Appendix B

Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development

Final Report

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Document History and Version Control

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R1	July 10, 2018	Update	Andrea McCrea	Werner de Schaetzen
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Statement of Qualifications and Limitations

This document represents GeoAdvice Engineering Inc. best professional judgment based on the information available at the time of its completion and as appropriate for the project scope of work. Services performed in developing the content of this document have been conducted in a manner consistent with that level and skill ordinarily exercised by a member of the engineering profession currently practicing under similar conditions. No warranty, express or implied is made.

Contents

1 Introduction

GeoAdvice Engineering Inc. ("GeoAdvice") was retained by David Schaeffer Engineering Ltd. ("DSEL") to size the proposed water trunk main network for East Urban Community Mixed-Use Centre Development ("development") in the City of Ottawa, ON ("City").

East Urban Community Mixed-Use Centre Development is located between Innes Road and Renaud Road, East of Page Road. The development will be serviced by pressure zone 2E.

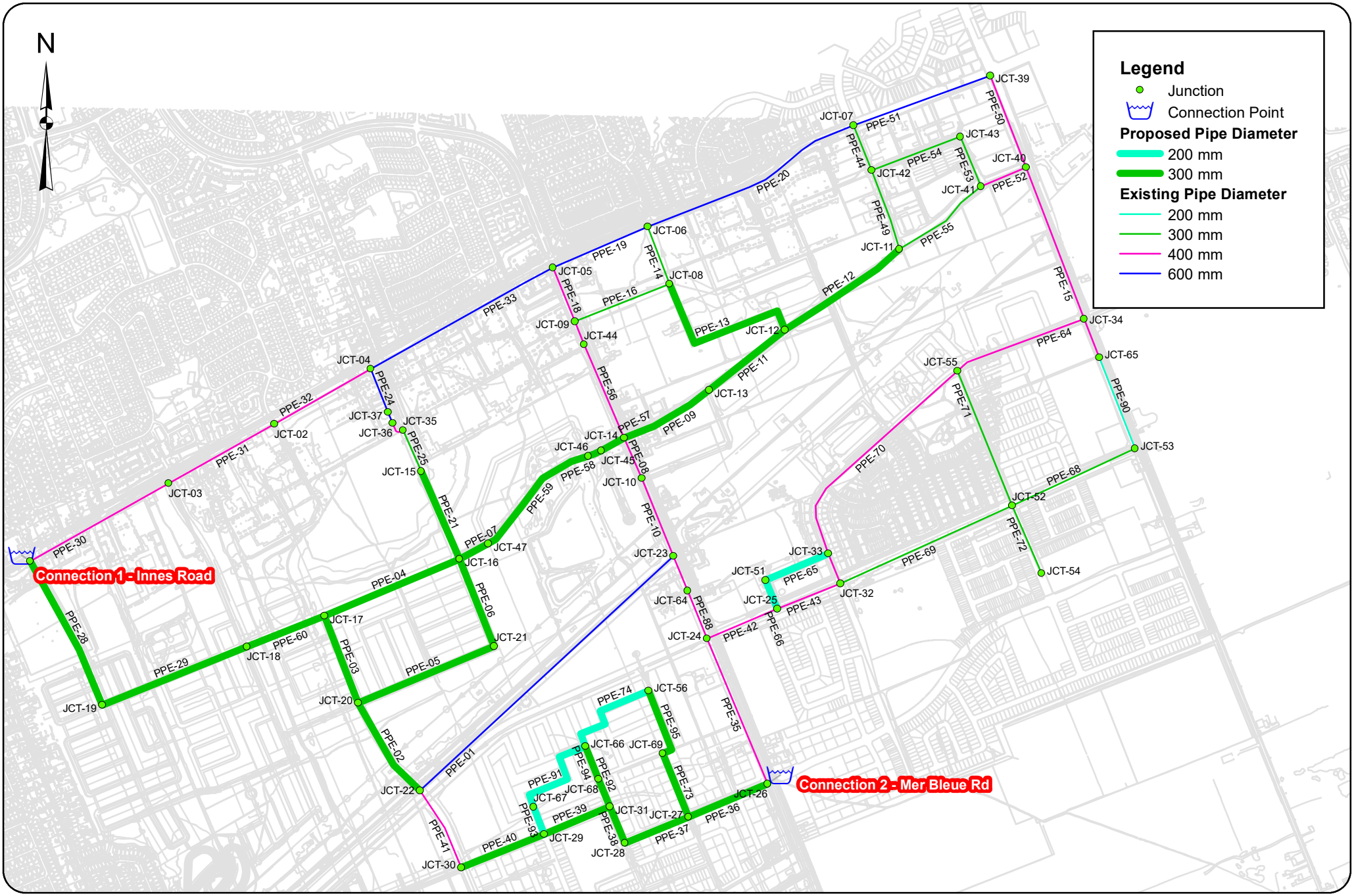
There are 605 single detached dwellings, 1,412 townhomes, 3,243 apartment units and 83.2 ha of commercial and institutional area serviced as part of the development.

The development trunk main network will connect in many locations to the existing City trunk main network. To conduct the hydraulic analysis and to size the proposed development trunk main network, only a few of the major City trunk mains and two (2) connection points were modeled. By simplifying the City network and modeling only two (2) connection points, the analysis results are more conservative. The two (2) connections to the City water system are located on Innes Road at the northwest corner of the development and on Mer Bleue Road at the south end of the development.

The development site is shown in **Figure 1.1** on the following page, with the final recommended pipe diameters.

This report describes the assumptions and results of the hydraulic modeling and capacity analysis using InfoWater (Innovyze), a GIS water distribution system modeling and management software application.

The results presented in this memo are based on the analysis of steady state simulations. The predicted available fire flows, as calculated by the hydraulic model, represent the flow available in the water main while maintaining a residual pressure of 20 psi at the hydrant. No extended period simulations were completed in this analysis to assess the water quality or to assess the hydraulic impact on storage and pumping.



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
Client: **David Schaeffer Engineering Ltd.**
Date: **July 2018**
Created by: **AM**
Reviewed by: **WdS**

0 400 800
Meters

Site Layout and Connection Points

Figure 1.1
B5

2 Modeling Considerations

2.1 Water Main Configuration

The water main network was modeled based on the pipe network layout prepared by DSEL (733_Wmain.dwg) and provided to GeoAdvice on May 11, 2018.

2.2 Elevations

Elevations of the modeled junctions in the northwest quadrant of the development were assigned according to a site grading plan prepared by DSEL (733_Grad_Opt1.dwg) and provided to GeoAdvice on May 11, 2018. In the absence of grading plans for the remaining three quadrants of the development, conservative estimates of the elevations were made based on elevations extracted from Google Earth.

2.3 Consumer Demands

The consumer demands were determined based on the factors summarized in **Table 2.1**, as provided by DSEL.

Table 2.1: City of Ottawa Demand Factors

Demand Type	Units
Single Family Residential	
Average Day Demand (ADD)	570 L/unit/day
Outdoor Water Demand (OWD)	1,050 L/unit/day
Maximum Day Demand (MDD)	ADD + OWD L/unit/day
Peak Hour Demand (PHD)	1.5 x ADD + 2.1 x MDD L/unit/day
Minimum Hour Demand (MHD)	0.5 x ADD L/unit/day
Multi-Family Residential	
Average Day Demand (ADD)	560 L/unit/day
Outdoor Water Demand (OWD)	0 L/unit/day
Maximum Day Demand (MDD)	ADD L/unit/day
Peak Hour Demand (PHD)	1.6 x MDD L/unit/day
Minimum Hour Demand (MHD)	0.5 x ADD L/unit/day
Apartment Residential	
Average Day Demand (ADD)	400 L/unit/day
Outdoor Water Demand (OWD)	0 L/unit/day
Maximum Day Demand (MDD)	ADD L/unit/day
Peak Hour Demand (PHD)	1.6 x MDD L/unit/day
Minimum Hour Demand (MHD)	0.5 x ADD L/unit/day

Demand Type	Units
Institutional, Commercial, and Institutional (ICI)	
Average Day Demand (ADD)	8,500 L/ha/day
Outdoor Water Demand (OWD)	0 L/ha/day
Maximum Day Demand (MDD)	ADD L/ha/day
Peak Hour Demand (PHD)	1.3 x MDD L/ha/day
Minimum Hour Demand (MHD)	0.5 x ADD L/unit/day

Table 2.2 and **Table 2.3** summarize the water demand calculations for residential and ICI demands, respectively.

Table 2.2: Residential Demand Calculations

Dwelling Unit		Average Day Demand	Maximum Day Demand	Peak Hour Demand	Minimum Hour Demand
Type	Number of Units	(L/s)	(L/s)	(L/s)	(L/s)
Single Detached	666	4.39	12.48	31.54	2.20
Townhome	1,553	10.07	10.07	16.10	5.03
Apartment Block	3,566	16.51	16.51	26.42	8.26
Total	**5,785**	**30.97**	**39.06**	**74.07**	**15.48**

Table 2.3: ICI Demand Calculations

Land Use Type	Area	Average Day Demand	Maximum Day Demand	Peak Hour Demand	Minimum Hour Demand
	(ha)	(L/s)	(L/s)	(L/s)	(L/s)
Commercial floor space	8.55	0.84	0.84	1.09	0.42
Institutional	11.30	1.11	1.11	1.44	0.56
Employment/Mixed Use	62.11	6.11	6.11	7.94	3.06
Park w/ Splash Pad	9.59	0.94	0.94	1.23	0.47
Total	**91.54**	**9.01**	**9.01**	**11.71**	**4.50**

It is important to note that the unit counts and areas in **Table 2.2** and **Table 2.3** have been increased by 10% to account for potential changes in the proposed land use of the development.

In addition to the demands summarized above, demands from neighbouring developments were included in the following analysis. These developments include:

- The future commercial land to the northeast of the study area;
- The development at 3490 Innes Road;
- The Mer Bleue Expansion development;
- The Trails Edge East development; and
- The Innes Road Commercial to the northwest of the development.

The demands from the additional neighbouring developments were also increased by 10% to account for potential land use changes, with the exception of the 3490 Innes Road and Mer Bleue Expansion developments. The demands from these two developments were included in the analysis but not increased by 10% because these values were considered approved per previous reports.

Demands were grouped into demand polygons then uniformly distributed to the model nodes located within each polygon. The calculation and allocation of the demands is shown in **Appendix A**.

2.4 Fire Flow Demand

At this time, there is not enough information available to calculate the required fire flows of the development. In previous development applications, the City has typically requested a maximum required fire flow of 250 L/s based on their requirement to limit distribution mains to 200 mm in diameter (Technical Bulletin ISDTB-2014-02). As such, a required fire flow of 250 L/s was assumed throughout the development.

Fire flow simulations were completed at each model node in the development. The locations of nodes do not necessarily represent hydrant locations.

2.5 Boundary Conditions

The boundary conditions were provided by the City of Ottawa in the form of Hydraulic Grade Line (HGL) at the following locations:

- Connection 1: Innes Road
- Connection 2: Mer Bleue Road

The above connection points are illustrated in **Figure 1.1**.

Boundary conditions were provided for Peak Hour, Maximum Day plus Fire and Minimum Hour (high pressure check) conditions. Boundary conditions can be found in **Appendix B**.

Table 2.4 summarizes the boundary conditions used to size the development water network.

Table 2.4: Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)
Min Hour (max. pressure)	130.3	130.3
Peak Hour (min. pressure)	126.4	125.5
Max Day + Fire Flow (250 L/s)	126.1	124.3

Please note that not all neighbouring developments were included in the boundary conditions; however, the boundary conditions were assumed to be adequate for this study based on discussions with the City of Ottawa staff.

3 Hydraulic Capacity Design Criteria

3.1 Pipe Characteristics

Pipe characteristics of internal diameter (ID) and Hazen-Williams C factors were assigned in the model according to the City of Ottawa Design Guidelines for PVC water main material. Pipe characteristics used for the development are outlined in **Table 3.1** below.

Table 3.1: Model Pipe Characteristics

Nominal Diameter (mm)	ID PVC (mm)	Hazen Williams C-Factor (/)
150	155	100
200	204	110
250	250	110
300	305	120
400	406	120
600	600	120

3.2 Pressure Requirements

As outlined in the City of Ottawa Design Guidelines, the generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi). The maximum pressure at any point in the distribution system in occupied areas outside of the public right-of-way shall not exceed 552 kPa (80 psi). Pressure requirements are outlined in **Table 3.2.**

Table 3.2: Pressure Requirements

Demand Condition	Minimum Pressure		Maximum Pressure	
	(kPa)	(psi)	(kPa)	(psi)
Normal Operating Pressure (maximum daily flow)	350	50	480	70
Peak Hour Demand (minimum allowable pressure)	276	40	-	-
Maximum Fixture Pressure (Ontario Building Code)	-	-	552	80
Maximum Distribution Pressure (minimum hour check)	-	-	552	80
Maximum Day Plus Fire	140	20	-	-

4 Hydraulic Capacity Analysis

The proposed water mains within the development were sized to the minimum diameter which would satisfy the greater of maximum day plus fire and peak hour demand. Modeling was carried out for minimum hour, peak hour and maximum day plus fire flow using InfoWater.

Detailed pipe and junction model input data can be found in **Appendix C**.

4.1 Development Pressure Analysis

The modeling results indicate that the development can be adequately serviced by the proposed water main layout shown in **Figure 1.1**. Modeled service pressures for the development are summarized in **Table 4.1** below.

Table 4.1: Summary of Available Service Pressures

Minimum Hour Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
400 kPa (58 psi)	297 kPa (43 psi)

Based on **Table 3.2** and **Table 4.1**, pressures fall within the desired range.

Detailed pipe and junction result tables and maps can be found in **Appendix D**.

4.2 Development Fire Flow Analysis

The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire. A summary of the minimum available fire flows is shown below in **Table 4.2**.

Table 4.2: Summary of Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow	Junction ID
250 L/s	263 L/s	JCT-67

As shown in **Table 4.2**, the model predicts that the fire flow requirements can be met throughout the development with the proposed water trunk main layout shown in **Figure 1.1**. Detailed fire flow results and figures illustrating the fire flow results can be found in **Appendix E**.

5 Conclusions

The hydraulic capacity and modeling analysis of East Urban Community Mixed-Use Centre development yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between 297 kPa and 400 kPa.
- Available fire flows are predicted to exceed 263 L/s at all modeled nodes. All fire flows are achievable (all residual pressures exceed 140 kPa).

Submission

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July 25, 2018

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Appendix A Domestic Water Demand Calculations and Allocation

NE Domestic Water Demands

10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	-	570	-	-	1,050	-	-	-	167	-	-
Townhome	-	560	-	-	-	-	-	-	167	-	-
Apartment	1,547	400	618,640	7.16	-	-	-	7.16	167	11.46	3.58
Subtotal:	**1,547**		**618,640**	**7.16**		**-**	**-**	**7.16**		**11.46**	**3.58**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	3.81	8,500	32,415	0.38	0.38	250*	0.49	0.19
Institutional		8,500	-	-	-	250*	-	-
Employment/Mixed Use	28.12	8,500	239,009	2.77	2.77	250*	3.60	1.38
Park w/ Splash Pad*	0.21	8,500	1,806	0.02	0.02	251*	0.03	0.01
Subtotal:	**32.14**		**273,229**	**3.16**	**3.16**		**4.11**	**1.58**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Total:	**10.32**	**10.32**	**15.57**	**5.16**

Future Commercial Land

10% increase in demand

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	32.36	8,500	275,077	3.18	3.18	250*	4.14	1.59
Institutional		8,500	-	-	-	250*	-	-
Employment/Mixed Use	-	8,500	-	-	-	250*	-	-
Park w/ Splash Pad*		8,500	-	-	-	250*	-	-
Subtotal:	**32.36**		**275,077**	**3.18**	**3.18**		**4.14**	**1.59**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Total:	**3.18**	**3.18**	**4.14**	**1.59**

North of Hydro Easement, East of Mer Bleue Road					
Land Use	Area (Ha)	Singles	THs	Apt	Employment
Mixed Use/Employment	10.15			1406	536
Employment	15.42				812
Commercial	3.47				147
Park	0.19				
Total	29.22	0	0	1406	1495

Total Demands	L/s
Avg. Day	**13.51**
Max Day	**13.51**
Peak Hour	**19.71**
MHD	**6.75**

SW Domestic Water Demands

10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	157	570	89,728	1.04	1,050	165,289	1.91	2.95	167	7.46	0.52
Townhome	367	560	205,693	2.38	-	-	-	2.38	167	3.81	1.19
Apartment	907	400	362,867	4.20	-	-	-	4.20	167	6.72	2.10
Subtotal:	**1,432**		**658,289**	**7.62**		**165,289**	**1.91**	**9.53**		**17.99**	**3.81**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	4.73	8,500	40,240	0.47	0.47	250*	0.61	0.23
Institutional	1.10	8,500	9,372	0.11	0.11	250*	0.14	0.05
Employment/Mixed Use	6.92	8,500	58,840	0.68	0.68	250*	0.89	0.34
Park w/ Splash Pad*	0.51	8,500	4,375	0.05	0.05	250*	0.07	0.03
Subtotal:	**13.27**		**112,827**	**1.31**	**1.31**		**1.70**	**0.65**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Total:	**8.92**	**10.84**	**19.69**	**4.46**

Trails Edge East

10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	275	570	156,750	1.81	1,050	288,750	3.34	5.16	167	13.03	0.91
Townhome	898	560	502,656	5.82	-	-	-	5.82	167	9.31	2.91
Apartment		400	-	-	-	-	-	-	167	-	-
Subtotal:	**1,173**		**659,406**	**7.63**		**288,750**	**3.34**	**10.97**		**22.34**	**3.82**

Total:	**7.63**	**10.97**	**22.34**	**3.82**

South of Hydro Easement, West of Mer Bleue Road

Land Use	Area (Ha)	Singles	THs	Apt	Employment
Mixed Use	6.29			252	265
Medium-High Density Residential	7.16			573	
Low Density Residential	13.87	143	334		
Institutional	1.00				3
Commercial	4.30				183
Park	0.47				
Brian Coburn	6.23				
Total	39.33	143	334	825	451

Total Demands	L/s
Avg. Day	**16.56**
Max Day	**21.81**
Peak Hour	**42.03**
MHD	**8.28**

SE Domestic Water Demands

10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	-	570	-	-	1,050	-	-	-	167	-	-
Townhome	-	560	-	-	-	-	-	-	167	-	-
Apartment	92	400	36,960	0.43	-	-	-	0.43	167	0.68	0.21
Subtotal:	**92**		**36,960**	**0.43**		**-**	**-**	**0.43**		**0.68**	**0.21**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	-	8,500	-	-	-	250*	-	-
Institutional	10.19	8,500	86,644	1.00	1.00	250*	1.30	0.50
Employment/Mixed Use		8,500	-	-	-	250*	-	-
Park w/ Splash Pad*	0.40	8,500	3,393	0.04	0.04	250*	0.05	0.02
Subtotal:	**10.59**		**90,037**	**1.04**	**1.04**		**1.35**	**0.52**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Total:				**1.47**	**1.47**		**2.04**	**0.73**

South of Hydro Easement, East of Mer Bleue Road

Land Use	Area (Ha)	Singles	THs	Apt	Employment
Institutional	9.27				1500
Park	0.36				
Medium Density Residential	0.99			84	
Total	10.62	0	0	84	1500

Total Demands	**L/s**
Avg. Day	**28.43**
Max Day	**53.99**
Peak Hour	**121.59**
MHD	**14.22**

Mer Bleue Exp.Water Demands

Not showing 10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	2,103	570	1,198,710	13.87	1,050	2,208,150	25.56	39.43	167	99.67	6.94
Townhome	1,191	560	666,960	7.72	-	-	-	7.72	167	12.35	3.86
Apartment	395	400	158,000	1.83	-	-	-	1.83	167	2.93	0.91
Subtotal:	**3,689**		**2,023,670**	**23.42**		**2,208,150**	**25.56**	**48.98**		**114.95**	**11.71**

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	4.00	8,500	34,000	0.39	0.39	250	0.51	0.20
Institutional*		8,500	-	-	-	250	-	-
Employment/Mixed Use	13.00	8,500	110,500	1.28	1.28	250	1.66	0.64
Park w/ Splash Pad**	19.00	8,500	161,500	1.87	1.87	250	2.43	0.93
Subtotal:	**36.00**		**306,000**	**3.54**	**3.54**		**4.60**	**1.77**

*Institutional assumed as light industiral in absence of population estimate

**Park using the 8500 L/ha/day value like commercial

Total:				**26.96**	**52.52**		**119.55**	**13.48**

NW Domestic Water Demands

10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	508	570	289,637	3.35	1,050	533,541	6.18	9.53	167	24.08	1.68
Townhome	1,186	560	663,962	7.68	-	-	-	7.68	167	12.30	3.84
Apartment	1,020	400	408,112	4.72	-	-	-	4.72	167	7.56	2.36
Subtotal:	**2,714**		**1,361,710**	**15.76**		**533,541**	**6.18**	**21.94**		**43.94**	**7.88**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space		8,500	-	-	-	250*	-	-
Institutional		8,500	-	-	-	250*	-	-
Employment/Mixed Use	27.07	8,500	230,068	2.66	2.66	250*	3.46	1.33
Park w/ Splash Pad*	8.47	8,500	71,956	0.83	0.83	250*	1.08	0.42
Subtotal:	**35.53**		**302,024**	**3.50**	**3.50**		**4.54**	**1.75**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Total:				**19.26**	**25.43**		**48.48**	**9.63**

3490 Innes Road

Not showing 10% increase in demand

Dwelling Type	Number of Units	Average Day Demand			Outdoor Water Demand			Max Day Avg. Day+OWD (L/s)	Fire Flow (L/s)	Peak Hour (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/unit/d)	(L/d)	(L/s)	(L/unit/d)	(L/d)	(L/s)				
Single Family	330	570	188,100	2.18	1,050	346,500	4.01	6.19	167	15.64	1.09
Townhome	491	560	274,960	3.18	-	-	-	3.18	167	5.09	1.59
Apartment	-	400	-	-	-	-	-	-	167	-	-
Subtotal:	**821**		**463,060**	**5.36**		**346,500**	**4.01**	**9.37**		**20.73**	**2.68**

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	5.40	8,500	45,900	0.53	0.53	250*	0.69	0.27
Institutional		8,500	-	-	-	250*	-	-
Employment/Mixed Use	-	8,500	-	-	-	250*	-	-
Park w/ Splash Pad*	1.43	8,500	12,155	0.14	0.14	250*	0.18	0.07
Subtotal:	**6.83**		**58,055**	**0.67**	**0.67**		**0.87**	**0.34**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

Total:				**6.03**	**10.04**		**21.61**	**3.02**

Innes Road Commercial

10% increase in demand

Land Use Type	Area (ha)	Average Day Demand			Max Day Avg. Day (L/s)	Fire Flow (L/s)	Peak Hour 1.3 x Max Day (L/s)	Min Hour 0.5 x Avg. Day (L/s)
		(L/ha/d)	(L/d)	(L/s)				
Commercial floor space	13.99	8,500	118,932	1.38	1.38	250*	1.79	0.69
Institutional	-	8,500	-	-	-	250*	-	-
Employment/Mixed Use	-	8,500	-	-	-	250*	-	-
Park w/ Splash Pad*	-	8,500	-	-	-	250*	-	-
Subtotal:	**13.99**		**118,932**	**1.38**	**1.38**		**1.79**	**0.69**

*Not enough information at this time to complete FUS calculations. Typical conservative estimate assumed.

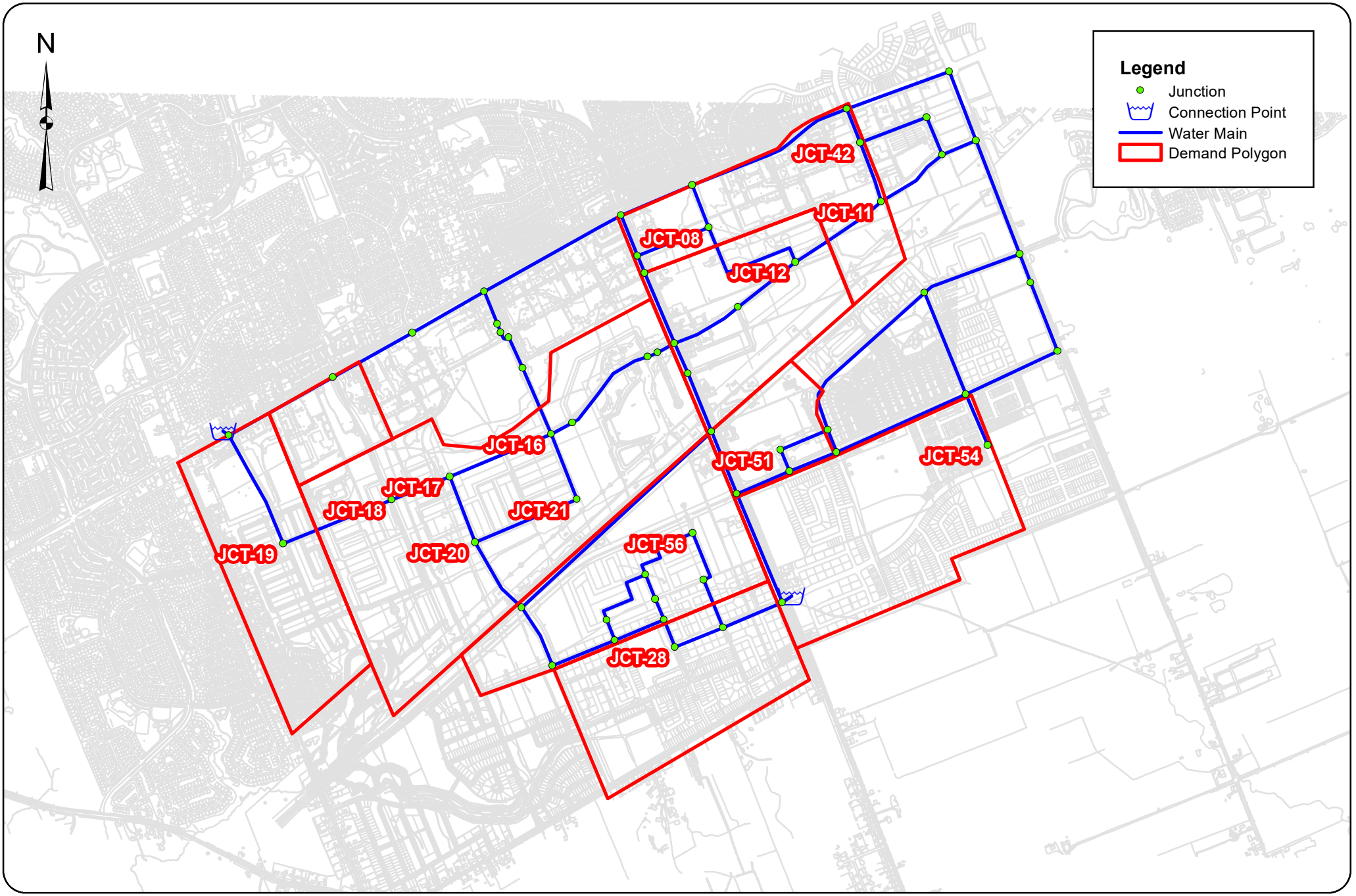
Total:				**1.38**	**1.38**		**1.79**	**0.69**

North of Hydro Easement, West of Mer Bleue Road					
Land Use	Area (Ha)	Singles	THs	Apt	Employment
Low Density Residential	44.76	462	1078		
Medium Density Residential	4.04			250	
Medium-High Density Residential	8.47			677	
Employment	24.61				1431
Park	7.70				
Stormwater Management Facility	1.47				
Rock Barren	5.44				
Total	96.48	462	1078	928	1431

Total Demands	**L/s**	**L/min**
Avg. Day	**26.66**	**1599.848**
Max Day	**36.85**	**2210.987**
Peak Hour	**71.88**	**4312.588**
MHD	**13.33**	**799.9238**

Domestic Demand Calculations and Allocation

Junction ID	Polygon	Quadrant	ADD (L/s)	MDD (L/s)	PHD (L/s)
JCT-8	Future Commercial Land	NE	1.06	1.06	1.38
JCT-11	Future Commercial Land	NE	1.06	1.06	1.38
JCT-12	NE Domestic Water Demands	NE	10.32	10.32	15.57
JCT-16	NW Domestic Water Demands	NW	3.85	5.09	9.70
JCT-17	NW Domestic Water Demands	NW	3.85	5.09	9.70
JCT-18	NW Domestic Water Demands	NW	3.85	5.09	9.70
JCT-19	3490 Innes Road	NW	6.03	10.04	21.61
JCT-20	NW Domestic Water Demands	NW	3.85	5.09	9.70
JCT-21	NW Domestic Water Demands	NW	3.85	5.09	9.70
JCT-54	Mer Bleue Exp.Water Demands	SE	26.96	52.52	119.55
JCT-28	Trails Edge East	SW	7.63	10.97	22.34
JCT-51	SE Domestic Water Demands	SE	1.47	1.47	2.04
JCT-42	Future Commercial Land	NE	1.06	1.06	1.38
JCT-38	Innes Road Commercial	NW	1.38	1.38	1.79
JCT-56	SW Domestic Water Demands	SW	8.92	10.84	19.69
	TOTAL		**85.16**	**126.16**	**255.21**



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
Client: **David Schaeffer Engineering Ltd.**
Date: **July 2018**
Created by: **AM**
Reviewed by: **WdS**

0 500 1,000
Meters

Demand Allocation

Figure A.1
B20

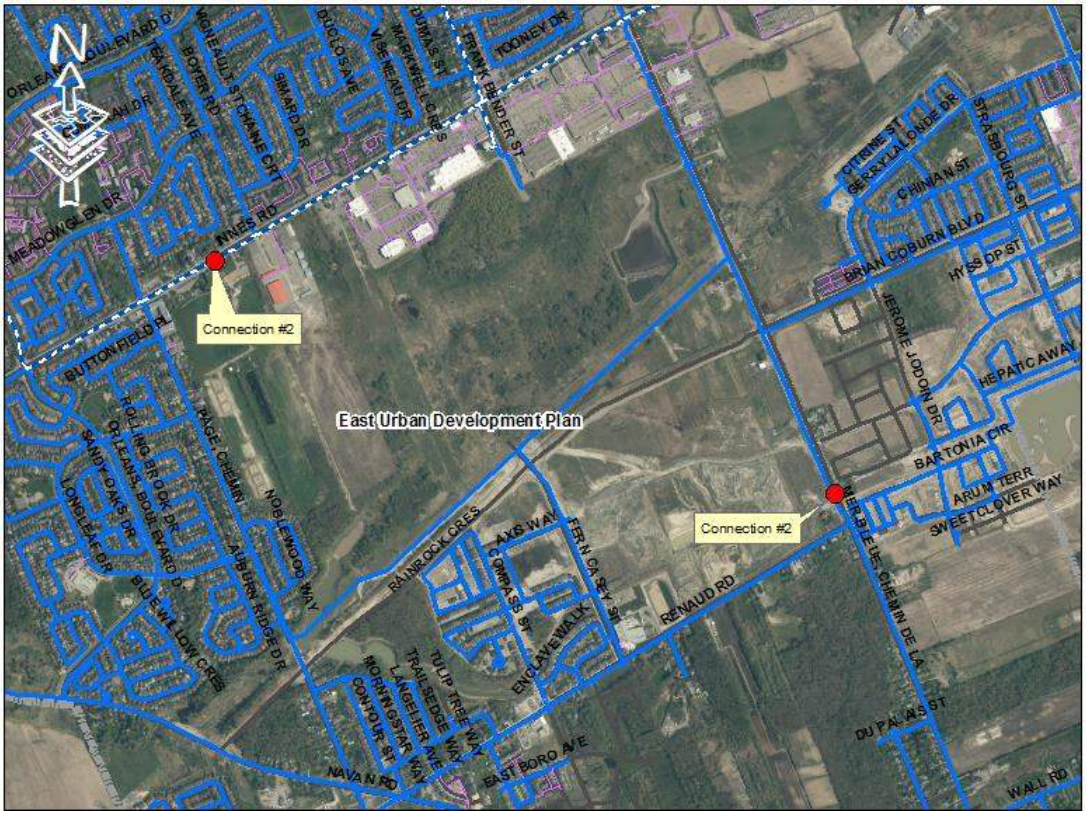
Appendix B Boundary Conditions

Boundary Conditions for East Urban Community

Information Provided

Date provided: 09 March 2018

Location



Results

Pre-Zone Configuration Model

Provided Information:

	Demand	
Scenario	**L/min**	**L/s**
Average Daily Demand	3492.2	58.2
Maximum Daily Demand	4418.6	73.6
Peak Hour	8282.5	138.0
Fire Flow Demand	10000	166.7
Fire Flow Demand	15000	250.0
# of connections	2	

Post-Zone Configuration Model

Connection 1 - Innes Road

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.3	55.9
Peak Hour	126.4	50.4
Max Day plus Fire (10,000 l/min)	126.3	50.2
Max Day plus Fire (15,000 l/min)	126.1	50.2

[1] Ground Elevation = 90.97 m

Connection 2 - Mer Bleue Rd

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	130.3	60.9
Peak Hour	125.5	54.1
Max Day plus Fire (10,000 l/min)	124.7	53.0
Max Day plus Fire (15,000 l/min)	124.3	52.5

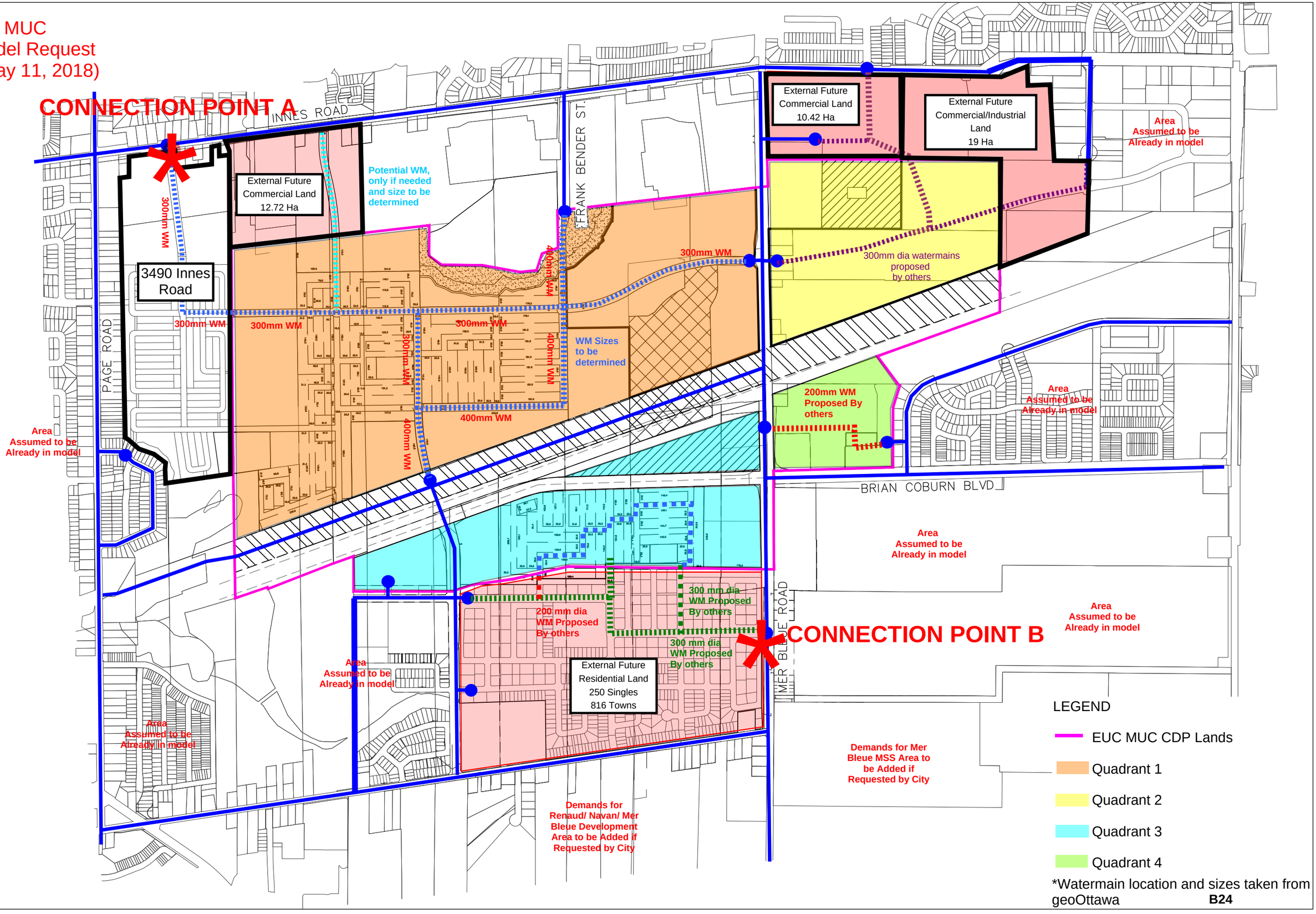
[1] Ground Elevation = 87.42 m

Considerations

Disclaimer

The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation. Fire Flow analysis is a reflection of available flow in the watermain; there may be additional restrictions that occur between the watermain and the hydrant that the model cannot take into account.

EUC CDP MUC
Water Model Request
(DSEL, May 11, 2018)



Appendix C Pipe and Junction Model Inputs

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness
PPE-01	JCT-23	JCT-22	1041.17	600	120
PPE-02	JCT-22	JCT-20	326.23	305	120
PPE-03	JCT-17	JCT-20	282.43	305	120
PPE-04	JCT-17	JCT-16	442.55	305	120
PPE-05	JCT-20	JCT-21	444.01	305	120
PPE-06	JCT-21	JCT-16	283.01	305	120
PPE-07	JCT-16	JCT-47	96.92	305	120
PPE-08	JCT-14	JCT-10	133.25	406	120
PPE-09	JCT-14	JCT-13	296.91	305	120
PPE-10	JCT-10	JCT-23	252.52	406	120
PPE-11	JCT-12	JCT-13	292.61	305	120
PPE-12	JCT-12	JCT-11	423.46	305	120
PPE-13	JCT-08	JCT-12	525.37	305	120
PPE-14	JCT-06	JCT-08	184.21	305	120
PPE-15	JCT-40	JCT-34	489.17	406	120
PPE-16	JCT-08	JCT-09	307.30	305	120
PPE-17	JCT-09	JCT-44	74.98	406	120
PPE-18	JCT-05	JCT-09	175.16	406	120
PPE-19	JCT-05	JCT-06	311.67	600	120
PPE-20	JCT-06	JCT-07	698.32	600	120
PPE-21	JCT-16	JCT-15	288.88	305	120
PPE-22	JCT-35	JCT-36	49.05	406	120
PPE-23	JCT-36	JCT-37	35.04	600	120
PPE-24	JCT-37	JCT-04	141.09	600	120
PPE-25	JCT-15	JCT-35	135.90	305	120
PPE-28	JCT-01	JCT-19	486.44	305	120
PPE-29	JCT-19	JCT-18	471.55	305	120
PPE-30	JCT-01	JCT-03	479.65	406	120
PPE-31	JCT-02	JCT-03	365.73	406	120
PPE-32	JCT-02	JCT-04	334.49	406	120
PPE-33	JCT-04	JCT-05	629.68	600	120
PPE-34	JCT-23	JCT-64	112.70	406	120
PPE-35	JCT-24	JCT-26	474.48	406	120

ID	Elevation (m)	ADD (L/s)
JCT-01	90.97	0.00
JCT-02	90.00	0.00
JCT-03	92.00	0.00
JCT-04	90.50	0.00
JCT-05	89.50	0.00
JCT-06	88.00	0.00
JCT-07	88.00	0.00
JCT-08	88.10	1.06
JCT-09	89.00	0.00
JCT-10	88.20	0.00
JCT-11	88.00	1.06
JCT-12	88.00	10.32
JCT-13	88.20	0.00
JCT-14	88.20	0.00
JCT-15	91.00	0.00
JCT-16	89.00	5.09
JCT-17	88.40	5.09
JCT-18	88.00	5.09
JCT-19	87.60	10.04
JCT-20	87.70	5.09
JCT-21	87.80	5.09
JCT-22	87.30	0.00
JCT-23	87.80	0.00
JCT-24	87.70	0.00
JCT-25	87.00	0.00
JCT-26	87.42	0.00
JCT-27	87.00	0.00
JCT-28	87.20	10.97
JCT-29	87.20	0.00
JCT-30	87.20	0.00
JCT-31	87.30	0.00
JCT-32	87.20	0.00
JCT-33	87.00	0.00

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness
PPE-36	JCT-26	JCT-27	259.70	305	120
PPE-37	JCT-27	JCT-28	207.09	305	120
PPE-38	JCT-28	JCT-31	118.66	305	120
PPE-39	JCT-31	JCT-29	215.23	305	120
PPE-40	JCT-29	JCT-30	269.49	305	120
PPE-41	JCT-30	JCT-22	265.15	406	120
PPE-42	JCT-24	JCT-25	230.16	406	120
PPE-43	JCT-25	JCT-32	205.18	406	120
PPE-44	JCT-07	JCT-42	146.06	305	120
PPE-46	JCT-32	JCT-33	97.58	406	120
PPE-49	JCT-42	JCT-11	253.01	305	120
PPE-50	JCT-39	JCT-40	298.05	406	120
PPE-51	JCT-07	JCT-39	439.19	600	120
PPE-52	JCT-40	JCT-41	148.00	305	120
PPE-53	JCT-43	JCT-41	163.03	305	120
PPE-54	JCT-42	JCT-43	286.99	305	120
PPE-55	JCT-41	JCT-11	312.77	305	120
PPE-56	JCT-44	JCT-14	307.64	406	120
PPE-57	JCT-45	JCT-14	76.97	305	120
PPE-58	JCT-46	JCT-45	43.29	305	120
PPE-59	JCT-47	JCT-46	413.66	305	120
PPE-60	JCT-17	JCT-18	251.68	305	120
PPE-64	JCT-34	JCT-55	415.52	406	120
PPE-65	JCT-33	JCT-51	205.12	204	110
PPE-66	JCT-51	JCT-25	92.97	204	110
PPE-67	JCT-34	JCT-65	124.78	406	120
PPE-68	JCT-53	JCT-52	408.39	305	120
PPE-69	JCT-52	JCT-32	569.65	305	120
PPE-70	JCT-55	JCT-33	743.16	406	120
PPE-71	JCT-55	JCT-52	439.12	305	120
PPE-72	JCT-52	JCT-54	223.65	305	120
PPE-73	JCT-27	JCT-56	439.14	305	120

ID	Elevation (m)	ADD (L/s)
JCT-34	89.00	0.00
JCT-35	92.30	0.00
JCT-36	92.00	0.00
JCT-37	91.00	0.00
JCT-39	89.00	0.00
JCT-40	89.00	0.00
JCT-41	88.50	0.00
JCT-42	88.50	1.06
JCT-43	88.50	0.00
JCT-44	89.00	0.00
JCT-45	88.20	0.00
JCT-46	88.20	0.00
JCT-47	89.00	0.00
JCT-51	87.00	1.47
JCT-52	88.50	0.00
JCT-53	89.00	0.00
JCT-54	88.50	52.52
JCT-55	88.50	0.00
JCT-56	88.00	10.84
JCT-64	88.00	0.00
JCT-65	89.00	0.00

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness
PPE-74	JCT-56	JCT-29	725.44	305	120
PPE-88	JCT-64	JCT-24	157.29	406	120
PPE-90	JCT-65	JCT-53	295.76	203	110

Appendix D MHD and PHD Model Results

Minimum Hour Demand Modeling Results

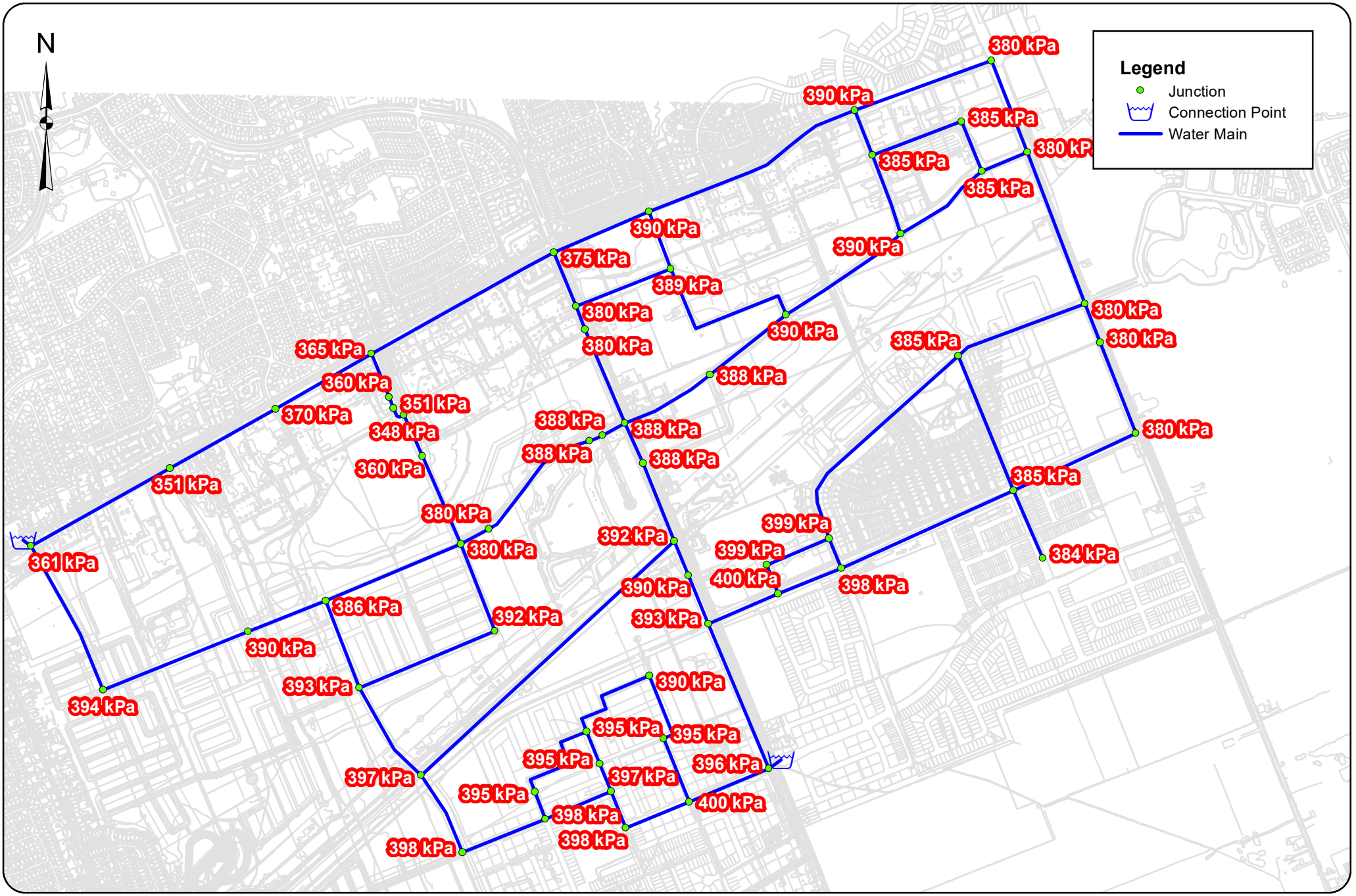
ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
PPE-01	JCT-23	JCT-22	1041.17	600	120	1.21	0.00	0.00	0.00
PPE-02	JCT-22	JCT-20	326.23	305	120	1.98	0.03	0.00	0.00
PPE-03	JCT-17	JCT-20	282.43	305	120	1.05	0.01	0.00	0.00
PPE-04	JCT-17	JCT-16	442.55	305	120	1.23	0.02	0.00	0.00
PPE-05	JCT-20	JCT-21	444.01	305	120	1.11	0.02	0.00	0.00
PPE-06	JCT-21	JCT-16	283.01	305	120	-0.82	0.01	0.00	0.00
PPE-07	JCT-16	JCT-47	96.92	305	120	-0.27	0.00	0.00	0.00
PPE-08	JCT-14	JCT-10	133.25	406	120	-4.42	0.03	0.00	0.01
PPE-09	JCT-14	JCT-13	296.91	305	120	2.36	0.03	0.00	0.01
PPE-10	JCT-10	JCT-23	252.52	406	120	-4.42	0.03	0.00	0.01
PPE-11	JCT-12	JCT-13	292.61	305	120	-2.36	0.03	0.00	0.01
PPE-12	JCT-12	JCT-11	423.46	305	120	-0.76	0.01	0.00	0.00
PPE-13	JCT-08	JCT-12	525.37	305	120	2.03	0.03	0.00	0.01
PPE-14	JCT-06	JCT-08	184.21	305	120	1.04	0.01	0.00	0.00
PPE-15	JCT-40	JCT-34	489.17	406	120	4.52	0.03	0.00	0.01
PPE-16	JCT-08	JCT-09	307.30	305	120	-1.52	0.02	0.00	0.00
PPE-17	JCT-09	JCT-44	74.98	406	120	-1.79	0.01	0.00	0.00
PPE-18	JCT-05	JCT-09	175.16	406	120	-0.26	0.00	0.00	0.00
PPE-19	JCT-05	JCT-06	311.67	600	120	7.39	0.03	0.00	0.00
PPE-20	JCT-06	JCT-07	698.32	600	120	6.35	0.02	0.00	0.00
PPE-21	JCT-16	JCT-15	288.88	305	120	-1.24	0.02	0.00	0.00
PPE-22	JCT-35	JCT-36	49.05	406	120	-1.24	0.01	0.00	0.00
PPE-23	JCT-36	JCT-37	35.04	600	120	-1.24	0.00	0.00	0.00
PPE-24	JCT-37	JCT-04	141.09	600	120	-1.24	0.00	0.00	0.00
PPE-25	JCT-15	JCT-35	135.90	305	120	-1.24	0.02	0.00	0.00
PPE-26	JCT-03	JCT-38	229.24	305	120	3.78	0.05	0.00	0.02
PPE-28	JCT-01	JCT-19	486.44	305	120	6.06	0.08	0.02	0.04
PPE-29	JCT-19	JCT-18	471.55	305	120	3.05	0.04	0.01	0.01
PPE-30	JCT-01	JCT-03	479.65	406	120	12.14	0.09	0.02	0.03
PPE-31	JCT-02	JCT-03	365.73	406	120	-8.36	0.06	0.01	0.02
PPE-32	JCT-02	JCT-04	334.49	406	120	8.36	0.06	0.01	0.02
PPE-33	JCT-04	JCT-05	629.68	600	120	7.12	0.03	0.00	0.00
PPE-34	JCT-23	JCT-64	112.70	406	120	-5.63	0.04	0.00	0.01
PPE-35	JCT-24	JCT-26	474.48	406	120	-15.32	0.12	0.03	0.05
PPE-36	JCT-26	JCT-27	259.70	305	120	9.05	0.12	0.02	0.08
PPE-37	JCT-27	JCT-28	207.09	305	120	5.13	0.07	0.01	0.03
PPE-38	JCT-28	JCT-31	118.66	305	120	1.31	0.02	0.00	0.00
PPE-39	JCT-31	JCT-29	215.23	305	120	0.70	0.01	0.00	0.00
PPE-40	JCT-29	JCT-30	269.49	305	120	0.78	0.01	0.00	0.00
PPE-41	JCT-30	JCT-22	265.15	406	120	0.78	0.01	0.00	0.00
PPE-42	JCT-24	JCT-25	230.16	406	120	9.69	0.07	0.01	0.02
PPE-43	JCT-25	JCT-32	205.18	406	120	8.20	0.06	0.00	0.02
PPE-44	JCT-07	JCT-42	146.06	305	120	2.48	0.03	0.00	0.01
PPE-45	JCT-38	JCT-18	319.58	305	120	3.09	0.04	0.00	0.01
PPE-46	JCT-32	JCT-33	97.58	406	120	2.68	0.02	0.00	0.00
PPE-47	RES-2	JCT-26	45.52	999	999	24.37	0.03	0.00	0.00
PPE-48	RES-1	JCT-01	29.65	999	999	18.20	0.02	0.00	0.00
PPE-49	JCT-42	JCT-11	253.01	305	120	1.13	0.02	0.00	0.00
PPE-50	JCT-39	JCT-40	298.05	406	120	3.87	0.03	0.00	0.00

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
JCT-01	0.00	93.47	130	361
JCT-02	0.00	92.50	130	370
JCT-03	0.00	94.50	130	351
JCT-04	0.00	93.00	130	365
JCT-05	0.00	92.00	130	375
JCT-06	0.00	90.50	130	390
JCT-07	0.00	90.50	130	390
JCT-08	0.53	90.60	130	389
JCT-09	0.00	91.50	130	380
JCT-10	0.00	90.70	130	388
JCT-11	0.53	90.50	130	390
JCT-12	5.16	90.50	130	390
JCT-13	0.00	90.70	130	388
JCT-14	0.00	90.70	130	388
JCT-15	0.00	93.50	130	360
JCT-16	1.92	91.50	130	380
JCT-17	1.92	90.90	130	386
JCT-18	1.92	90.50	130	390
JCT-19	3.01	90.10	130	394
JCT-20	1.92	90.20	130	393
JCT-21	1.92	90.30	130	392
JCT-22	0.00	89.80	130	397
JCT-23	0.00	90.30	130	392
JCT-24	0.00	90.20	130	393
JCT-25	0.00	89.50	130	400
JCT-26	0.00	89.92	130	396
JCT-27	0.00	89.50	130	400
JCT-28	3.81	89.70	130	398
JCT-29	0.00	89.70	130	398
JCT-30	0.00	89.70	130	398
JCT-31	0.00	89.80	130	397
JCT-32	0.00	89.70	130	398
JCT-33	0.00	89.50	130	399
JCT-34	0.00	91.50	130	380
JCT-35	0.00	94.80	130	348
JCT-36	0.00	94.50	130	351
JCT-37	0.00	93.50	130	360
JCT-38	0.69	92.70	130	368
JCT-39	0.00	91.50	130	380
JCT-40	0.00	91.50	130	380
JCT-41	0.00	91.00	130	385
JCT-42	0.53	91.00	130	385
JCT-43	0.00	91.00	130	385
JCT-44	0.00	91.50	130	380
JCT-45	0.00	90.70	130	388
JCT-46	0.00	90.70	130	388
JCT-47	0.00	91.50	130	380
JCT-51	0.73	89.50	130	399
JCT-52	0.00	91.00	130	385

Minimum Hour Demand Modeling Results

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
PPE-51	JCT-07	JCT-39	439.19	600	120	3.87	0.01	0.00	0.00
PPE-52	JCT-40	JCT-41	148.00	406	120	-0.65	0.01	0.00	0.00
PPE-53	JCT-43	JCT-41	163.03	305	120	0.81	0.01	0.00	0.00
PPE-54	JCT-42	JCT-43	286.99	305	120	0.81	0.01	0.00	0.00
PPE-55	JCT-41	JCT-11	312.77	305	120	0.16	0.00	0.00	0.00
PPE-56	JCT-44	JCT-14	307.64	406	120	-1.79	0.01	0.00	0.00
PPE-57	JCT-45	JCT-14	76.97	305	120	-0.27	0	0.00	0.00
PPE-58	JCT-46	JCT-45	43.29	305	120	-0.27	0	0.00	0.00
PPE-59	JCT-47	JCT-46	413.66	305	120	-0.27	0	0.00	0.00
PPE-60	JCT-17	JCT-18	251.68	305	120	-4.21	0.06	0.00	0.02
PPE-64	JCT-34	JCT-55	415.52	406	120	2.39	0.02	0.00	0.00
PPE-65	JCT-33	JCT-51	205.12	204	110	-0.76	0.02	0.00	0.01
PPE-66	JCT-51	JCT-25	92.97	204	110	-1.49	0.05	0.00	0.02
PPE-67	JCT-34	JCT-65	124.78	406	120	2.13	0.02	0.00	0.00
PPE-68	JCT-53	JCT-52	408.39	305	120	2.13	0.03	0.00	0.01
PPE-69	JCT-52	JCT-32	569.65	305	120	-5.52	0.08	0.02	0.03
PPE-70	JCT-55	JCT-33	743.16	406	120	-3.44	0.03	0.00	0.00
PPE-71	JCT-55	JCT-52	439.12	305	120	5.83	0.08	0.02	0.04
PPE-72	JCT-52	JCT-54	223.65	305	120	13.48	0.18	0.04	0.17
PPE-73	JCT-27	JCT-69	207.27	305	120	3.92	0.05	0.00	0.02
PPE-74	JCT-66	JCT-56	320.17	204	110	0.54	0.02	0.00	0.00
PPE-88	JCT-64	JCT-24	157.29	406	120	-5.63	0.04	0	0.01
PPE-90	JCT-65	JCT-53	295.76	203	110	2.13	0.07	0.01	0.05
PPE-91	JCT-66	JCT-67	319.52	204	110	0.08	0	0	0
PPE-92	JCT-31	JCT-68	89.57	305	120	0.61	0.01	0	0
PPE-93	JCT-67	JCT-29	88.38	204	110	0.08	0	0	0
PPE-94	JCT-68	JCT-66	106.11	305	120	0.61	0.01	0	0
PPE-95	JCT-69	JCT-56	221.31	305	120	3.92	0.05	0	0.02

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
JCT-53	0.00	91.50	130	380
JCT-54	13.48	91.00	130	384
JCT-55	0.00	91.00	130	385
JCT-56	4.46	90.50	130	390
JCT-64	0.00	90.50	130	390
JCT-65	0	91.5	130.26	379.86
JCT-66	0	90	130.27	394.64
JCT-67	0	90	130.27	394.64
JCT-68	0	90	130.27	394.64
JCT-69	0	90	130.28	394.67



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
Client: **David Schaeffer Engineering Ltd.**
Date: **July 2018**
Created by: **AM**
Reviewed by: **WdS**

0 400 800
Meters

MHD Pressure Results

Figure D.1
B32

Peak Hour Demand Modeling Results

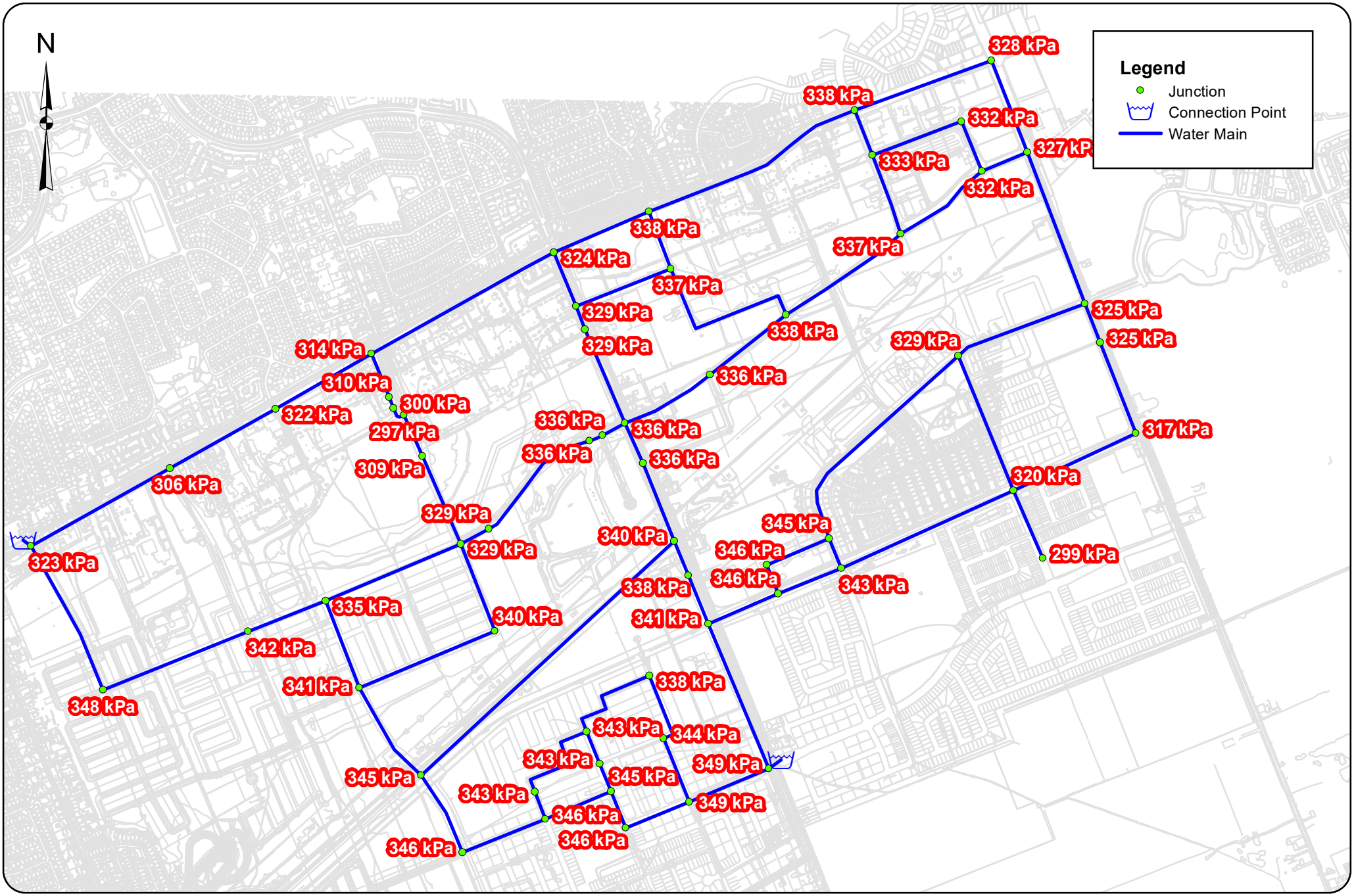
ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
PPE-01	JCT-23	JCT-22	1041.17	600	120	-3.88	0.01	0.00	0.00
PPE-02	JCT-22	JCT-20	326.23	305	120	-3.81	0.05	0.01	0.02
PPE-03	JCT-17	JCT-20	282.43	305	120	16.38	0.22	0.07	0.24
PPE-04	JCT-17	JCT-16	442.55	305	120	11.87	0.16	0.06	0.13
PPE-05	JCT-20	JCT-21	444.01	305	120	2.87	0.04	0.00	0.01
PPE-06	JCT-21	JCT-16	283.01	305	120	-6.83	0.09	0.01	0.05
PPE-07	JCT-16	JCT-47	96.92	305	120	5.32	0.07	0.00	0.03
PPE-08	JCT-14	JCT-10	133.25	406	120	-6.13	0.05	0.00	0.01
PPE-09	JCT-14	JCT-13	296.91	305	120	11.66	0.16	0.04	0.13
PPE-10	JCT-10	JCT-23	252.52	406	120	-6.13	0.05	0.00	0.01
PPE-11	JCT-12	JCT-13	292.61	305	120	-11.66	0.16	0.04	0.13
PPE-12	JCT-12	JCT-11	423.46	305	120	6.52	0.09	0.02	0.04
PPE-13	JCT-08	JCT-12	525.37	305	120	10.42	0.14	0.05	0.10
PPE-14	JCT-06	JCT-08	184.21	305	120	3.51	0.05	0.00	0.01
PPE-15	JCT-40	JCT-34	489.17	406	120	49.71	0.38	0.23	0.47
PPE-16	JCT-08	JCT-09	307.30	305	120	-8.29	0.11	0.02	0.07
PPE-17	JCT-09	JCT-44	74.98	406	120	0.22	0.00	0.00	0.00
PPE-18	JCT-05	JCT-09	175.16	406	120	8.51	0.07	0.00	0.02
PPE-19	JCT-05	JCT-06	311.67	600	120	49.46	0.17	0.02	0.07
PPE-20	JCT-06	JCT-07	698.32	600	120	45.96	0.16	0.04	0.06
PPE-21	JCT-16	JCT-15	288.88	305	120	-9.97	0.14	0.03	0.10
PPE-22	JCT-35	JCT-36	49.05	406	120	-9.97	0.08	0.00	0.02
PPE-23	JCT-36	JCT-37	35.04	600	120	-9.97	0.04	0.00	0.00
PPE-24	JCT-37	JCT-04	141.09	600	120	-9.97	0.04	0.00	0.00
PPE-25	JCT-15	JCT-35	135.90	305	120	-9.97	0.14	0.01	0.10
PPE-26	JCT-03	JCT-38	229.24	305	120	25.60	0.35	0.13	0.55
PPE-28	JCT-01	JCT-19	486.44	305	120	45.44	0.62	0.78	1.60
PPE-29	JCT-19	JCT-18	471.55	305	120	23.83	0.33	0.23	0.48
PPE-30	JCT-01	JCT-03	479.65	406	120	93.54	0.72	0.72	1.51
PPE-31	JCT-02	JCT-03	365.73	406	120	-67.94	0.52	0.31	0.83
PPE-32	JCT-02	JCT-04	334.49	406	120	67.94	0.52	0.28	0.83
PPE-33	JCT-04	JCT-05	629.68	600	120	57.97	0.21	0.06	0.09
PPE-34	JCT-23	JCT-64	112.70	406	120	-2.25	0.02	0.00	0.00
PPE-35	JCT-24	JCT-26	474.48	406	120	-74.12	0.57	0.47	0.98
PPE-36	JCT-26	JCT-27	259.70	305	120	42.1	0.58	0.36	1.39
PPE-37	JCT-27	JCT-28	207.09	305	120	24.41	0.33	0.10	0.51
PPE-38	JCT-28	JCT-31	118.66	305	120	2.07	0.03	0.00	0.01
PPE-39	JCT-31	JCT-29	215.23	305	120	0.41	0.01	0.00	0.00
PPE-40	JCT-29	JCT-30	269.49	305	120	0.07	0	0.00	0.00
PPE-41	JCT-30	JCT-22	265.15	406	120	0.07	0	0.00	0.00
PPE-42	JCT-24	JCT-25	230.16	406	120	71.88	0.56	0.21	0.93
PPE-43	JCT-25	JCT-32	205.18	406	120	62.7	0.48	0.15	0.72
PPE-44	JCT-07	JCT-42	146.06	305	120	14.54	0.2	0.03	0.19
PPE-45	JCT-38	JCT-18	319.58	305	120	23.81	0.33	0.15	0.48
PPE-47	RES-2	JCT-26	45.52	999	999	116.22	0.15	0.00	0.00
PPE-48	RES-1	JCT-01	29.65	999	999	138.98	0.18	0.00	0.00
PPE-46	JCT-32	JCT-33	97.58	406	120	15.02	0.12	0.00	0.05
PPE-49	JCT-42	JCT-11	253.01	305	120	4.47	0.06	0.01	0.02
PPE-51	JCT-07	JCT-39	439.19	600	120	31.41	0.11	0.01	0.03

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
JCT-01	0.00	93.47	126	323
JCT-02	0.00	92.50	125	322
JCT-03	0.00	94.50	126	306
JCT-04	0.00	93.00	125	314
JCT-05	0.00	92.00	125	324
JCT-06	0.00	90.50	125	338
JCT-07	0.00	90.50	125	338
JCT-08	1.38	90.60	125	337
JCT-09	0.00	91.50	125	329
JCT-10	0.00	90.70	125	336
JCT-11	1.38	90.50	125	337
JCT-12	15.57	90.50	125	338
JCT-13	0.00	90.70	125	336
JCT-14	0.00	90.70	125	336
JCT-15	0.00	93.50	125	309
JCT-16	9.70	91.50	125	329
JCT-17	9.70	90.90	125	335
JCT-18	9.70	90.50	125	342
JCT-19	21.61	90.10	126	348
JCT-20	9.70	90.20	125	341
JCT-21	9.70	90.30	125	340
JCT-22	0.00	89.80	125	345
JCT-23	0.00	90.30	125	340
JCT-24	0.00	90.20	125	341
JCT-25	0.00	89.50	125	346
JCT-26	0.00	89.92	126	349
JCT-27	0.00	89.50	125	349
JCT-28	22.34	89.70	125	346
JCT-29	0.00	89.70	125	346
JCT-30	0.00	89.70	125	346
JCT-31	0.00	89.80	125	345
JCT-33	0.00	89.50	125	345
JCT-34	0.00	91.50	125	325
JCT-35	0.00	94.80	125	297
JCT-36	0.00	94.50	125	300
JCT-37	0.00	93.50	125	310
JCT-38	1.79	92.70	126	322
JCT-32	0.00	89.70	125	343
JCT-39	0	91.5	124.96	327.85
JCT-40	0	91.5	124.9	327.27
JCT-41	0	91	124.91	332.27
JCT-42	1.38	91	124.94	332.6
JCT-43	0	91	124.92	332.39
JCT-44	0	91.5	125.03	328.57
JCT-45	0	90.7	125.03	336.44
JCT-46	0	90.7	125.03	336.45
JCT-47	0	91.5	125.05	328.73
JCT-51	2.04	89.5	124.76	345.5
JCT-52	0	91	123.68	320.24

Peak Hour Demand Modeling Results

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness	Flow (L/s)	Velocity (m/s)	Headloss (m)	HL/1000 (m/km)
PPE-50	JCT-39	JCT-40	298.05	406	120	31.41	0.24	0.06	0.2
PPE-52	JCT-40	JCT-41	148	406	120	-18.3	0.14	0.01	0.07
PPE-54	JCT-42	JCT-43	286.99	305	120	8.69	0.12	0.02	0.07
PPE-55	JCT-41	JCT-11	312.77	305	120	-9.61	0.13	0.03	0.09
PPE-53	JCT-43	JCT-41	163.03	305	120	8.69	0.12	0.01	0.07
PPE-56	JCT-44	JCT-14	307.64	406	120	0.22	0	0	0
PPE-57	JCT-45	JCT-14	76.97	305	120	5.32	0.07	0	0.03
PPE-58	JCT-46	JCT-45	43.29	305	120	5.32	0.07	0	0.03
PPE-59	JCT-47	JCT-46	413.66	305	120	5.32	0.07	0.01	0.03
PPE-60	JCT-17	JCT-18	251.68	305	120	-37.95	0.52	0.29	1.14
PPE-64	JCT-34	JCT-55	415.52	406	120	30.2	0.23	0.08	0.19
PPE-65	JCT-33	JCT-51	205.12	204	110	-7.14	0.22	0.09	0.43
PPE-66	JCT-51	JCT-25	92.97	204	110	-9.18	0.28	0.06	0.69
PPE-67	JCT-34	JCT-65	124.78	406	120	19.51	0.15	0.01	0.08
PPE-68	JCT-53	JCT-52	408.39	305	120	19.51	0.27	0.14	0.33
PPE-69	JCT-52	JCT-32	569.65	305	120	-47.68	0.65	0.99	1.74
PPE-70	JCT-55	JCT-33	743.16	406	120	-22.16	0.17	0.08	0.1
PPE-71	JCT-55	JCT-52	439.12	305	120	52.36	0.72	0.91	2.07
PPE-72	JCT-52	JCT-54	223.65	305	120	119.55	1.64	2.14	9.57
PPE-73	JCT-27	JCT-69	207.27	305	120	17.68	0.24	0.06	0.28
PPE-74	JCT-66	JCT-56	320.17	204	110	2.01	0.06	0.01	0.04
PPE-88	JCT-64	JCT-24	157.29	406	120	-2.25	0.02	0	0
PPE-90	JCT-65	JCT-53	295.76	203	110	19.51	0.6	0.84	2.85
PPE-91	JCT-66	JCT-67	319.52	204	110	-0.34	0.01	0	0
PPE-92	JCT-31	JCT-68	89.57	305	120	1.67	0.02	0	0
PPE-93	JCT-67	JCT-29	88.38	204	110	-0.34	0.01	0	0
PPE-94	JCT-68	JCT-66	106.11	305	120	1.67	0.02	0	0
PPE-95	JCT-69	JCT-56	221.31	305	120	17.68	0.24	0.06	0.28

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
JCT-53	0	91.5	123.82	316.68
JCT-54	119.55	91	121.54	299.26
JCT-55	0	91	124.59	329.17
JCT-56	19.69	90.5	125.02	338.28
JCT-64	0	90.5	125.03	338.41
JCT-65	0	91.5	124.66	324.92
JCT-66	0	90	125.03	343.31
JCT-67	0	90	125.03	343.31
JCT-68	0	90	125.03	343.31
JCT-69	0	90	125.08	343.78



GeoAdvice Engineering Inc.

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Client: **David Schaeffer Engineering Ltd.**
Date: **July 2018**
Created by: **AM**
Reviewed by: **WdS**

0 400 800
Meters

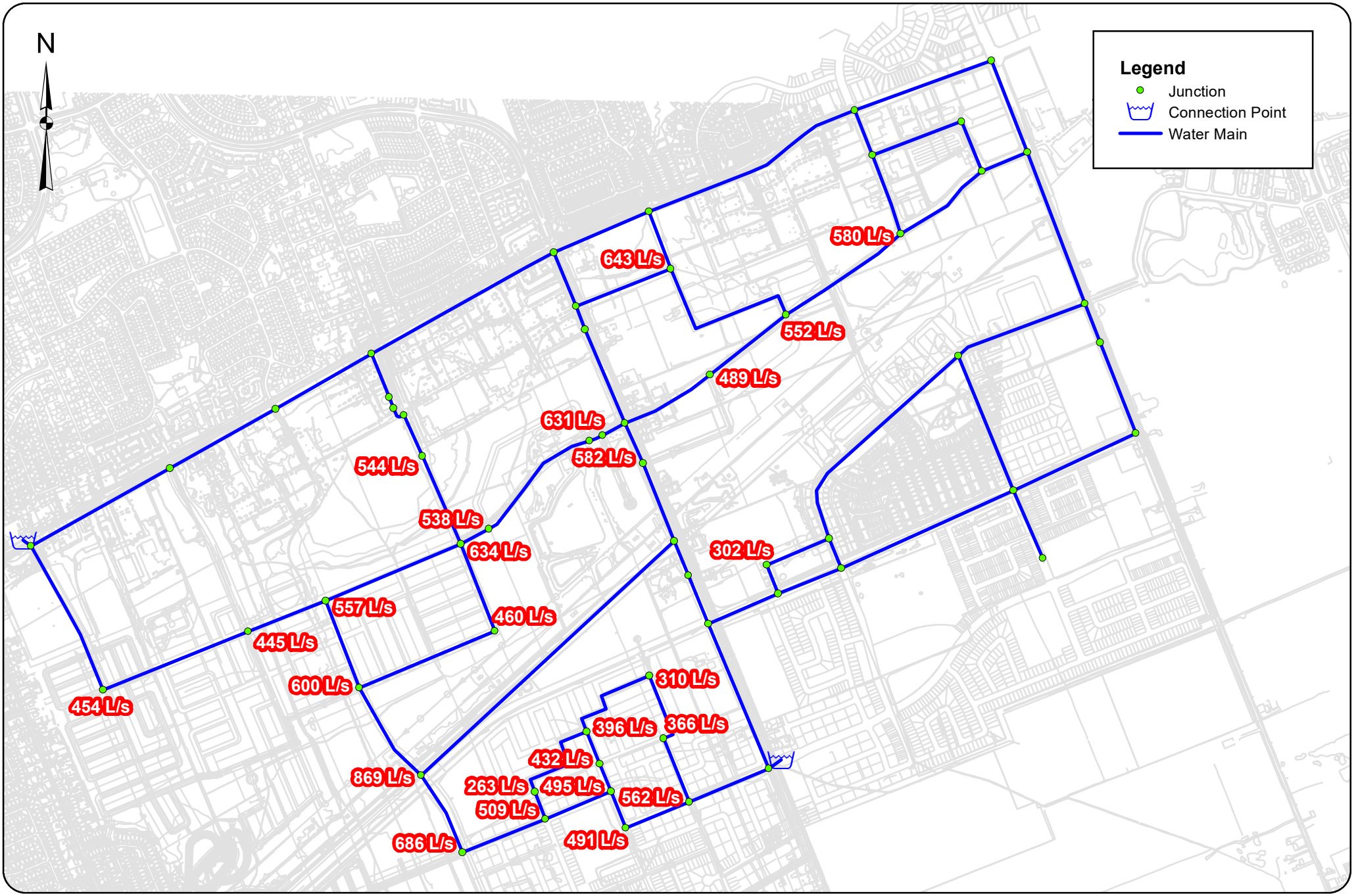
PHD Pressure Results

Figure D.2
B35

Appendix E MDD+FF Model Results

Fire Flow Modeling Results

ID	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Available Flow at Hydrant (L/s)	Available Flow Pressure (kPa)
JCT-08	1.06	334	125	250	296	643	140
JCT-11	1.06	334	125	250	289	580	140
JCT-12	10.32	334	125	250	283	552	140
JCT-13	0.00	333	125	250	273	489	140
JCT-15	0.00	306	125	250	263	544	140
JCT-16	5.09	325	125	250	287	634	140
JCT-17	5.09	331	125	250	284	557	140
JCT-18	5.09	337	125	250	265	445	140
JCT-19	10.04	345	125	250	271	454	140
JCT-20	5.09	338	125	250	294	600	140
JCT-21	5.09	337	125	250	268	460	140
JCT-22	0.00	341	125	250	317	869	140
JCT-27	0.00	343	124	250	293	562	140
JCT-28	10.97	341	124	250	276	491	140
JCT-29	0.00	341	125	250	284	509	140
JCT-30	0.00	342	125	250	307	686	140
JCT-31	0.00	340	124	250	279	495	140
JCT-45	0.00	333	125	250	294	631	140
JCT-46	0.00	333	125	250	289	582	140
JCT-47	0.00	325	125	250	277	538	140
JCT-51	1.47	343	124	250	197	302	140
JCT-56	10.84	333	124	250	192	310	140
JCT-66	0.00	338	124	250	250	396	140
JCT-67	0.00	338	125	250	157	263	140
JCT-68	0.00	338	124	250	263	432	140
JCT-69	0.00	338	124	250	236	366	140



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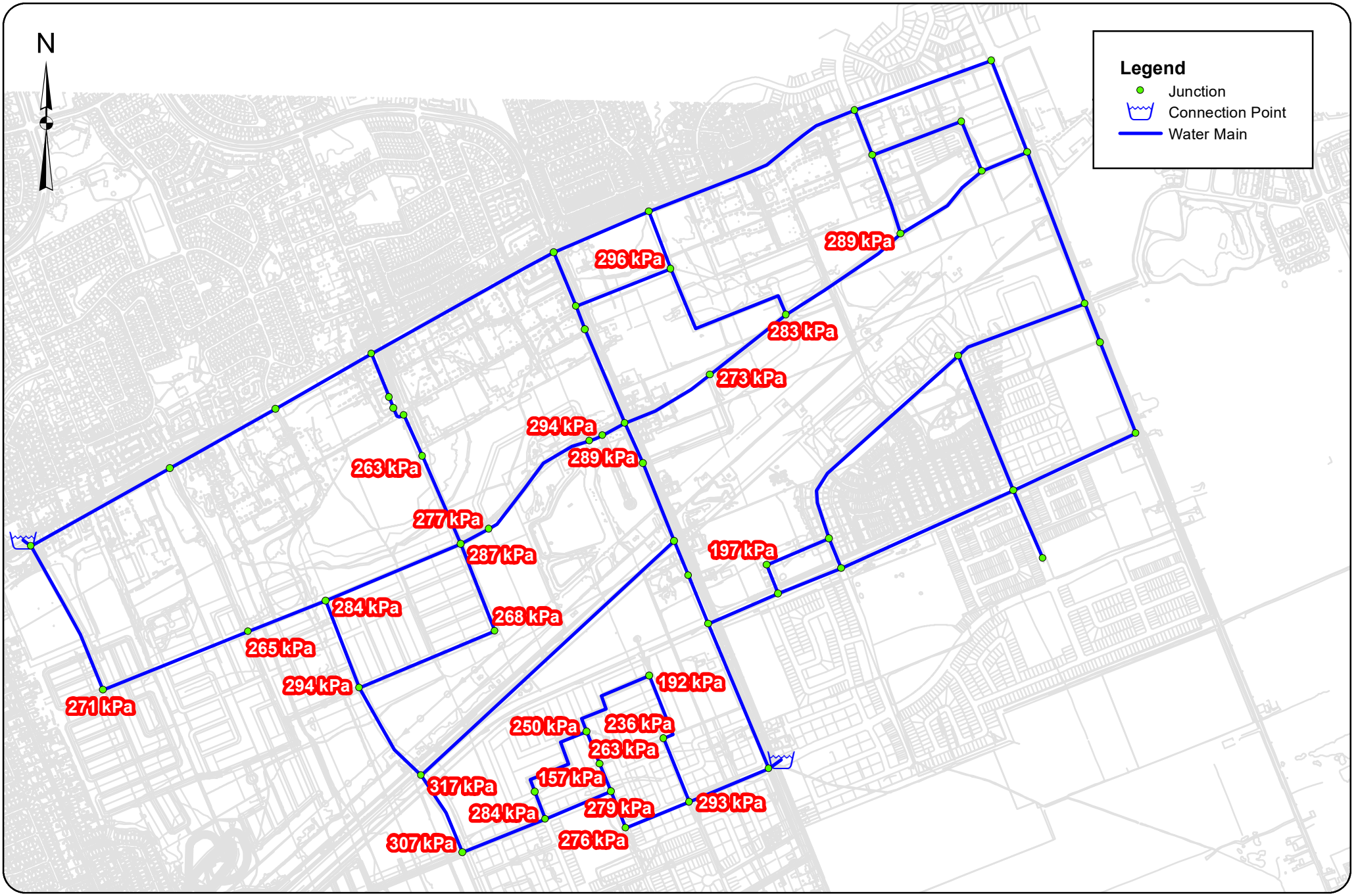
Reviewed by: **WdS**

0 400 800
Meters

Available Fire Flow @ 20 psi

Figure E.1
B38



GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis East Urban Community Mixed-Use Centre Development**
Client: **David Schaeffer Engineering Ltd.**
Date: **July 2018**
Created by: **AM**
Reviewed by: **WdS**

0 400 800
Meters

Residual Pressure @ Required Fire Flow

Figure E.2
B39

Braden Kaminski

From: Braden Kaminski
Sent: Wednesday, May 9, 2018 10:37 AM
To: Braden Kaminski
Subject: FW: EUC MUC CDP - MSS Demand Parameters & Water Boundary Request

From: Laura Maxwell
Sent: Thursday, February 22, 2018 11:56 AM
To: Bougadis, John <John.Bougadis@ottawa.ca>
Cc: Fairouz Wahab <FWahab@richcraft.com>; van de Lande, Robin <Robin.vandeLande@ottawa.ca>; Steve Pichette <SPichette@dsel.ca>; Braden Kaminski <BKaminski@dsel.ca>; Joshua.White@ottawa.ca
Subject: RE: EUC MUC CDP - MSS Demand Parameters & Water Boundary Request

Hi John,

Thank you for your call last month where you confirmed that the proposed sanitary parameters described in the email below are appropriate to use in the MSS.

Thank you for also confirming that the proposed water demands in the snapshot below are appropriate to use in the MSS.

City of Ottawa – Email Correspondence (February 2013)		
Residential – Single Family	Average Day	570 L/unit/day
	Outdoor Water Demand	1050 L/unit/day
	Max Day	Average + OWD (L/unit/day)
	Peak Hour	1.5 x Avg Day + 2.1 x Max Day (L/unit/day)
Residential – Multi-Family	Average Day	560 L/unit/day
	Outdoor Water Demand	0
	Max Day	Average (L/unit/day)
	Peak Hour	1.6 x Max Day (L/unit/day)
Residential - Apartment	Average Day	400 L/unit/day
	Outdoor Water Demand	0 L/unit/day
	Max Day	Average (L/unit/day)
	Peak Hour	1.6 x Max Day (L/unit/day)
Institutional / Commercial/ Industrial	Average Day	8500 L/ha/day
	Outdoor Water Demand	0 L/ha/day
	Max Day	Average (L/ha/day)
	Peak Hour	1.3 x Max Day (L/ha/day)

Please note that we've received agency comments at and after the Jan 2018 TAC meeting about the land use plan, and – for the purpose of the MSS – the attached updated water estimate is in line with the latest thinking on the land uses in the study area. As you've suggested, to avoid future back-and-forth, we've added a blanket 10% increase to the residential unit estimates and to the ICI area estimates, to accommodate any potential changes as we move forward in the CDP/MSS process.

As a next step, can you please provide water boundary conditions per the attached updated water demand calculations? The boundary condition request is summarized below.

We understand that you may shift some of the nodes according to the City's water model. If this is the case, please let us know any differing assumptions associated with the boundary request.

Thanks,

Laura Maxwell, B.Sc.(Civil Eng), M.Pl.
Client Project Manager

DSEL
david schaeffer engineering ltd.

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Stittsville, ON K2S 1E9

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cell: (613) 293-8750
email: lmaxwell@DSEL.ca

Final Report
34739-5.2.2

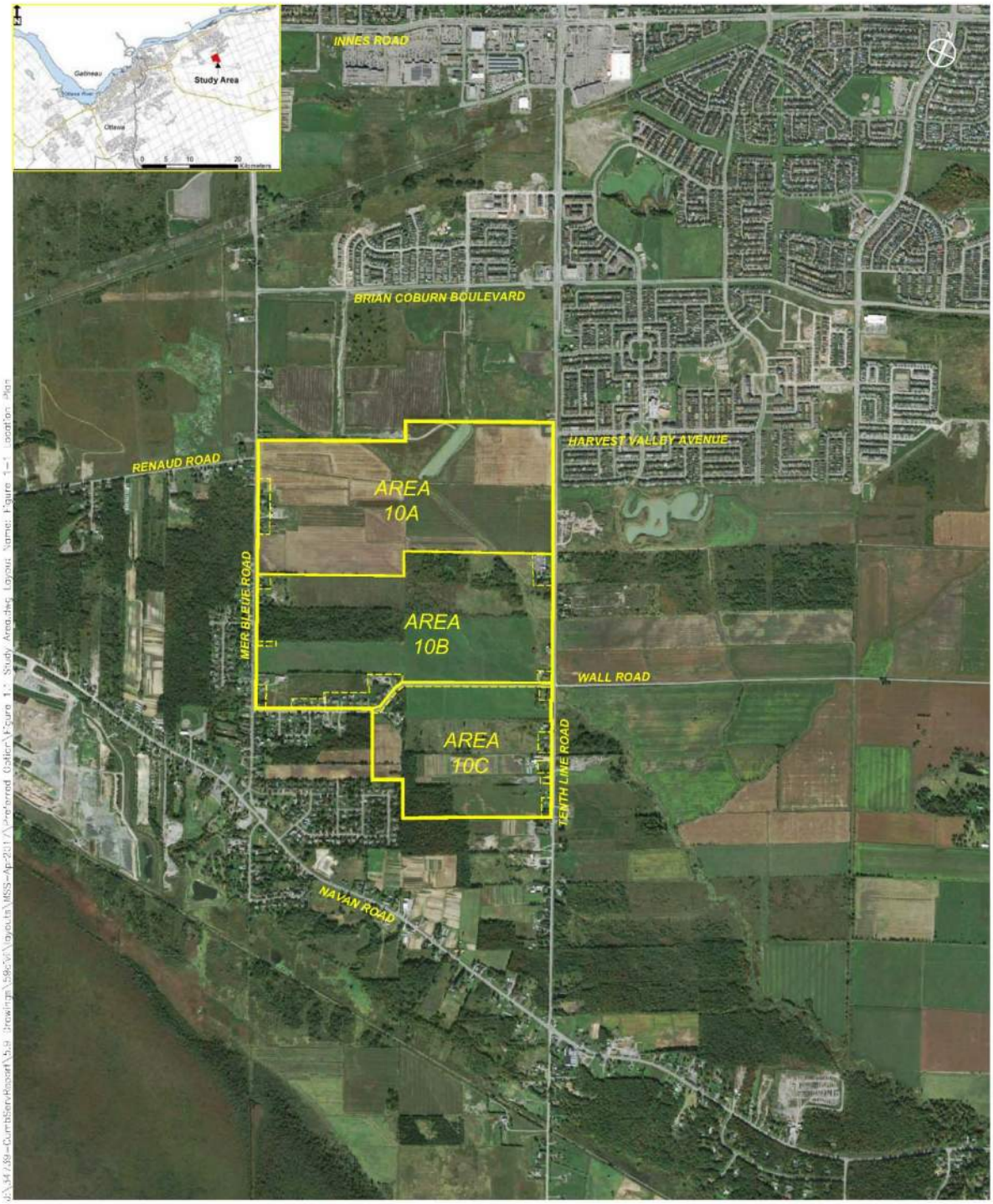
Mer Bleue Urban Expansion Area 10 Master Servicing Study

Prepared for Mer Bleue Expansion Area Participating Land Owners
Claridge Homes
Caivan Communities
Mattamy Homes
Richcraft Homes
On behalf of: City of Ottawa

Prepared by IBI Group
In Association with:
Walker Nott Dragicevic Associates Limited
Muncaster Environmental Planning Inc.
Golder Associates
Parish Geomorphic Ltd.
Morrison Hershfield

FINAL REPORT: DECEMBER 2017

IBI



Project Title	Drawing Title	Sheet No.
MER BLEUE MASTER SERVICING STUDY	STUDY AREA	FIGURE 1.1 APR 2017

The above noted demonstration plan illustrates the recommended development configuration. The following **Table 8.1** and **Table 8.2** provide the estimated land use and yield from the preferred plan, respectively.

Table 8.1: Estimated Land Use

LAND USE	AREA (ha)	%
Existing Residential	8	4%
Low Density Residential	72	33%
Medium Density	20	9%
High Density	5	2%
Commercial	4	2%
Parks and Recreational Related Uses	19	8%
Institutional	13	6%
Creek *does not include the 3m pathway along both sides of the creek*	8	3%
Woodlot	5	2%
SWM Ponds	22	10%
Servicing (Pump Station)	0	0%
Roads incl. widenings	44	20%
Total Area	**219**	**100%**

Note: All calculations are approximate (not based on survey).
All areas are show subject to rounding, and may not add up to total.

Table 8.2: Estimated Yield

DWELLING UNIT PROJECTIONS	AREA (ha)	DENSITY (UPH)		UNITS		%		HOUSEHOLD SIZE (PPU)	POPULATION	
		min.	max.	min.	max.	min.	max.		min.	max.
Low Density (Singles/Semis)	72	26	28	1,869	2,013	59%	56%	3.2	5,980	6,440
Medium Density (Multi-Family)	20	50	60	993	1,191	31%	33%	2.6	2,581	3,097
High Density (Apartments)	5	60	75	316	395	10%	11%	1.6	506	632
Total	**97**			**3,178**	**3,599**	100%	100%		**9,067**	**10,169**