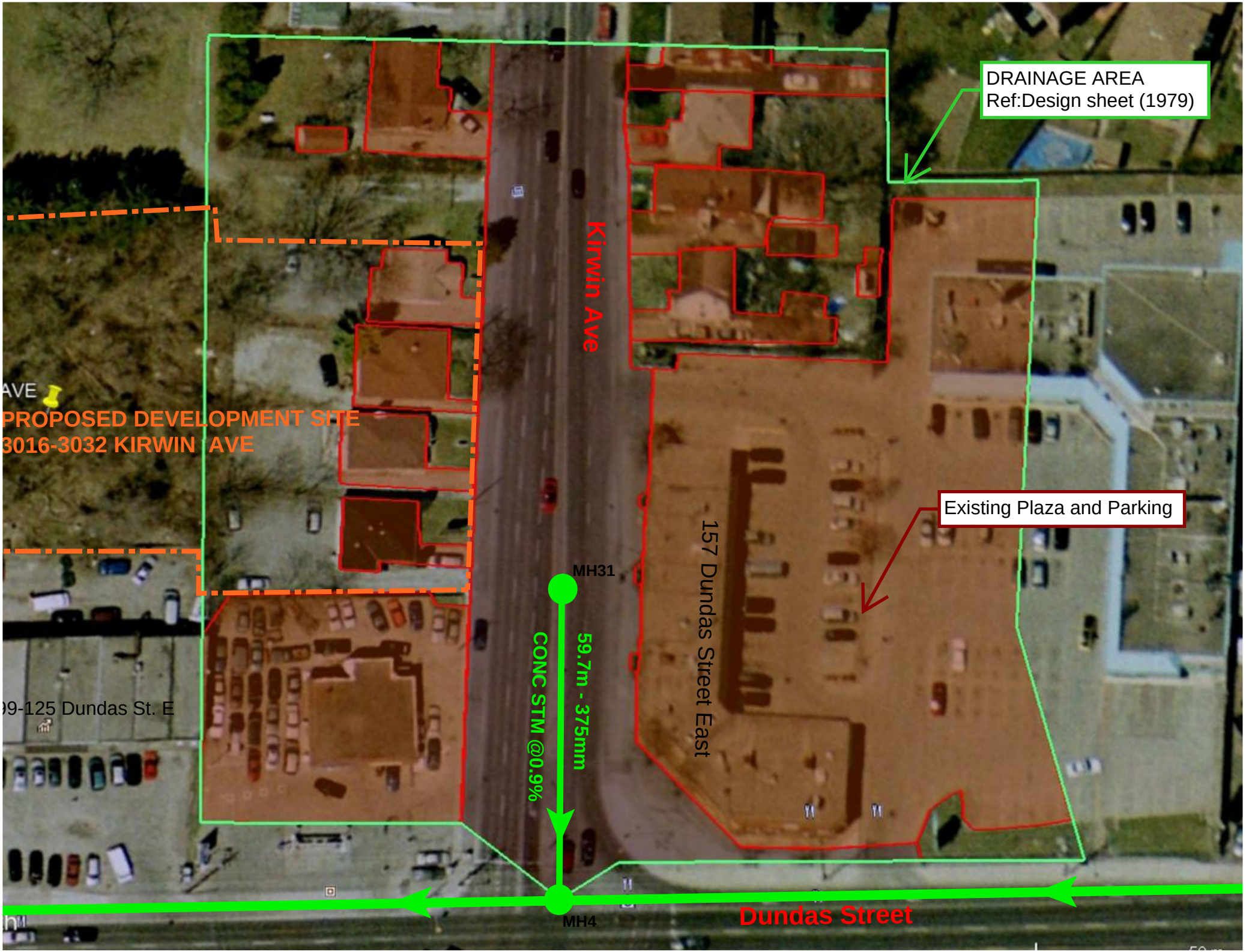
STORM DRAINAGE DESIGN CHART FOR CIRCULAR DRAINS FLOWING FULL

SHEET No. 3 OF 3 DATE _____
PROJECT No. _____
DESIGNED BY _____

LOCATION OF SECTION	FROM UPSTREAM	TO DOWNSTREAM	ADJACENT CONTRIBUTARY AREA	RUNOFF COEFFICIENT		ACCUMULATIVE AREA DRAINED BY SECTION	ACCUMULATIVE AREA TIMES RUNOFF COEFFICIENT FOR SECTION	FLOW TIME TO SECTION (FROM EXTREME UPSTREAM INLET)	INITIAL TIME OF CONCENTRATION AT EXTREME UPSTREAM INLET	TIME OF CONCENTRATION AT UPSTEAM END OF SECTION	INTENSITY OF RAINFALL	QUANTITY OF FLOW TO BE ACCOMMODATED IN SECTION.	TYPE OF PIPE	MANNINGS ROUGHNESS COEFFICIENT	SLOPE	DIAMETER	LENGTH OF SECTION	VELOCITY OF FLOW WITH PIPE FLOWING FULL	CAPACITY OF PIPE FLOWING FULL	PIPE INVERT AT UPSTREAM M.H.	PIPE INVERT AT DOWNSTREAM MH	TIME OF FLOW IN SECTION
	MH#	MH#	A_A	C_A	$A_A C_A$	$A = \Sigma A_A$	$A \times C = \Sigma A_A C_A$	t_{c_f}	t_{c_i}	$t_c = t_{c_f} + t_{c_i}$	I	$Q = \frac{I A C}{360}$		n	S	D	L	V	Q			$t = \frac{L}{V \times 60}$
			(ha)			(ha)		(min)	(min)	min	mm/hr	m^3/SEC			%	mm	m	m/SEC	m^3/SEC	m	m	min
DUNDAS ST	3	2	0.36	0.75	0.27	37.37	20.72			26.70	68	3.92			0.78	1050	91	2.81	2.52			0.54
								PSS							0.80	975	76	2.71	2.09			
																			4.61			
	2	CULV	0.18	0.75	0.14	37.55	20.86			27.24	67	3.92			0.84	1050	43	2.92	2.61			0.25
								PSS							0.80	975	35	2.71	2.09			
																			4.70			

PSS — PARALLELING STORM SEWER

EFFECTIVE DATE: 79 08 PLAN Nº 2-1-5


DRAINAGE AREA
Ref:Design sheet (1979)
Kirwin Ave
PROPOSED DEVELOPMENT SITE
3016-3032 KIRWIN AVE
Existing Plaza and Parking
157 Dundas Street East
MH31
CONC STM @0.9%
59.7m - 375mm
MH4
Dundas Street

DEVELOPMENT: 3016 Kirwin Ave

CONSULTANT: LEA Consulting Ltd

MAJOR DRAINAGE AREA: Cooksville Creek

MISSISSAUGA Transportation and Works

STORM DRAINAGE DESIGN CHART

FOR CIRCULAR DRAINS FLOWING FULL

SHEET No.:

DATE: 18-Mar-19

DESIGNED BY: F.M.

CHECKED BY: M.D.

City of Mississauga Intensity 10yr = $1010/(tc+4.6)^{0.78}$

FROM UPSTREAM	TO DOWNSTREAM	Catchment AREA	RUNOFF COEFFICIENT	AREA TIMES RUNOFF COEFFICIENT	ACCUMULATIVE AREA DRAINED BY SECTION	ACCUMULATIVE AREA TIMES RUNOFF COEFFICIENT FOR SECTION	FLOW TIME TO SECTION FROM EXTREME UPSTREAM INLET	INITIAL TIME OF CONCENTRATION AT EXTREME UPSTREAM INL.	TIME OF CONCENTRATION UPSTREAM END OF SECTION	INTENSITY OF RAINFALL	QUANTITY OF FLOW TO BE ACCOMODATED IN SECTION	TYPE OF PIPE	MANNING ROUGHNESS COEFFICIENT	SLOPE	DIAMETER	LENGTH OF SECTION	VELOCITY OF FLOW WITH PIPE FLOWING FULL	CAPACITY OF PIPE FLOWING FULL	PIPE INVERT AT UPSTREAM M.H.	PIPE INVERT AT DOWNSTREAM M.H.	TIME OF FLOW IN SECTION	QUANTITY OF FLOW TO PIPE FLOWING FULL	NOTES
MH#	MH#	A ha	C	AxC	SUM. A ha	SUM AxC	tc_f min	tc_i min	$tc=tc_f+tc_i$ min	i mm/hr	Q=iAC/360 m3/sec		n	S %	D mm	L m	V m/sec	Q_f m3/sec	m	m	t=L/Vx60 min	Q/Q_f %	
																					0		
MH31	4	1.37	0.74	1.01	1.37	1.01	0	15	15	99.2	**0.28**	CONC	0.013	0.90	375	57.90	1.51	0.17	109.91	190.38	0.64	1.68	Surcharging
Flow from STM Sewer on Dundas Street					35.35	19.68			25.77	70.5	**3.85**										0.43		SUM AxC= 19.68, Q=3840l/s, Tc=25.77 min
4	3	0.29	0.75	0.22	37.01	20.91	0.43	25.77	26.20	69.7	**4.05**	CONC	0.013	0.79	1050	86.00	2.80	2.43			0.51	0.91	
												CONC	0.013	0.80	975	91.00	2.68	2.00			0.56		
																		4.43					
3	2	0.36	0.75	0.27	37.37	21.18	0.51	26.20	26.71	68.8	**4.05**	CONC	0.013	0.78	1050	91.00	2.79	2.41			0.54	0.92	
												CONC	0.013	0.80	975	76.00	2.68	2.00			0.47		
																		4.42					
2	CULVERT	0.18	0.75	0.14	37.55	21.32	0.54	26.71	27.26	67.9	**4.02**	CONC	0.013	0.84	1050	35.97	2.89	2.50			0.21	0.89	
												CONC	0.013	0.80	975	35.00	2.68	2.00			0.22		
																		4.51					

APPENDIX E

Hydrant Flow Test Data and Watermain Adequacy Assessment Data

LEA Consulting Ltd. Consulting Engineers and Planners	Residual Pressure			
	Prepared:	F.M.	Page No.	C-04
	Checked:	M.D.		
Project: Proposed Development 3016 Kirwin Ave, Mississauga	Proj. #	17347		
	Date:	08-Feb-19		

Hydrant Test Readings (300mm watermain, 3016 Kirwin Ave) undertaken on June 15, 2017, by Focus Fire Protection

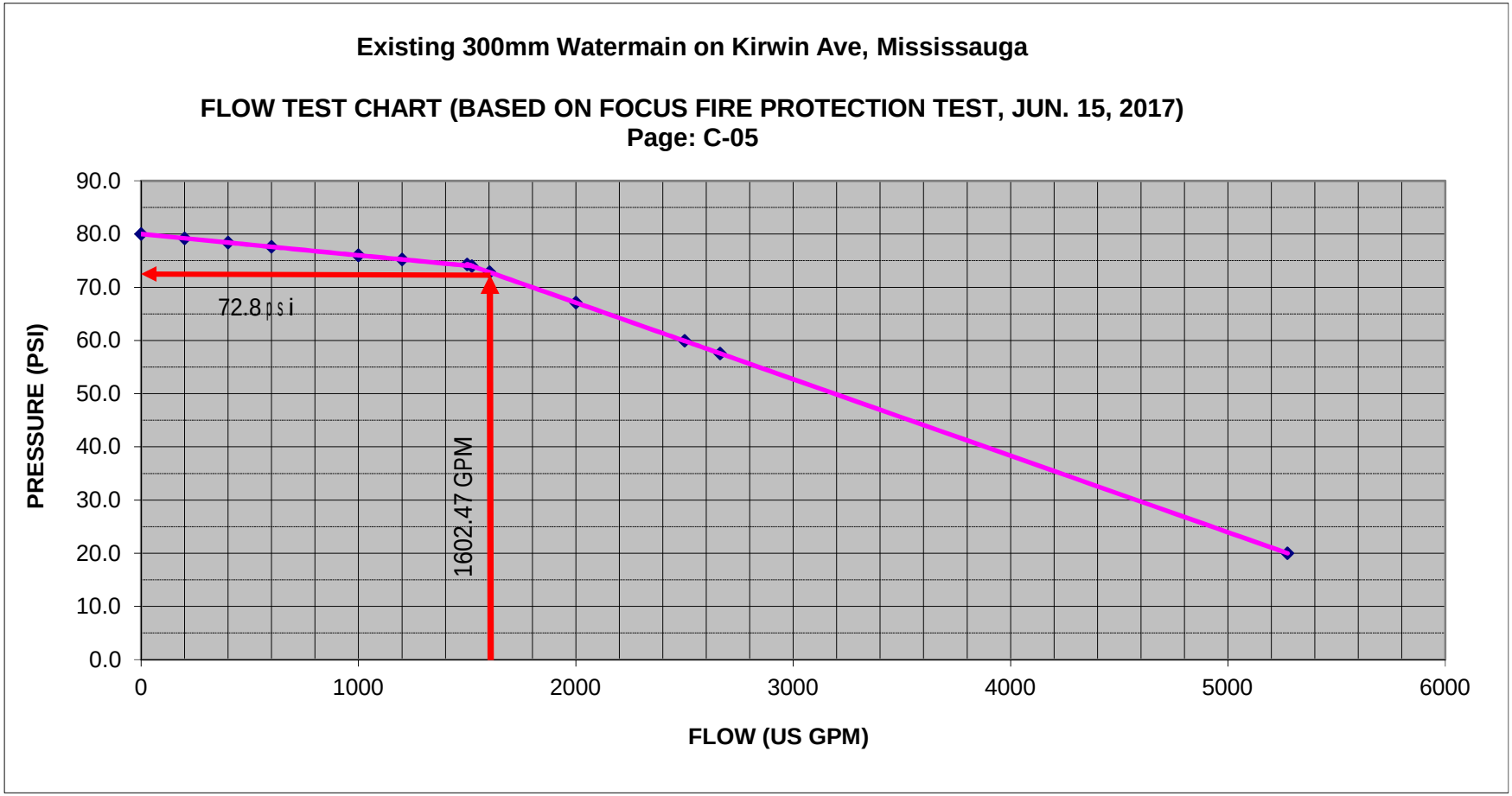
Flow		Residual Pressure		
0	US GPM	80	psi	
1000	US GPM	76	psi	
1521	US GPM	74	psi	
5274	US GPM	20	psi	Focus Fire Protection Estimate

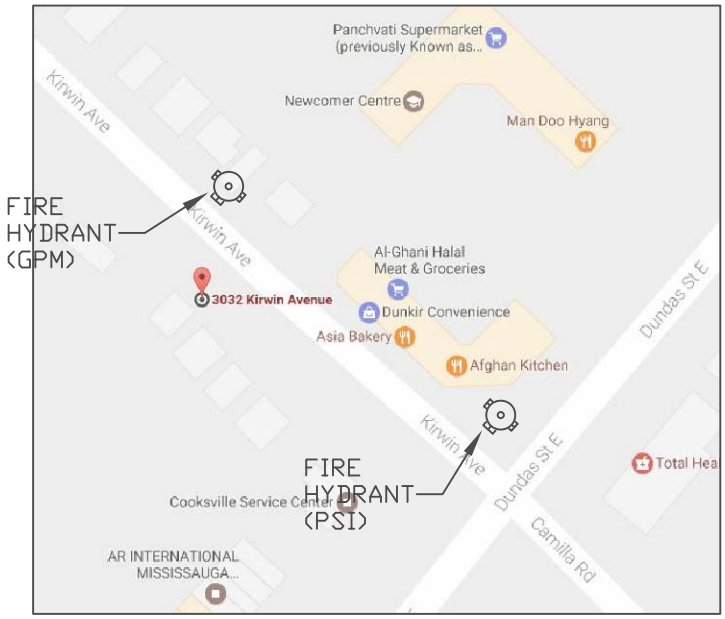
Interpolated

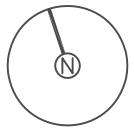
Flow (US GPM)	Residual Pressure (psi)
0	**80.0**
200	79.2
400	78.4
600	77.6
1000	**76.0**
1000	76.0
1200	75.2
1521	**74.0**
1500	74.3
1602	72.8
2000	67.1
2500	59.9
2663.6	57.6
5274	**20.0**

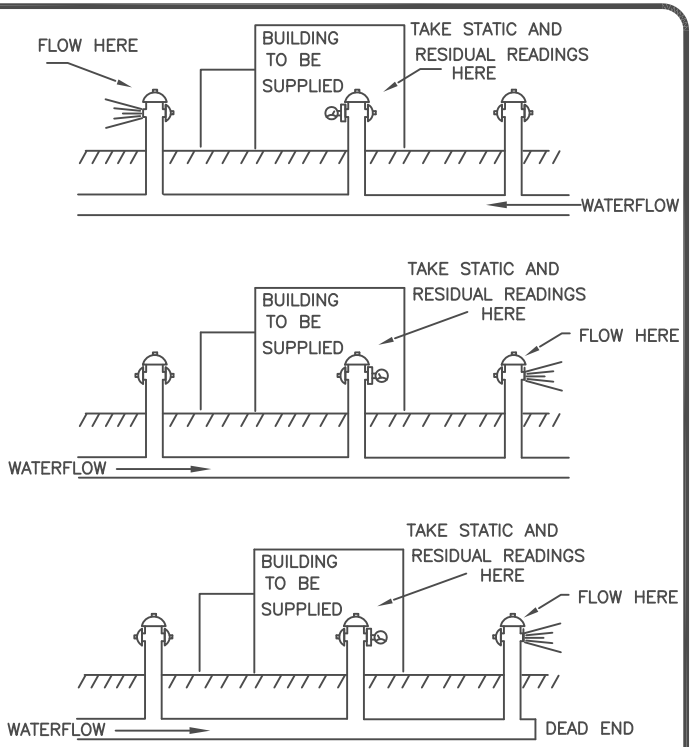
Existing 300mm Watermain on Kirwin Ave, Mississauga

FLOW TEST CHART (BASED ON FOCUS FIRE PROTECTION TEST, JUN. 15, 2017)
Page: C-05





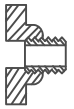




TEST:	PLAY PIPE	C=	STATIC(PSI)	RESIDUAL(PSI)	PITOT(PSI)	FLOW(USGPM)
	1x1 1/8					
	2x1 1/8					
	3x1 1/8					
	4x1 1/8					
	1x1 3/4					
	2x1 3/4					
	3x1 3/4					
	4x1 3/4					
	HYDRANT BUTT					
1	1x2 1/2	.80	80	76	45	1000
2	2x2 1/2	.80	80	74	26	1521
	3x2 1/2					
	4x2 1/2					
	FM NOZZLE					
	1x2 1/4	.88				
	2x2 1/4	.88				
	3x2 1/4	.88				
	4x2 1/4	.88				

OUTLET TYPE

☐  COEF.=0.90 OUTLET SMOOTH AND WELL ROUNDED

☒  COEF.=0.80 OUTLET SQUARE AND SHARP

☐  COEF.=0.70 OUTLET SQUARE AND PROJECTING INTO BARREL

Client:

Location:

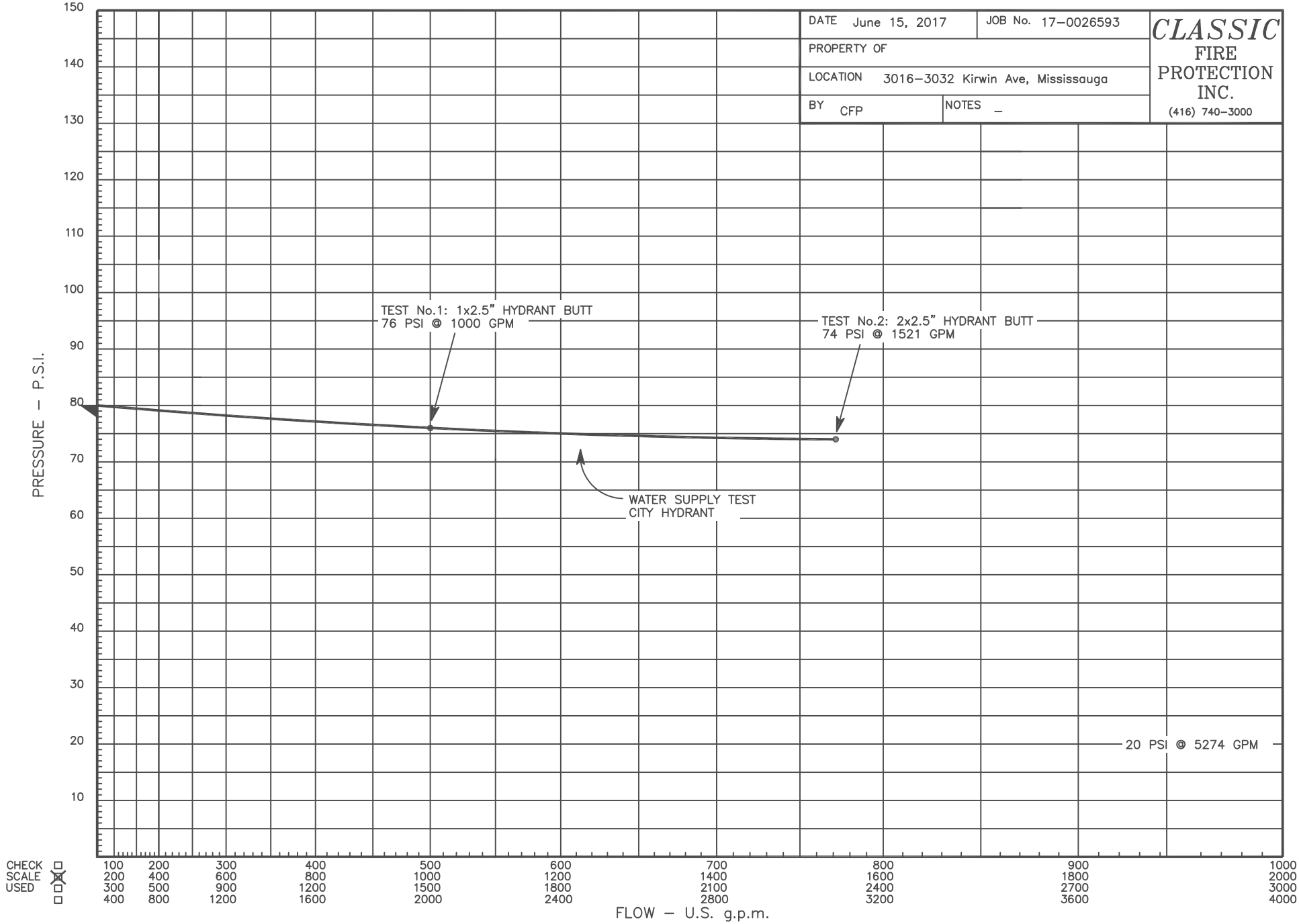
3016–3032 Kirwin Ave

Mississauga, ON

DEDICATED SERVICE SINCE 1988
CLASSIC FIRE PROTECTION INC.
645 GARYRAY DR.
North York, ON
M9L 1P9
(416) 740-3000
Web: www.classicfire.com

WATER SUPPLY GRAPH

DATE June 15, 2017		JOB No. 17–0026593	CLASSIC FIRE PROTECTION INC. (416) 740–3000
PROPERTY OF			
LOCATION 3016–3032 Kirwin Ave, Mississauga			
BY CFP	NOTES –		



APPENDIX F

Floodlines Assessment

1 INTRODUCTION

A Floodplain Analysis for the 3016-3032 Kirwin Avenue & 3031 Little John residential development site has been done to demonstrate the impacts of proposed development on the Regional Storm Floodplain. The analysis includes reviewing the existing hydraulic model prepared by Credit Valley Conservation (CVC) and updating the model based on the new topographic survey and proposed development.

2 EXISTING HYDRAULIC MODEL

The Cooksville Creek watershed is located within the City of Mississauga, east of the Credit River, that drains an area of approximately 33.9 Km^2 (3,390 ha) and outlets to Lake Ontario.

The Cooksville Creek has been modelled by R.V. Anderson Ltd. in February 1996, subsequently updated and completed by CVC. For this study, the HEC-RAS hydraulic model was obtained from the CVC. Based on the model, the proposed development site is located between cross section #5.120 in upstream and #5.053 in downstream.

The output of the HecRas model and Cooksville Creek cross section are presented in Table F4 and FIG F1

3 EXISTING HYDRAULIC MODEL UPDATE

An up-to-date topographic survey has been completed for the study area in October 2016. The HEC-RAS model was updated based on the topographic contour mapping. Three new cross sections are added between section #5.120 and section #5.053 in order to show the existing geometric condition of study area. Fig. F4 illustrates the location and station number of existing and new cross sections.

Based on the future Regional storm (280 m^3/s), the output from the original CVC model and updated model for existing condition, is summarized on Table F1.

The output of the HecRas model and Cooksville Creek cross section are presented in Table F4 and FIG F2.

TABLE F1: FUTURE REGIONAL STORM WATER SURFACE ELEVATIONS FOR EXISTING CONDITION

HEC-RAS River Station	CVC Model (m)	Updated Model (m)
5.179	112.56	112.42
5.120	112.55	112.41
* 5.101	-	112.36
* 5.082	-	112.36
* 5.059	-	112.33
5.053	111.68	111.68
Dundas St E. Culvert	111.68	111.68
4.960	109.10	109.10

* New cross section

Table F1 illustrates that the actual Regional flood level based on the current topographic survey is approximately 0.13m lower than the original model at section #5.179 and #5.120 (upstream of the development site).

4 PROPOSED HYDRAULIC MODEL

The proposed development consists of the construction of stacked townhouses in the northern part of property. The existing ground within the development area will be raised above the Regional flood elevation by earth fill. In order to assess the impact on floodplain. it is understood that a Site Plan Application was submitted for a proposed 40-storey hotel in 2012. Based on the site grading plan prepared by MSAI, the existing ground is filled up to an approximately Elev. 112.60m with an earth retaining wall on the south side. The development limit is approximately 78m south of Kirwin Avenue property line, or the proposed development is partly located within Regional floodplain. The approved floodlines provided by amec on Feb. 11, 2011 is presented in Fig. F5.

However, the current development scheme is different from the proposed hotel, the hydraulic model is updated to review the potential impact on the watershed (if any) in terms of proposed development.

The southern wall of Block C and proposed retaining wall will provide a limit between the future development site and existing ground. Different cross sections (#5.101, #5.082 and #5.059) are considered accordingly in hydraulic analysis.

Based on the future Regional storm (280 m3/s), water surface elevation and average velocity of flow for existing and proposed conditions are summarized in Table F2 and Table F3.

The output of the HecRas model and Cooksville Creek cross section are presented in Table F4 and FIG F3

The model results based on the regional storm are provided in this Appendix and the existing and proposed floodlines are shown in FIG F4.

TABLE F2: WATER SURFACE ELEVATIONS FOR EXISTING AND PROPOSED CONDITIONS

HEC-RAS River Station	CVC Model Existing Condition (m)	Updated Model Existing Condition (m)	Updated Model Proposed Condition (m)
5.179	112.56	112.42	112.43
5.120	112.56	112.41	112.41
5.101	-	112.36	112.37
5.082	-	112.36	112.37
5.059	-	112.33	112.34
5.053	111.68	111.68	111.69
Dundas St E. Culvert	111.68	111.68	111.69
4.960	109.10	109.10	109.10

Table F2 indicates that Regional Flood levels for proposed development will rise by only 1.0Cm at the upstream of the site, however it is still less than the flood level from CVC model. In comparison with the total water depth of 5.0m, this increase is negligible.

TABLE F3: CHANNEL FLOW VELOCITY FOR EXISTING AND PROPOSED CONDITIONS

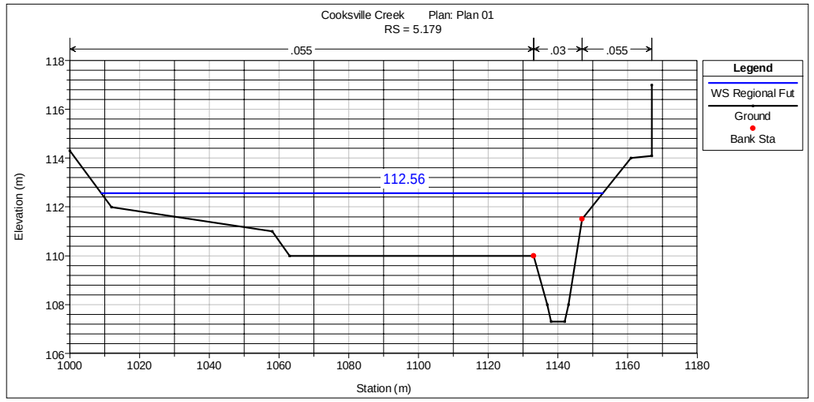
HEC-RAS River Station	CVC Model Existing Condition (m/s)	Updated Model Existing Condition (m/s)	Proposed Condition (m/s)
5.179	1.93	2.08	2.07
5.120	1.54	1.64	1.64
5.101	-	1.84	1.83
5.082	-	1.63	1.64
5.059	-	1.98	1.93
5.053	3.90	3.90	3.88
Dundas St E. Culvert	4.14	4.14	4.14
4.960	5.81	5.81	5.81

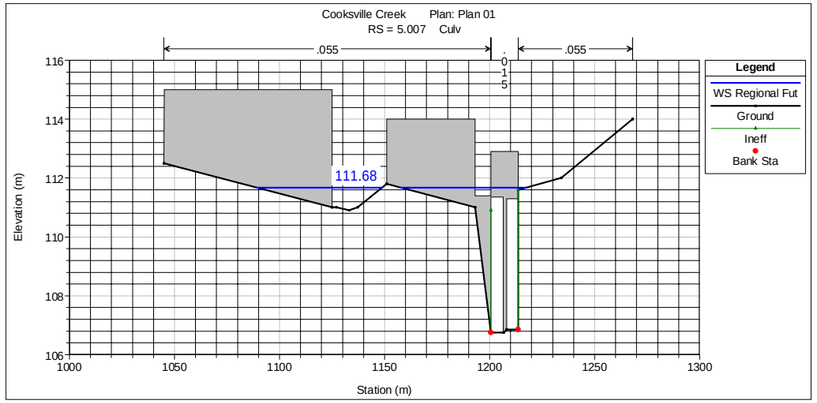
Table F3 illustrates no significant changes will be happened in channel flow velocity, due to proposed development.

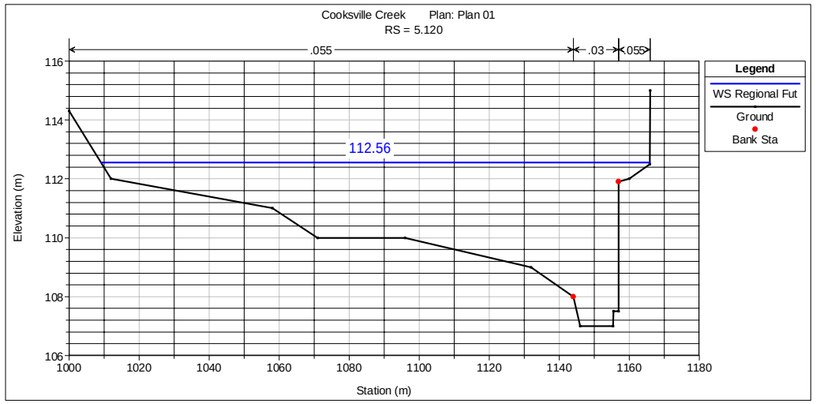
In conclusion, the proposed development will not have significant impacts on floodplain and hydraulic conditions of Cooksville Creek in the study area.

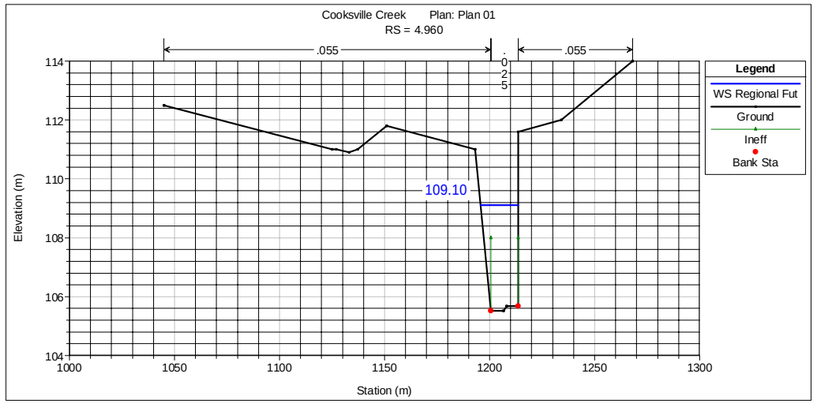
TABLE F4: HecRas output for existing and proposed conditions

River	Reach	River Sta	Profile	Plan	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	E.G. Elev (m)	Vel Chnl (m/s)	Vel Total (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Cooksville	Lower	5.179	Regional Future Storm	CVC Existing Condition	280	107.30	112.56	112.65	1.93	0.94	298.94	143.89	0.31
				LEA Updated Existing Condition	280	107.30	112.42	112.53	2.08	1.00	279.08	142.38	0.34
				Proposed Condition	280	107.30	112.43	112.53	2.07	1.00	279.38	142.41	0.34
		5.120	Regional Future Storm	CVC Existing Condition	280	107.00	112.55	112.61	1.54	0.75	371.81	156.78	0.21
				LEA Updated Existing Condition	280	107.00	112.41	112.48	1.64	0.80	350.07	155.01	0.23
				Proposed Condition	280	107.00	112.41	112.48	1.64	0.80	350.39	155.05	0.23
		5.101	Regional Future Storm	LEA Updated Existing Condition	280	106.81	112.36	112.46	1.84	0.82	343.27	155.17	0.26
				Proposed Condition	280	106.81	112.37	112.46	1.83	0.83	336.40	142.86	0.26
		5.082	Regional Future Storm	LEA Updated Existing Condition	280	106.76	112.36	112.45	1.63	0.86	323.88	157.73	0.24
				Proposed Condition	280	106.76	112.37	112.45	1.64	0.89	313.59	143.72	0.25
		5.059	Regional Future Storm	LEA Updated Existing Condition	280	106.75	112.33	112.44	1.98	0.97	288.85	161.43	0.31
				Proposed Condition	280	106.75	112.34	112.44	1.93	0.99	281.66	139.71	0.30
		5.053	Regional Future Storm	CVC Existing Condition	280	106.75	111.68	112.37	3.90	2.29	122.17	120.22	0.56
				LEA Updated Existing Condition	280	106.75	111.68	112.37	3.90	2.29	122.17	120.22	0.56
				Proposed Condition	280	106.75	111.69	112.38	3.88	2.26	123.81	122.58	0.56
		5.007	5.007 Dundas Street E.	Culvert									
		4.96	Regional Future Storm	CVC Existing Condition	280	105.52	109.10	110.75	5.81	5.11	54.75	18.00	0.99
				LEA Updated Existing Condition	280	105.52	109.10	110.75	5.81	5.11	54.75	18.00	0.99
				Proposed Condition	280	105.52	109.10	110.75	5.81	5.11	54.75	18.00	0.99









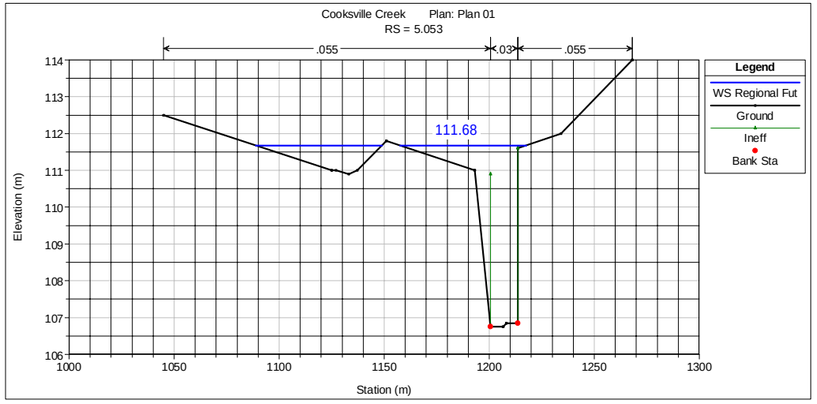
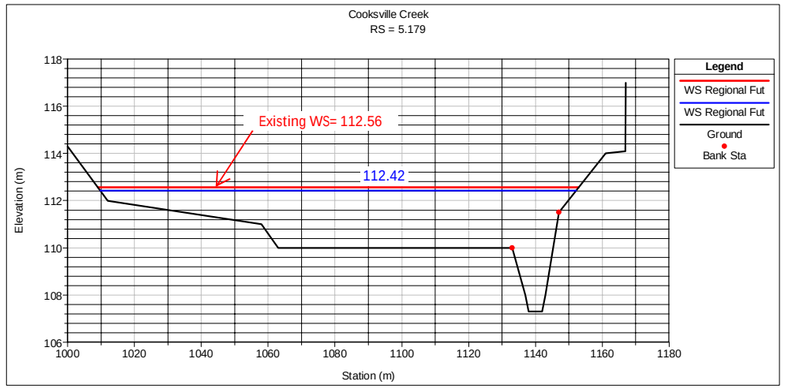
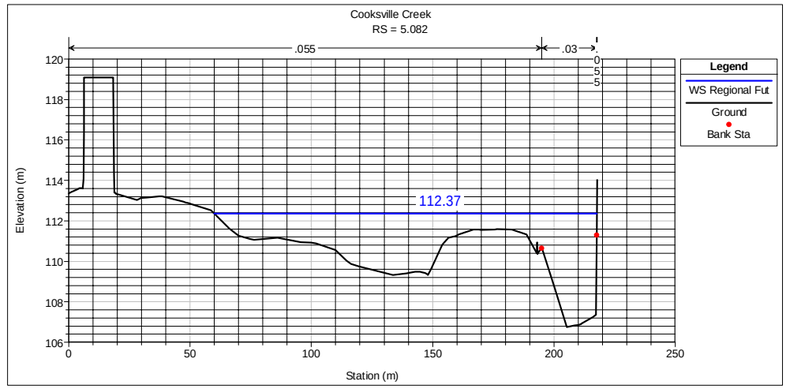
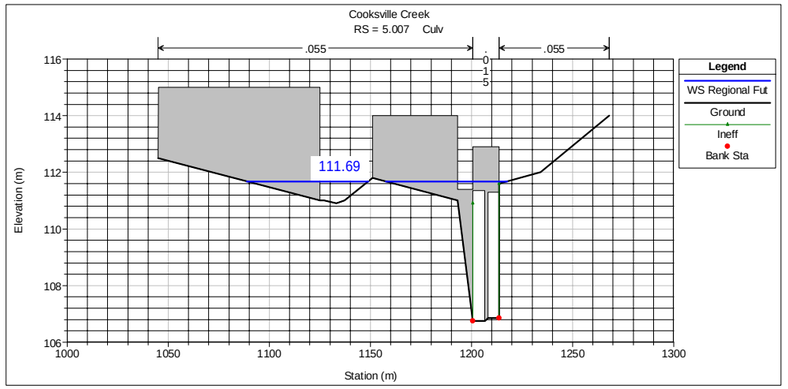
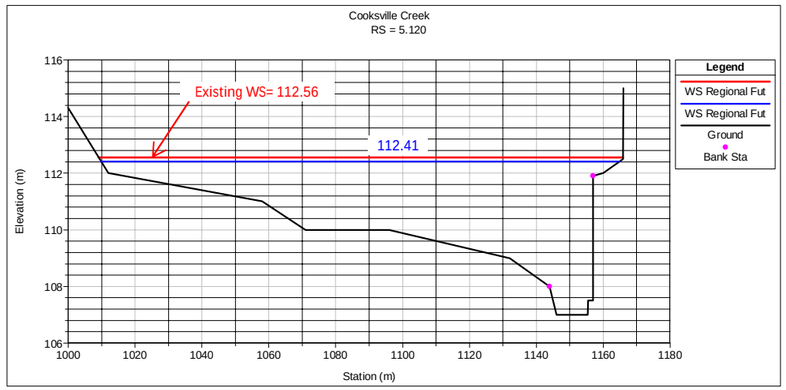


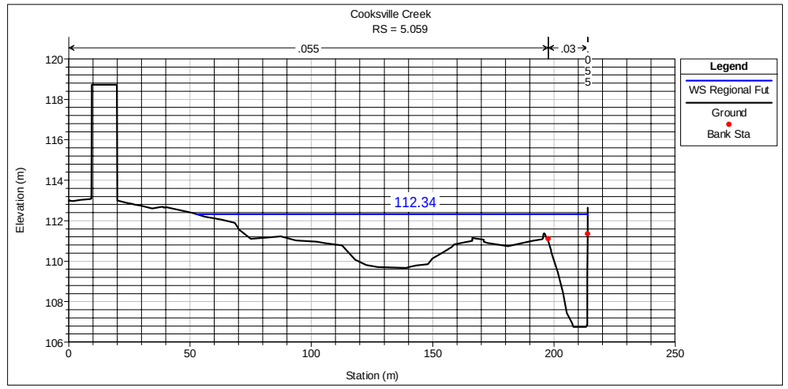
FIG F1- CVC Model- Existing Condition

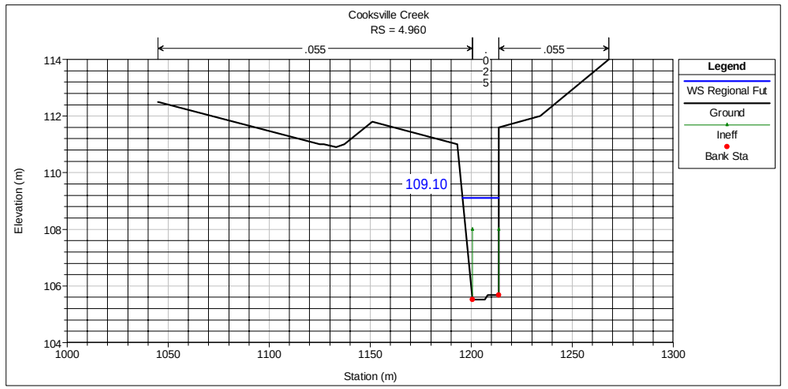


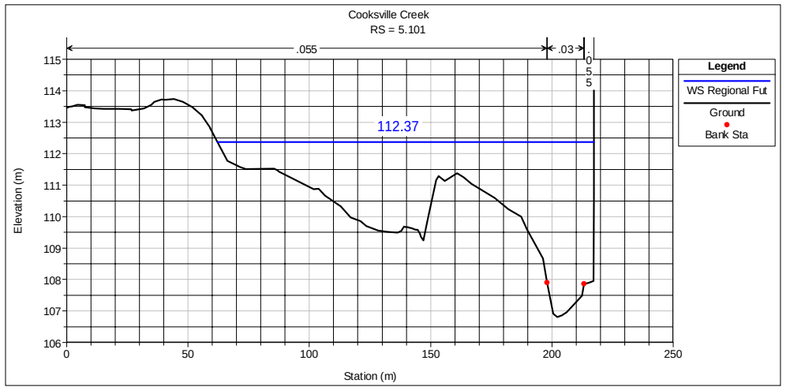












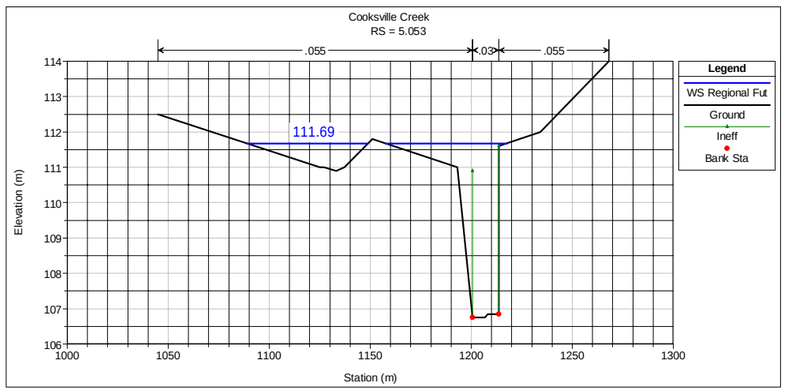
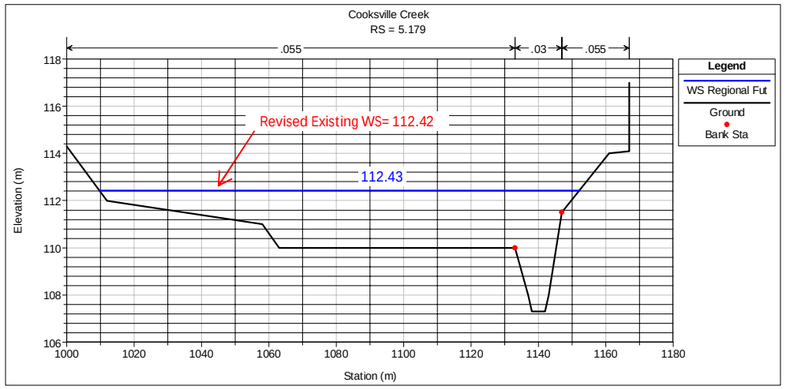
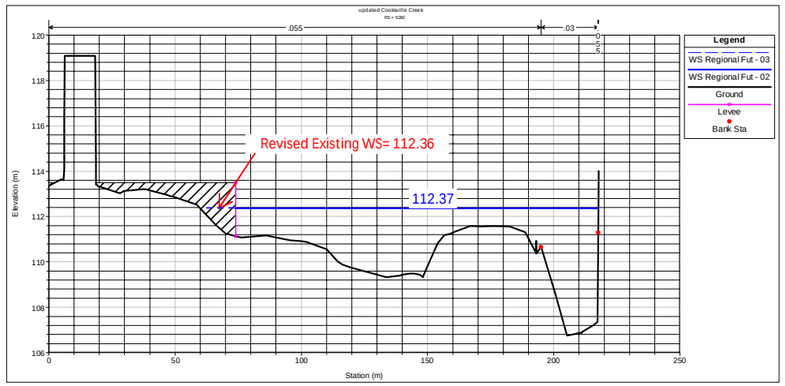
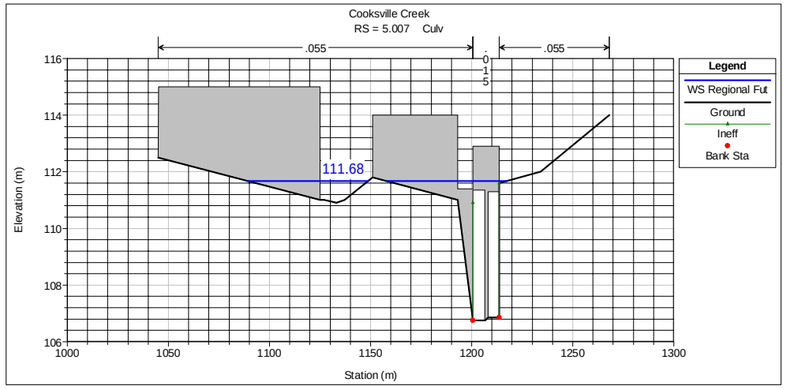
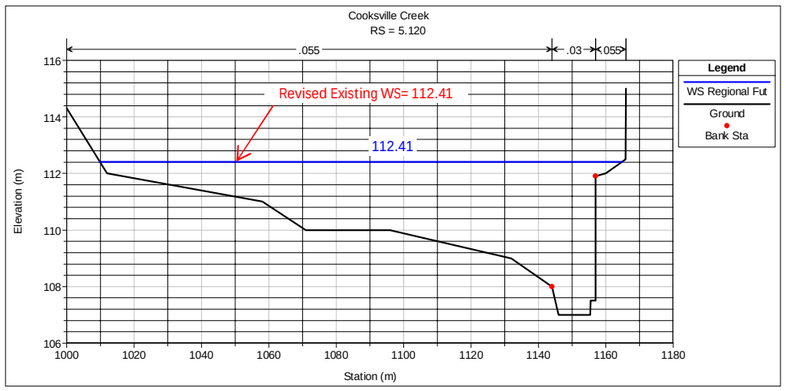


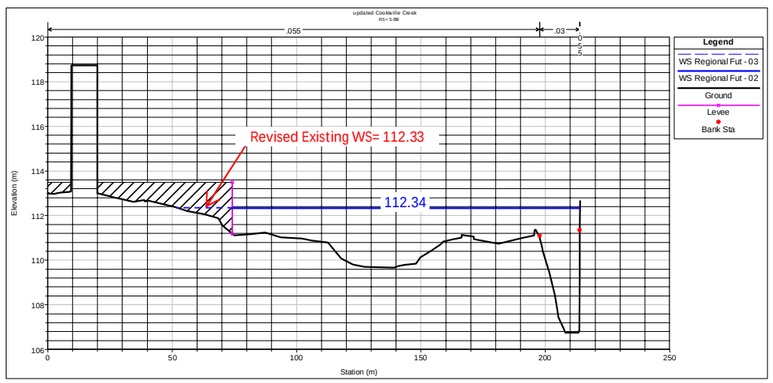
FIG. F2- LEA Updated Model- Existing Condition

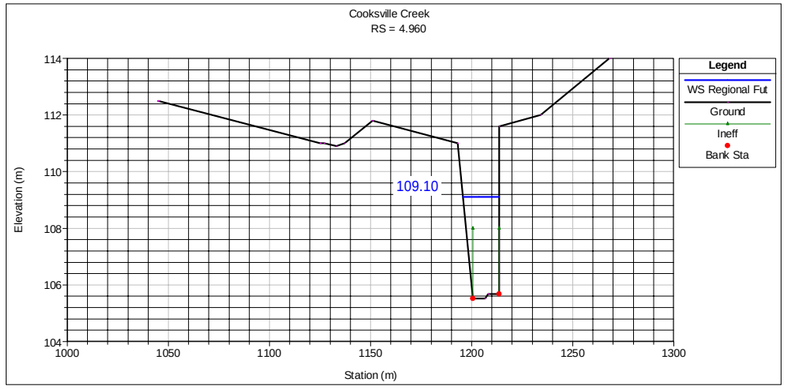


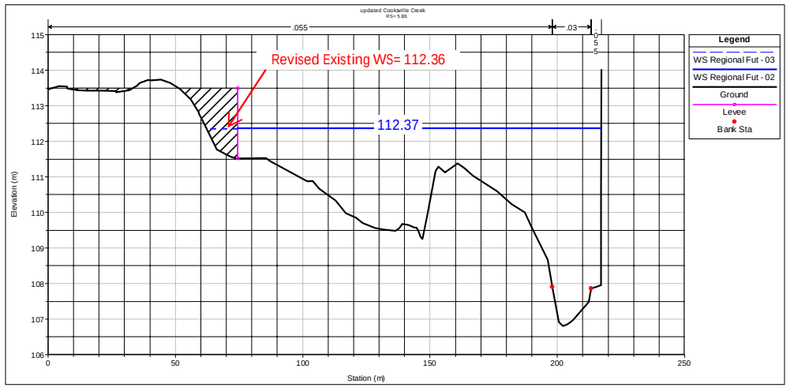












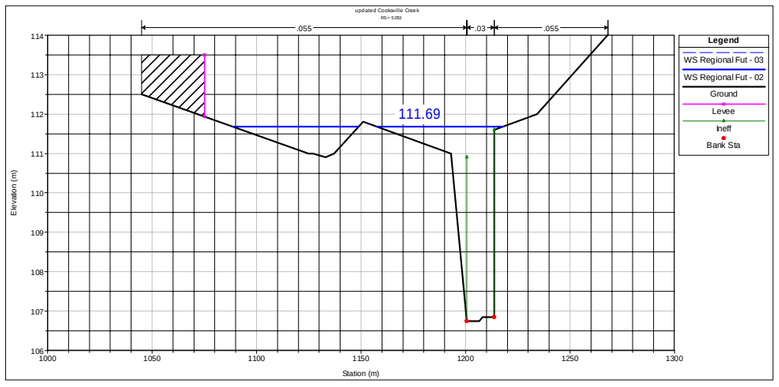
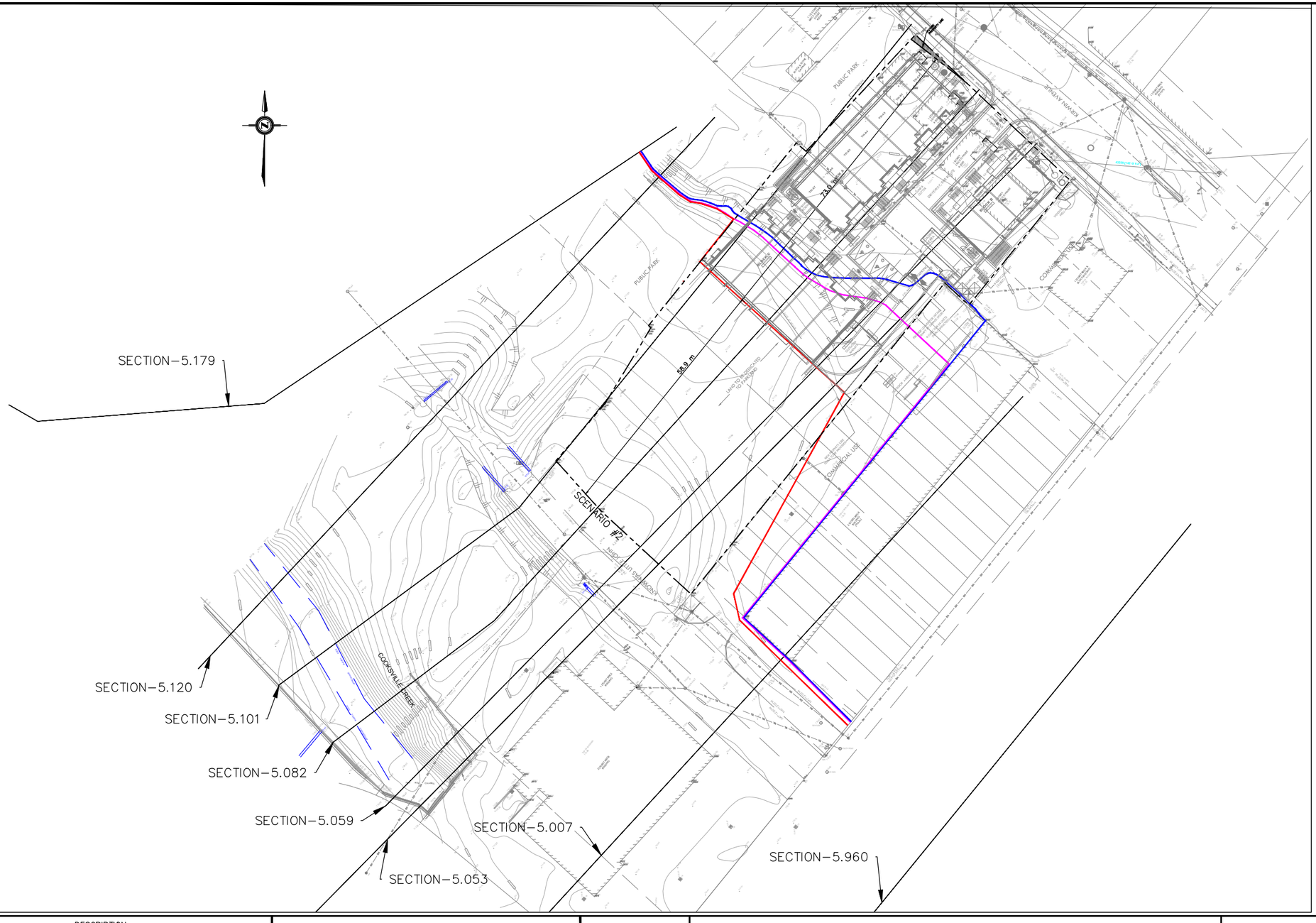


FIG. F3- Proposed Condition



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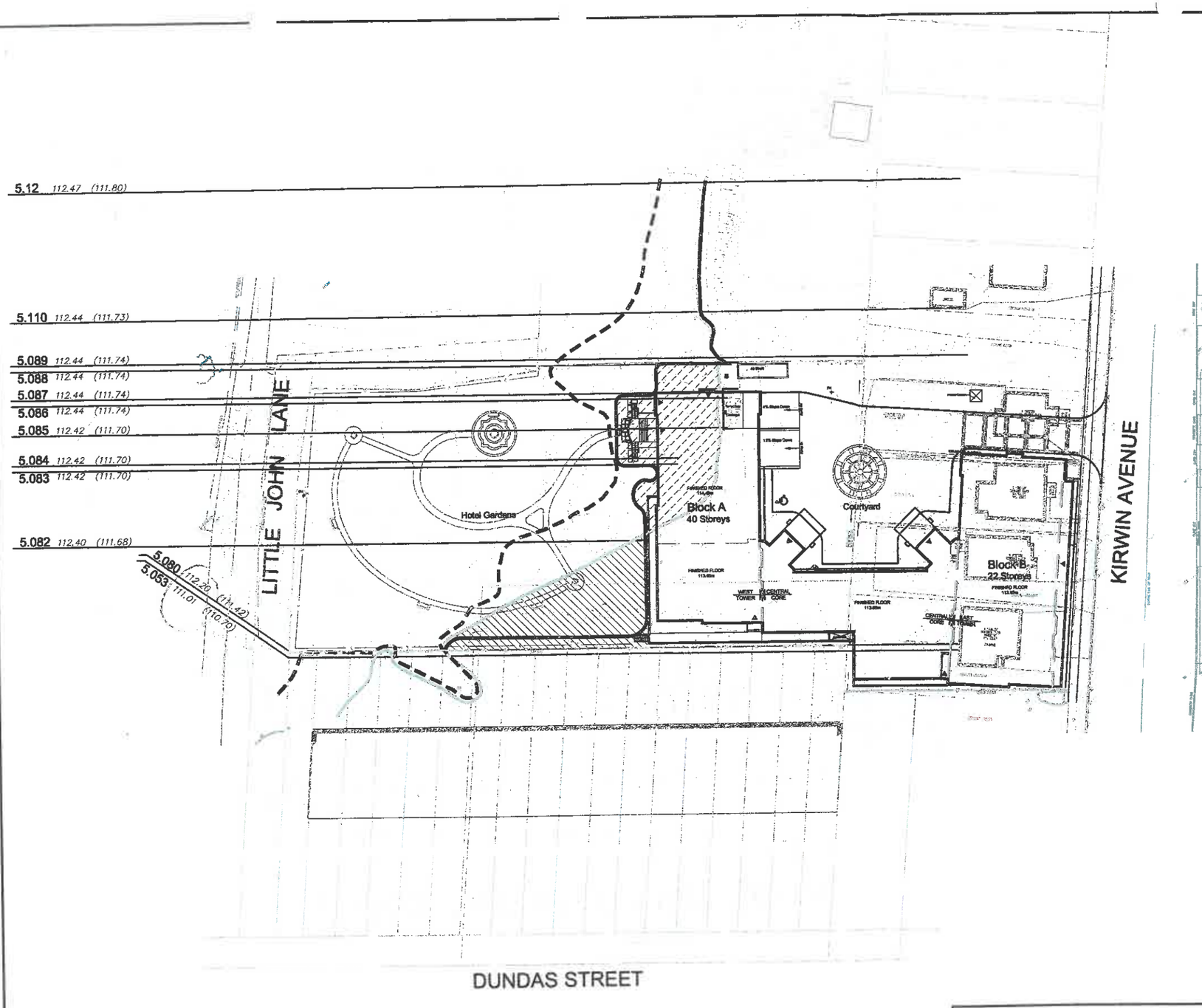
3031 LITTLJOHN & 3016-3032 KIRWIN AVE DEVELOPMENT

EXISTING AND PROPOSED FLOODPLAINS

DESIGN	F.M.	DRAWN	M.N.	CHECKED	R.B.	CONTRACT No17347
SCALE:	1 : 1000			DRAWING NUMBER		FIG. F4
DATE:	FEB. 15, 2019					



NOTE:

MAXIMUM REGIONAL FLOOD ELEVATION = 112.47m

MINIMUM PROPOSED FLOOR ELEVATION = 113.65m

PROPOSED FREEBOARD = 0.77m

LEGEND

5.053 — HEC-2 CROSS SECTION AND LABEL

FUT WITH HOTEL

111.03 (109.78) — REGIONAL FLOOD LEVEL / 100 YEAR FLOOD LEVEL

EXISTING REGIONAL FLOODLINE

CUT AREA = 365m²

FILL AREA = 272m²

FIG. F5- amec APPROVED FLOODLINES

LITTLE JOHN LANE
HYDRAULIC ASSESSMENT
ACTIVE MANAGEMENT LTD.
PROPOSED DEVELOPMENT
FLOODPLAIN

amec

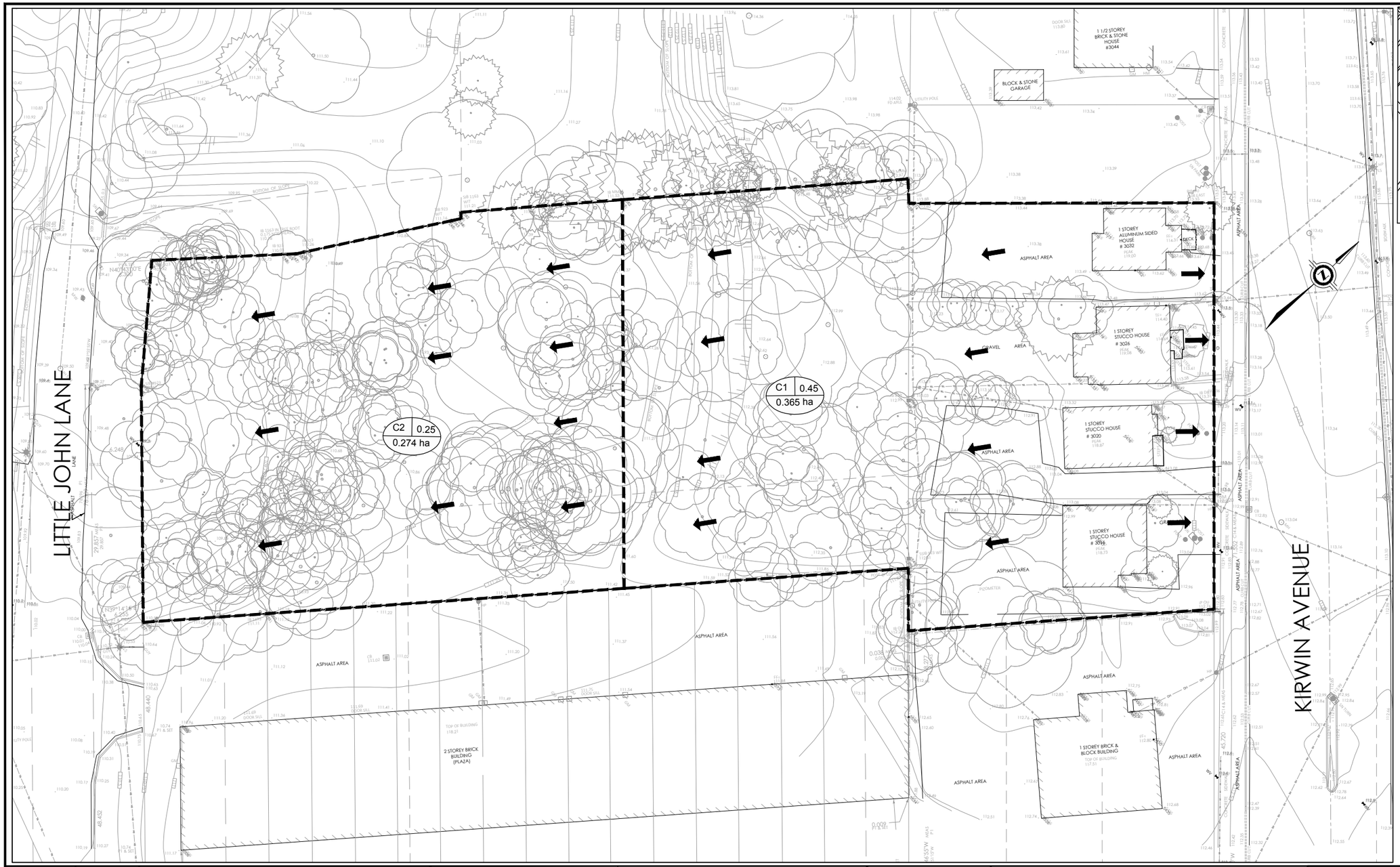
PROJECT No.	103068
DATE	FEBRUARY 2011
SCALE	1:750
DRAWING No.	2

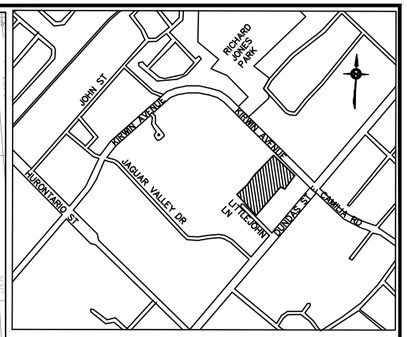
G:\Work\103068\land\dwg\contract\sub4\cvc\1_floodupdate.dwg

FEBRUARY 10 2011 – D.B.

APPENDIX G

Figures and Drawings





LEGEND

- EXISTING MANHOLE
- EXISTING CATCHBASIN
- EXISTING WV
- PROPERTY LINE
- OVERLAND FLOW ROUTE
- DRAINAGE BOUNDARY
- C1 | 0.22 / 0.388 ha — DRAINAGE ID/RUNOFF COEFFICIENT DRAINAGE AREA (ha)
- EXISTING TREE
- EXISTING BUILDING

No.	DATE	DESCRIPTION
02	28-03-2019	ISSUED FOR ZBA RESUBMISSION
01	08-12-2017	ISSUED FOR ZBA SUBMISSION

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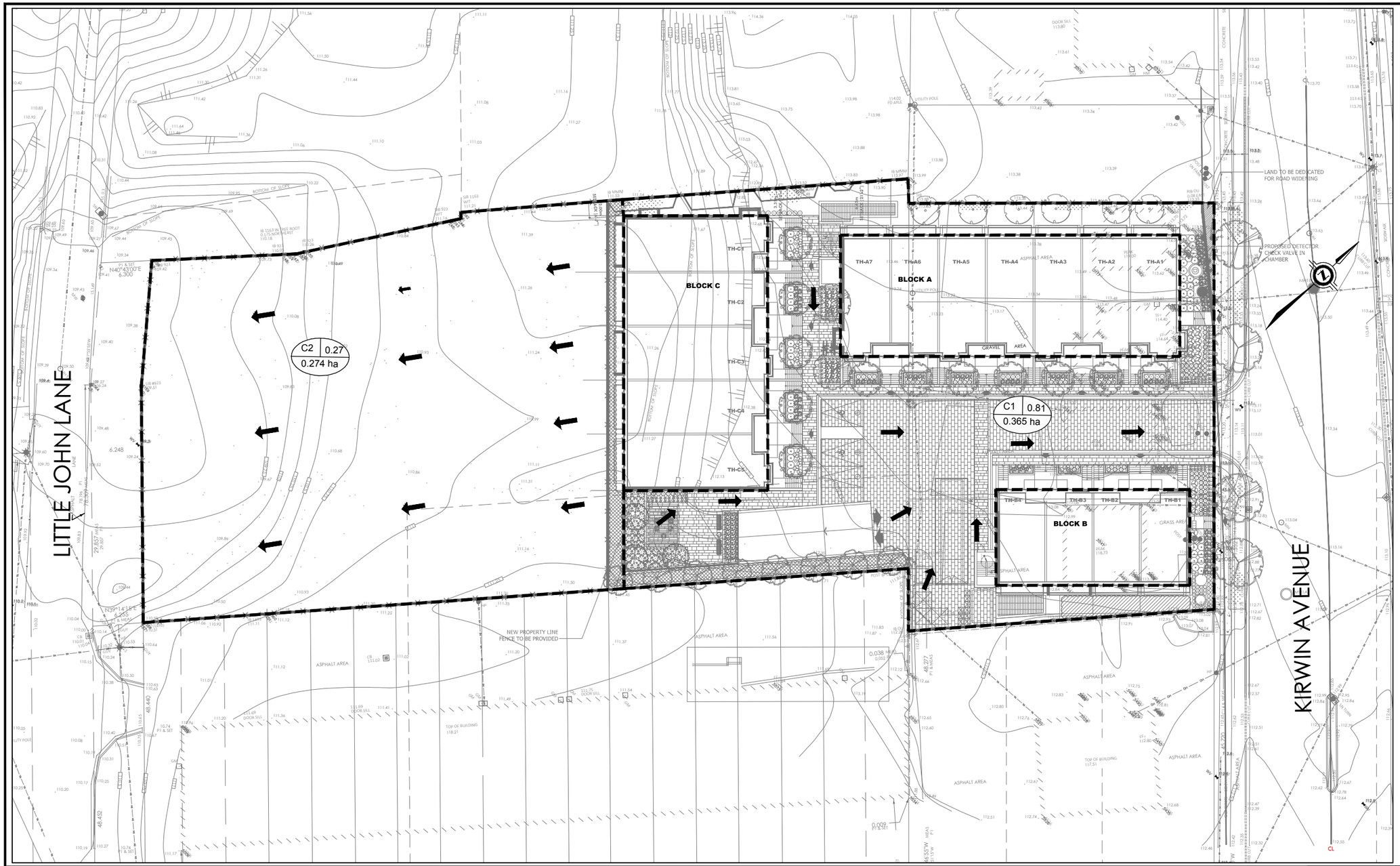
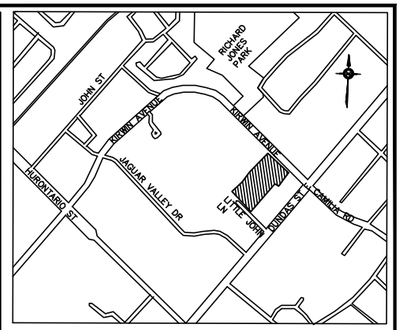
EXISTING DRAINAGE PLAN

DESIGN	F.M.	DRAWN	F.M.	CHECKED	R.B.	CONTRACT No. 17347
SCALE:	1:500 (FULL SIZE)			DRAWING NUMBER		FIG-1
DATE:	AUGUST 08, 2017					

DRAWING NAME: P:\17347 – 3016 Kirwin Ave\Drafting\Current Drawings\P2017-15 drainage area.dwg
Mar 27, 2019–3:19pm





LEGEND

- EXISTING MANHOLE
- EXISTING CATCHBASIN
- EXISTING WV
- PROPERTY LINE
- OVERLAND FLOW ROUTE
- DRAINAGE BOUNDARY
- DRAINAGE ID/RUNOFF COEFFICIENT DRAINAGE AREA (ha) (C1 0.25 / 0.388 ha)
- PROPOSED TREE
- SOFT LANDSCAPE AREA

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PROPOSED DRAINAGE PLAN

DESIGN	F.M.	DRAWN	F.M.	CHECKED	R.B.	CONTRACT No. 17347
SCALE:	1:500 (FULL SIZE)			DRAWING NUMBER		FIG-2
DATE:	AUGUST 08, 2017					

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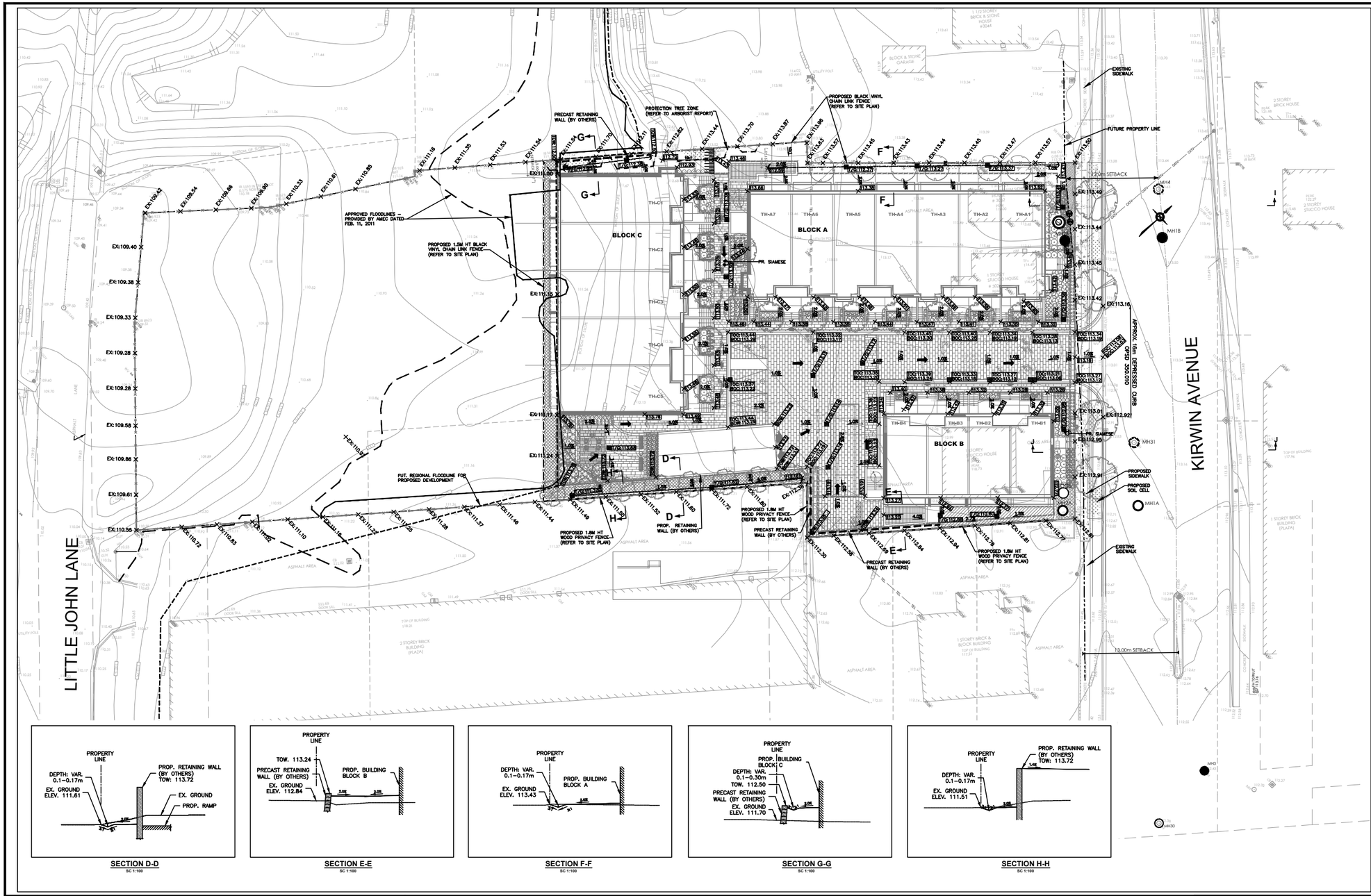

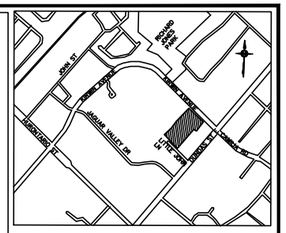

LEGEND:

- PROPOSED V & B
- PROPOSED VALVE CHAMBER
- PROPERTY LINE
- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED STORM MANHOLE
- EXISTING FIRE HYDRANT
- EXISTING FIRE HYDRANT
- EXISTING HYDRO POLE
- PROPOSED AREA DRAIN
- Ex:113.24 EXISTING GROUND ELEVATION
- 111.56 EXISTING GROUND ELEVATION
- 112.86 PROPOSED GROUND ELEVATION
- TOC:113.01 TOP OF CURB ELEVATION
- BOC:112.86 BOTTOM OF CURB ELEVATION
- TOW:113.23 TOP OF WALL ELEVATION
- BOW:112.38 BOTTOM OF WALL ELEVATION
- T/G:112.91 TOP OF GRATE ELEVATION
- OVERLAND FLOW ROUTE
- UNDERGROUND PARKING WALL
- PROPOSED RETAINING WALL

GENERAL NOTES:

1. ELEVATIONS ARE REFERRED TO THE CITY OF MISSISSAUGA BENCHMARK NO. 793 LOCATED ON THE NORTH FACE AT THE EAST CORNER OF CONCRETE END POST OF BOX CULVERT UNDER DUNDAS STREET EAST ON SOUTH SIDE OF DUNDAS STREET EAST, 15M EAST OF JAGUAR VALLEY DRIVE; HAVING A PUBLISHED ELEVATION OF 110.955 METERS.
2. REFER TO DWG C-06 FOR CROSS SECTIONS I-I AND J-J

SECTION D-D
SC 1:100

SECTION E-E
SC 1:100

SECTION F-F
SC 1:100

SECTION G-G
SC 1:100

SECTION H-H
SC 1:100

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LICENSED PROFESSIONAL ENGINEER
F. MORSHEDI
100229200
MARCH 28, 2019
PROVINCE OF ONTARIO

3031 LITTLE JOHN & 3016-3032 KIRWIN AVE DEVELOPMENT

PRELIMINARY SITE GRADING PLAN

DESIGN	F.M.	DRAWN	F.M.	CHECKED	R.B.	CONTRACT No. 17347
SCALE:	1:250 (FULL SIZE)			DRAWING NUMBER		C-01
DATE:	AUGUST 08, 2017					

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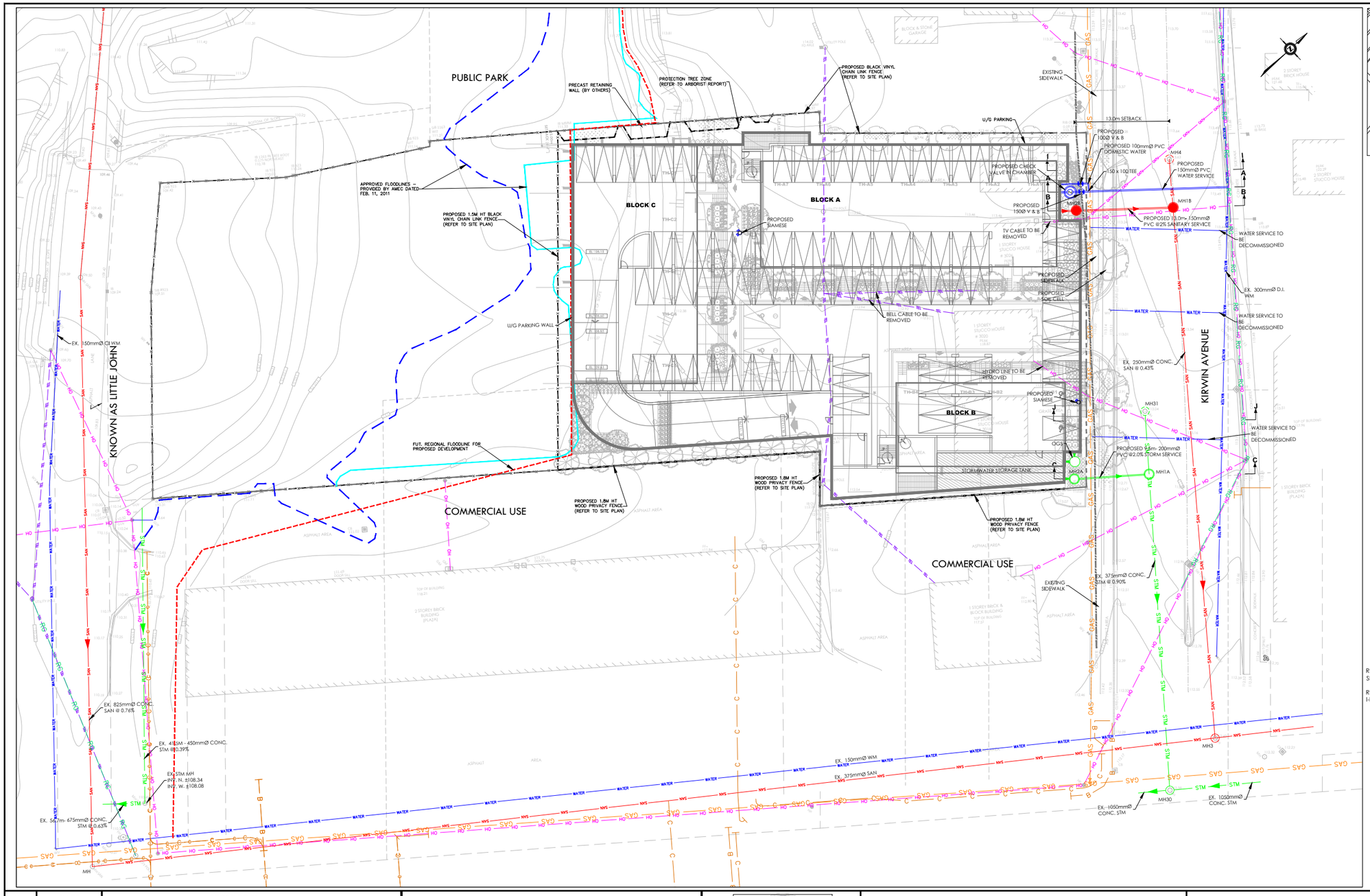
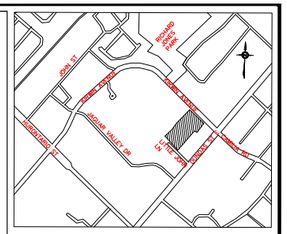
Mar 27, 2019 - 8:11pm





LEGEND:

- PROPOSED STORM MANHOLE
- PROPOSED SANITARY MANHOLE
- PROPOSED OIL GRIT SEPARATOR
- PROPOSED V & B
- PROPOSED VALVE CHAMBER
- PROPERTY LINE
- EXISTING CATCHBASIN
- EXISTING SANITARY MANHOLE
- EXISTING STORM MANHOLE
- EXISTING FIRE HYDRANT
- EXISTING FIRE HYDRANT
- EXISTING HYDRO POLE
- EXISTING WATERMAIN
- EXISTING SANITARY SEWER
- EXISTING STORM SEWER
- EXISTING GAS MAIN
- EXISTING HYDRO
- EXISTING BELL CABLE
- EXISTING TV CABLE
- EXISTING BELL CONDUIT
- EXISTING BURIED BELL CABLE
- EXISTING AERIAL ROGERS CABLE

NOTE

REFER TO DWG C-05 "SITE SERVICING CROSS SECTIONS" FOR SERVICING CROSS SECTIONS

REFER TO DWG C-06 "STREETSCAPE CROSS SECTIONS" FOR I-I AND J-J CROSS SECTIONS

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PROVINCE OF ONTARIO

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PRELIMINARY SITE SERVICING PLAN

DESIGN	F.M.	DRAWN	M.N.	CHECKED	R.B.	CONTRACT No. 17347
SCALE:	1:250 (FULL SIZE)			DRAWING NUMBER		C-02
DATE:	AUGUST 08, 2017					

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