david schaeffer engineering ltd

120 Iber Road, Suite 103
Ottawa, Ontario K2S 1E9
Tel. (613)836-0856
Fax (613) 836-7183
www.DSEL.ca

FUNCTIONAL SERVICING REPORT

FOR

7000 CAMPEAU DRIVE

CITY OF OTTAWA

MINTO COMMUNITIES ON BEHALF OF CLUBLINK
CORPORATION ULC

PROJECT NO.: 18-1061

JULY 2020 – SUBMISSION 2

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FOR
7000 CAMPEAU DRIVE

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) and J.F. Sabourin and Associates (JFSA) have been retained by Minto Communities on behalf of ClubLink Corporation ULC to prepare a Functional Servicing Report (FSR) in support of the contemplated re-development of the existing Kanata Golf and Country Club lands located at 7000 Campeau Drive, Ottawa.

The subject property is located within the City of Ottawa urban boundary, in the Kanata North Ward. As illustrated in the ***Location Plan*** found in ***Appendix A***, the subject property is comprised of four parcels of land and measures approximately ***70.9 ha*** in area. The parcels are accessed from Campeau Drive and Knudson Drive. Kanata Avenue is to the west and the site is north of Highway 417. The lands are currently zoned Parks and Open Space (O1A).

The planned residential development involves the construction of single family (detached) homes, townhomes, and medium density products. The current unit breakdown, based on the NAK Design Strategies '*Land Use Concept Plan, 2nd Submission (dated 14 May, 2020)*, attached as ***Figure 2*** in ***Appendix A*** is as follows:

Table 1
Proposed Unit Breakdown

Unit Type		Number of Units	Person per unit (1)	Estimated Population
Single Family		630	3.4	2,142
Front Drive Townhomes		332	2.7	897
Back-to-Back Townhomes		70	2.7	189
Stacked Townhome Block		76	2.3	175
Medium Density		436	2.3	1003
		1,544		4,406

(1) Per unit populations extracted from Section 4.3 of the City of Ottawa Sewer Design Guidelines, October 2012.

The purpose of this functional servicing report is to provide support for the draft plan approval of the subject property. The report will demonstrate that the proposed development area can be supported by municipal services based on design criteria of the

City of Ottawa, the Ontario Ministry of the Environment, Conservation and Parks (MECP) and general industry practice.

1.1 Existing Conditions/Servicing

The proposed development land area is currently utilized as a golf course facility (Kanata Golf and Country Club) and is owned and operated by ClubLink. The site topography varies, following land contours, and consists of landscaped areas typical of golf course composition.

The existing surrounding community right-of-ways (ROW) contain various sizes of sanitary/storm sewers and watermain infrastructure. The location and sizes are reflected in the servicing drawings included at the rear of this report. Additionally, existing storm and sanitary easements transect the property at various locations. These easements will be relocated according to the evolving development concept plans. Relocation of any trunk servicing infrastructure would ultimately have to be coordinated with City staff and appropriate MECP Environmental Compliance Approvals.

1.2 Required Permits / Approvals

The following table summarizes a list of potential permits and / or approvals.

Table 2: Required Permits / Approvals

Agency	Approval Type	Trigger	Remarks
City of Ottawa	Application for Zoning Amendment and Plan of Subdivision	Application by Proponent	
City of Ottawa	Site Plan Applications for multi-unit blocks	Application by Proponent	
Ministry of the Environment, Conservation and Parks (MECP)	Environmental Compliance Approval for sanitary and storm sewers	Construction of new sanitary and storm sewers throughout the subdivision.	The MECP will issue an ECA for the sanitary and storm sewer design through the City of Ottawa transfer of review process.
City of Ottawa	Commence Work Notification (CWN)	Construction of new sanitary and storm sewers throughout the subdivision.	The City of Ottawa will issue a commence work notification for construction of the sanitary and storm sewers once an ECA is issued by the MECP.
City of Ottawa	MECP Form 1 – Record of Watermains Authorized as a Future Alteration	Construction of watermains throughout the subdivision.	The City of Ottawa is expected to review the watermains on behalf of the MECP through the Form 1 – Record of Watermains Authorized as a Future Alteration.

1.3 Existing Studies, Guidelines, and Reports

The following studies were utilized in the preparation of this report:

- Ottawa Sewer Design Guidelines,
  City of Ottawa, *SDG002,* October 2012
  (City Standards)
    - Technical Bulletin ISDTB-2014-01
      City of Ottawa, February 5, 2014
      (ITSB-2014-01)
    - Technical Bulletin PIEDTB-2016-01
      City of Ottawa, September 6, 2016
      (PIEDTB-2016-01)
- Technical Bulletin ISTB-2018-01
  City of Ottawa, March 21, 2018
  (ISTB-2018-01)
- Technical Bulletin ISTB-2018-04
  City of Ottawa, June 27, 2018
  (ISTB-2018-04)
- Ottawa Design Guidelines – Water Distribution
  City of Ottawa, July 2010.
  (Water Supply Guidelines)
- Technical Bulletin ISD-2010-2
  City of Ottawa, December 15, 2010.
  (ISD-2010-2)
- Technical Bulletin ISDTB-2014-2
  City of Ottawa, May 27, 2014.
  (ISDTB-2014-2)
- Technical Bulletin ISTB-2018-02
  City of Ottawa, March 21, 2018
  (ISTB-2018-02)
- Design Guidelines for Sewage Works,
  Ministry of the Environment, Conservation and Parks, 2008 (formerly MOECC).
  (MECP Design Guidelines*)*
- Stormwater Planning and Design Manual,
  Ministry of the Environment, March 2003. (formerly MOE)
  (SWMP Design Manual)

- Ontario Building Code Compendium
  Ministry of Municipal Affairs and Housing Building Development Branch,
  January 1, 2010 Update *(OBC)*

- Water Supply for Public Fire Protection
  Fire Underwriters Survey, 1999.
  (FUS)

- City of Ottawa Infrastructure Master Plan, 2013

- Kanata North Community Design Plan, Master Servicing Study
  Novatech Engineering, June 28, 2016. *(KNCDP)*

- Geotechnical Investigation, Kanata Lakes Golf and Country Club, 7000 Campeau Drive, Ottawa, Ontario
  Paterson Group, May 2020 (Report: PG4135-2 Rev4) *(Paterson Geotechnical Report)*

- Master Sanitary Servicing Plan – Kanata Lakes, Broughton & Interstitial Lands
  Stantec Consulting Ltd., December 2007. (*Stantec MSSP*)

- West Urban Community (WUC) Wastewater Collection Model Development and System Capacity Assessment
  Stantec Consulting Ltd., May 2012. (*Stantec WUC Model*)

- West Urban Community – Wastewater Collection System Master Servicing Plan
  R.V. Anderson Associates Ltd., July 2012. (*RVAA Wastewater MP)*

- Kanata Golf and Country Club – 2018 Surface Infiltration Testing
  J.F. Sabourin and Associates Inc., February 6, 2019 (*JFSA Infiltration*)

- Kanata Golf & Country Club, 2019 Monitoring & Hydrologic Model Calibration Report
  J.F. Sabourin and Associates Inc., (Updated July 2020) (*JFSA Calibration)*

- 7000 Campeau Drive Subdivision – Preliminary Stormwater Management Plan
  J.F. Sabourin and Associates Inc., July 2020 (*JFSA SWM Plan)*

- Downstream of 7000 Campeau Drive – Hydrologic Assessment
  J.F. Sabourin and Associates Inc., July 2020 (*JFSA Hydrologic Assessment)*

- Kizell Drain Downstream of 7000 Campeau Drive – Geomorphological and Erosion Threshold Assessment, Kanata, Ontario
  GEO Morphix., July 2020 (*GEO Morphix Assessment)*

2.0 WATER SUPPLY SERVICING

The subject property lies within the City of Ottawa 3W pressure zone, as shown by the Pressure Zone map excerpt found in ***Appendix B***.

Potable water pressure is regulated in this pressure zone by the Campeau Drive P.S., Glen Cairn P.S., and the Stittsville Elevated Tank. The Campeau Drive P.S. and Glen Cairn P.S. both have a Nominal Discharge HGL of 160 m, according to the City of Ottawa Infrastructure Master Plan. The facilities combined have a total capacity of 187.5 ML/d and a firm capacity of 107.5 ML/d. The Stittsville Elevated tank is at 161 m and manages 4.5 ML of potable water.

The various design criteria are summarized in the following table.

Table 3: Water Supply Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 p/unit
Residential - Townhome	2.7 p/unit
Residential – Medium Density	2.3 p/unit
Institutional	28,000 L/ha/day
(1) Residential – Basic Day Demand (BSDY)	280 L/cap/day
(1) Residential - Maximum Daily Demand (MXDY)	2.5 x Average Daily Demand
(1) Residential – Peak Hour Demand (PKHR)	2.2 x Average Daily Demand
Fire Flow	Calculated as per the Fire Underwriter's Survey 1999.
Minimum Watermain Size	150 mm diameter
Service Lateral Size	19 mm dia Soft Copper Type 'K' or approved equivalent
Minimum Depth of Cover	2.4 m from top of watermain to finished grade
Peak hourly demand operating pressure	275 kPa and 690 kPa
Fire flow operating pressure minimum	140 kPa
(1) Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010), ISDTB-2010-2	

The internal watermains will connect to existing watermain infrastructure within the adjacent residential development ROWs.

The contemplated and existing watermains are depicted in ***Drawing 1,*** provided in ***Appendix E*** of this report. A preliminary hydraulic analysis was prepared for the water distribution network to confirm that water supply is available within the required pressure range, under the anticipated demand during average day, peak hour and fire flow conditions and was based on boundary conditions requested from the City of Ottawa. Refer to the *Hydraulic Capacity and Modeling Analysis, 7000 Campeau Drive - Kanata prepared by GeoAdvice Engineering Inc. dated July 19, 2019* ***(GeoAdvice Water Analysis)***, enclosed in ***Appendix B.***

2.1 Fire Flow Demand

Detailed Fire flow calculations for single detached dwellings have not been provided for this functional level analysis. However, typical values for single detached dwellings and traditional townhomes at the City of Ottawa's cap of 10,000 L/min (167 L/s) have been used as outlined in *ISDTB-2014-02*. The required fire flow for higher density back-to-back townhomes is 15,000 L/min (250 L/s) so a conservative fire flow of 250 L/s was assumed, which is a typical requirement for similar land uses.

2.2 Boundary Conditions

Boundary conditions were requested from the City of Ottawa for Peak Hour, Max Day Plus Fire Flow and Maximum HGL (high pressure check) conditions and can be found in the appendices of the *GeoAdvice Water Analysis*, located in ***Appendix B*** of this report. At the time of the boundary condition request the development area concept plan was still being developed, as such, a conservative unit density of 28 units/ha was used to assess the potential water demands for the generation of the boundary conditions. This conservative estimate ensured that the analysis completed would be reflective of the ability of the existing water supply network to service the property (i.e. evaluated for a population of approximately 5,600 persons as opposed to the current estimated population of 4,406 noted in Table 1).

The following tables demonstrate that the current development concept (as per ***Table 1*** of this report) results in a unit and associated population count that is lower than the data used to generate the boundary conditions. As such, the boundary conditions were conservative for the proposed development area.

Table 4A: Estimated Water Demands (Connections 1 and 2)

Demand Type	Demand	
	Preliminary Demands Submitted for Boundary Conditions	Refined Demands for Current Concept Plan
	L/min	L/min
Average Daily Demand	282.9	**223.6**
Maximum Daily Demand	707.3	**559.0**
Peak Hour	1556.0	**1229.9**
Fire Flow #1 Demand	10,000	**10,000**
Based on Connection Points #1 and #2 as shown in the Boundary Conditions provided by City of Ottawa		

Table 4B: Estimated Water Demands (Connections 3 to 6)

Demand Type	**Demand**	
	Preliminary Demands Submitted for Boundary Conditions	**Refined Demands for Current Concept Plan**
	L/min	**L/min**
Average Daily Demand	811.6	**639.5**
Maximum Daily Demand	2029.0	**1598.8**
Peak Hour	4463.9	**3517.4**
Fire Flow #1 Demand	15,000	**15,000**
Based on Connection Points #3, 4, 5 & 6 as shown in the Boundary Conditions provided by City of Ottawa		

2.3 Summary of Hydraulic Modeling Analysis

A complete watermain analysis has been prepared to confirm that the proposed development is serviceable with appropriate sized watermain infrastructure. Preliminary analysis for the network indicates that 200 mm, 250 mm and 300 mm diameter sizes will deliver potable water throughout the proposed development during average daily, peak hourly, and fire flow scenarios.

Refer to the ***GeoAdvice Water Analysis,*** enclosed in ***Appendix B.***

2.3.1 System Pressures

The modeling indicates that the proposed development can be adequately serviced by the proposed watermain network. Modeled service pressures for the proposed development are summarized in the following table while the detailed pipe and junction tables are contained in the ***GeoAdvice Water Analysis,*** enclosed in ***Appendix B.***

Table 5: Summary of Available System Pressures

	Average Day Demand Maximum Pressure		**Peak Hour Demand Minimum Pressure**	
	kPA	psi	kPA	psi
Development Area	656	95	532	77

The generally accepted best practice is to design new water distribution systems to operate between 350 kPa (50 psi) and 480 kPa (70 psi), as outlined in the City of Ottawa Design Guidelines. Based on the anticipated service pressures, pressure reducing valves may be required in the development area.

2.3.2 Available Fire Flows

The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire. A summary of the available fire flows is presented in ***Table 6,*** below. The detailed fire flow reports are found in the ***GeoAdvice Report*** enclosed in ***Appendix B***.

Table 6: Summary of Available Fire Flows

	Required Fire Flow (L/s)	Minimum Available Flow (L/s)	Junction ID
Development Area	167	219	J-5
	250	288	J-15

As shown in the above table, the model predicts the network will be able to provide all required fire flows based on the boundary conditions provided. Detailed results are included in the ***GeoAdvice Report***, enclosed in ***Appendix B***. In the circumstance of development phasing the appropriate analyses would be undertaken to ensure that sufficient fire flows are available at each stage of the development.

2.4 Water Supply Conclusion

The watermain network must be capable of delivering potable water within the City's recommended pressure ranges during average daily, peak hour, and maximum day plus fire flow demands. Preliminary analysis for the network indicates that a series of contemplated 200 mm, 250 mm and 300 mm diameter sizes will sufficiently deliver potable water throughout the contemplated development, with connections to existing watermains at Campeau Drive, Knudson Drive, Weslock Way and Beaverbrook Road.

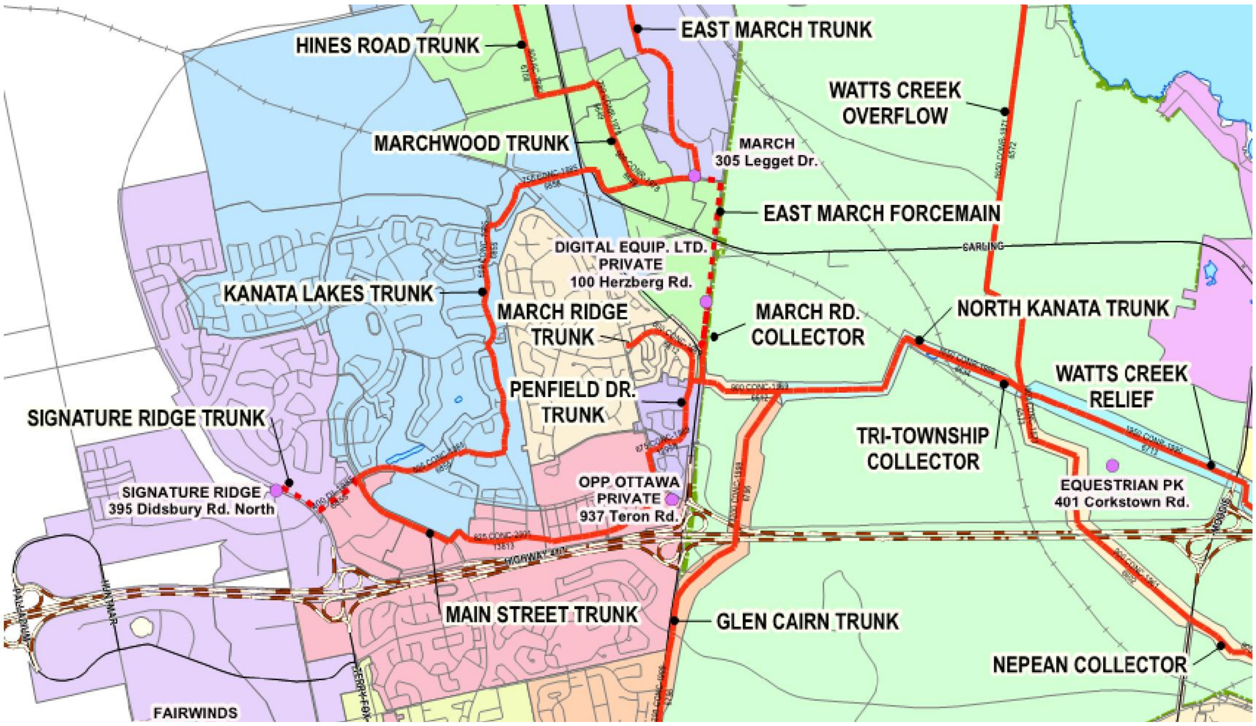
Water supply will be available within the required pressure range under the anticipated demand during average day, peak hour and fire flow conditions. Phase specific analysis would be undertaken to ensure that the system is sufficiently serviced during various stages of development.

The proposed water supply design conforms to all relevant City guidelines and policies.

3.0 WASTEWATER SERVICING

The subject property is located within the Kanata Lakes Trunk Sewer catchment area. The existing trunk sewer bi-sects the southern portion of the property, in a northeasterly direction, from Campeau Drive to Rosenfield Crescent. This section of the trunk sewer is a 525 mm diameter pipe and ranges between 4 m and 6 m deep.

The following overview image extracted from the City of Ottawa '*Sanitary Trunk Sewers and Collection Area Map*' (April 2014) illustrates the catchment area and trunk sewer routing.



In the current condition, the Kanata Lakes Trunk Sewer conveys flow to the 900 mm Marchwood Trunk Sewer on Legget Drive (west of Schneider Road) where wastewater flows are then conveyed to the March Road Pumping Station (***March P.S.***). The Village of Carp, the existing business park west of Herzberg Road, Morgan's Grant, and Shirley's Brook Communities are tributary to the ***March P.S.*** Flow is conveyed through the ***March P.S.*** by a forcemain within Legget Drive and Herzberg Road to the North Kanata Trunk.

Redevelopment of the subject property will utilize the Kanata Lakes Trunk Sewer and adjacent local sewers to service the property. Connection points and peak wet weather flow are summarized in the following table.

Table 7: Summary of Wastewater Connections

Connection Point Description	Proposed Area (Ha)	Proposed Population	Peak Wet Weather Flow (L/s)	Connection MH (DSEL)[1]	Connection MH (City HGL Analysis)[2]
Relocated Trunk Sewer, North of Campeau Drive	16.26	1288	18.65	MH10	MHSA00860
Knudson Drive, South of Sherk Crescent	4.64	368	5.62	MH17A	MHSA00850
Knudson Drive, North of Sherk Crescent	12.29	974	14.30	MH26	MHSA00841
Knudson Drive, East of Kanata Avenue	9.93	787	11.67	MH32C	MHSA00835
Weslock Way, North of Knudson Drive	9.54	756	11.23	MH33	MHSA00834
Weslock Way, South of Zokol Crescent	9.70	769	11.41	MH36	MHSA00831
Weslock Way, North of Zokol Crescent	6.29	498	7.53	MH40	MHSA00827
Total	**68.65**	**5440**	**71.47[3]**		

1) Refer to Drawing 2 in Appendix E for DSEL MH identification
2) Refer to HGL Analysis prepared by the City of Ottawa included in ***Appendix C*** for City MH identification
3) Total Peak Wet Weather Flow not summative due to differing time to peak (Harmon's Peaking Factor for Total = 2.77)

The total anticipated wet weather flow contributions from the subject property to the Kanata Lakes Trunk Sewer is ***71.47 L/s***, refer to ***Appendix C*** for anticipated wastewater calculations.

Based on correspondence with the City of Ottawa, included in ***Appendix C***, the ***March P.S.*** has a capacity of ***412 L/s*** and receives wet weather flow of **± *325 L/s,*** resulting in a residual capacity of **± *87 L/s,*** sufficient to convey the flow from the contemplated development. It is noted that this does not fully account for additional active subdivision development applications within the tributary area. Notwithstanding, the capacity of the station is not a concern since the Marchwood Trunk Sewer on Legget Drive is ultimately planned to no longer outlet to the ***March P.S.*** Ultimately the North Kanata Trunk – Phase 2, currently under construction, will convey flows from the Marchwood Trunk Sewer to the Watts Creek Relief Sewer (see further discussion later in this section).

The ***KNCDP*** for the Kanata North Urban Expansion Area (***KNUEA***) summarizes that the lower-reach of the Marchwood Trunk has a free-flowing capacity of ***1,100 L/s*** with an estimated peak flow of ***230 L/s*** in 2010 and projected flow of ***592 L/s*** in 2031 (which includes the ***KNUEA*** area). The residual capacity in the existing and future condition is sufficient to convey the anticipated flow from the subject property. Excerpts from the ***KNCDP*** are provided in **Appendix C**.

A detailed review of the available capacity within the existing Kanata Lakes Trunk Sewer up to the Marchwood Trunk has been provided in the attached calculation sheets, found in ***Appendix C***. The following City criteria, summarized in the following table, below were used to evaluate the new flows into the existing system.

Table 8: Wastewater Design Criteria

Design Parameter	Value
Residential - Single Family	3.4 persons/unit
Residential - Townhome	2.7 persons/unit
Residential – Stacked Townhome & Medium Density	2.3 persons/unit
Residential - Average Daily Demand	280 L/d/per
Residential - Peaking Factor	Harmon's Peaking Factor. Max 3.8, Min 2.0
Harmon - Correction Factor	0.80
Institutional – Average Flow	28,000 L/ha/day
Institutional – Peaking Factor	1.5 if ICI in contributing area is >20% 1.0 if ICI in contributing area is <20%
Infiltration and Inflow Allowance	0.33 L/s/ha
Park Flow	9,300 L/ha/day
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Minimum Sewer Size	200 mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6 m/s
Maximum Full Flowing Velocity	3.0 m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012 and Technical Bulletin ISTB-2018-01.	

Refer to the ***Sanitary Servicing and Drainage Plan, Drawing 02D (Appendix E)*** and sanitary sewer design sheet in ***Appendix C*** for details.

Based on the sanitary design sheet, the anticipated wastewater flow from the subject property can be accommodated within the Kanata Lakes Trunk Sewer.

The City of Ottawa provided a Hydraulic Grade Line (HGL) analysis of the Kanata Lakes Trunk Sewer and Marchwood Trunk Sewer up to the ***March P.S.*** for the current (2013) and future (2060) conditions, see ***Appendix C***. The 2013 model illustrates that sewers up to the ***March P.S.*** result in flows between ***43.83 L/s*** and ***295.67 L/s*** with conduits between ***23%-43%*** full at the critical nodes. The 2060 model indicates that flows are between ***199.87 L/s*** and ***675.99 L/s*** with conduits between ***57%-80%*** full at critical nodes. The City has found no HGL issues in the 2013 and 2060 model scenarios. It is anticipated the wastewater flow from the subject property can be accommodated without a negative impact to the Kanata Lakes Trunk Sewer HGL.

Based on the above analysis of the ***March P.S.***, Marchwood Trunk and Kanata Lakes Trunk Sewer, there is sufficient capacity in the current condition to accommodate the anticipated flow of ***71.47 L/s*** from the subject property.

Based on correspondence with the City of Ottawa in April 2019, included in ***Appendix C***, there are future modifications anticipated to the wastewater trunk infrastructure and pump stations within the vicinity of the contemplated development, summarized further below.

As described in the *West Urban Community – Wastewater Collection System Master Servicing Plan (RV Anderson & Associates Ltd., 2013)* (***RVAA Wastewater MP***), *City of Ottawa*

Infrastructure Master Plan (2013) **(*IMP)*** and *Kanata North Community Design Plan – Master Servicing Study (Novatech, 2016)* (***KNCDP***), it is contemplated to install a gravity sanitary sewer from the ***March P.S.*** to the North Kanata Trunk Sewer, referred to as North Kanata Trunk – Phase 2. Additionally, the City of Ottawa has provided a conceptual design of the modifications to the ***March P.S.*** and the future North Kanata Trunk – Phase 2 sewer, prepared by Jacobs (formerly CH2M Hill), which is included in ***Appendix C.*** The proposed construction of the North Kanata Trunk – Phase 2, redirects flow from the Kanata Lakes Trunk and Marchwood Trunk from the ***March P.S.,*** thus providing a gravity connection to the North Kanata Trunk sewer. As per the City's Asset Management group, timing of the gravity sewer installation was anticipated to be in operation by the end of 2020 and that timeline is still anticipated at the time of preparation of this report. The ***March P.S.*** is contemplated to be converted to a lift station in order to continue to convey flow from East March Trunk to the proposed North Kanata Trunk – Phase 2.

As noted in the *West Urban Community (WUC) Wastewater Collection Model Development and System Capacity Assessment (Stantec 2012)* (***Stantec WUC Model***) report, a diversion structure was designed to limit the flow contributions to 140 L/s from the Signature Ridge catchment area to the Kanata Lakes Trunk. Once the flow level is achieved the excess flows are to be conveyed to the Main Street/Penfield Drive sewers. As per the correspondence in ***Appendix C*** from the City of Ottawa, upgrades to the Signature Ridge Pump Station (***SRPS***) and forcemain will be redirected away from the Kanata Lakes Trunk Sewer to the Penfield Trunk Sewer. Timing of the upgrades is to be confirmed by City of Ottawa. In accordance with the direction provided by the City of Ottawa in April 2019, the sanitary design sheet does not include the 140 L/s from the ***SRPS***.

Based on the review of the contemplated changes to the ***March P.S.*** and ***SRPS***, there is available capacity in the future condition to accommodate the anticipated wastewater flow from the subject property.

3.1 Kanata Lakes Trunk Sewer Realignment

As noted previously, the existing Kanata Lakes Trunk Sewer bi-sects the southern portion of the property, in a northeasterly direction, from Campeau Drive to Rosenfield Crescent (see ***Sanitary Servicing and Drainage Plan***). It is presumed that the chosen alignment was simply the most efficient/direct (least disruptive) routing at that time given that it was traversing a relatively open area. In order to accommodate a more functional development layout for the property it is proposed to realign the trunk sewer to be within the development concept ROWs in order to optimize the land use conceptualized.

Based on as-built information available the existing capacity of the trunk sewer through the site is approximately 215 L/s with a full flowing velocity of 0.99m/s (Note: the existing sewers are indicated as being without drops in the manholes). The extent of existing sewer proposed to be realigned is approximately 340 meters. The new contemplated sewer alignment has a total length of approximately 550m with start and end inverts of 96.48m and 95.53m respectively. Based on the upstream and downstream connection elevations, and consideration for drops through manholes, the new average slope will be

0.10%. Therefore, the new sewer capacity would be ~136 L/s with a full flowing velocity of 0.63 m/s. However, as noted above, if consideration to this same allowance of minimizing drops through manholes is made for the realigned sewer (at least in straight sections) the overall average sanitary slope/capacity could be increased.

The City's future conditions model indicates a total flow of 200 L/s with ***SRPS*** flows removed (i.e. 140 L/s).

4.0 STORMWATER MANAGEMENT

The subject lands are tributary to the Kizell Drain Wetland Complex and Watts Creek. Lands west of Knudson Drive and Weslock Way drain to the Kizell Drain Wetland Complex, while the lands to the east are tributary to Watts Creek. Drainage from the entire development is conveyed to the various outlets through existing storm sewers.

It is proposed that the development will be serviced by five (5) stormwater management facility (SWMF) locations, which includes four (4) stormwater management (SWM) ponds. Where required, the SWMF locations will provide any required quality control (via upstream oil-grit separators (OGS)) and/or quantity control (via a stormwater management pond). The proposed controls for the development area are as follows:

Stormwater Management Facility I.D.	Quantity Control (Pond I.D.)	Quality Control (OGS I.D.)
SWMF 1	Pond 1	OGS 1
SWMF 2	Pond 2	OGS 2
SWMF 3	n/a(1)	OGS 3
SWMF 4	Pond 4	OGS 4
SWMF 5	Pond 5	OGS 5

(1) Note: The development area analysis originally had five stormwater management ponds proposed in prior circulations. After further analysis it was determined that there would not be a requirement for a pond at the SWMF 3 location. To ensure consistency with previous circulated reports, the names of the various pond locations have remained as initially set out.

The stormwater management (SWM) facilities were strategically located at low points in the development where each could outlet to the existing storm trunk sewers along Knudson Drive / Weslock Way. The storm system layout and preliminary OGS unit sizing for the various locations illustrated in ***Drawing 03D*** can be found in ***Appendix E*** along with the preliminary storm sewer design sheets. In addition, ***Figure 02F*** has been provided in ***Appendix D*** to illustrate the catchment areas draining to each of the proposed SWM facilities.

To assess the operation of the proposed SWM ponds, the City of Ottawa provided detailed PCSWMM (hydrology & hydraulic) models of the existing major and minor systems that discharge to the Beaver Pond. This is a highly detailed model that was developed using the vast amounts of available City GIS data (topography, minor system, catch basin locations etc.). This model was reviewed with the data obtained from flow monitoring within the Campeau Drive, Weslock Way minor systems completed from June 2019 to October 2019, which showed a good correlation between the two data sets. Under separate cover, JFSA has prepared two studies detailing the stormwater monitoring data:

- "*Kanata Golf & Country Club, 2018 Surface Water and Rainfall Monitoring Program"* (February 2019); and
- "*Kanata Golf & Country Club, 2019 Monitoring & Hydrologic Model Calibration Report*" (July 2020)

The preceding studies outline the data obtained from the flow monitoring programs and explains how the data was used to produce a dependable hydrologic model of the area. Those reports should be referred to for full details.

Note that no major events greater than a 2-year event were observed during this period of monitoring. Based on this finding the highly detailed model was then updated by JFSA to the same level of detail to reflect the inclusion of the proposed development. These updates included all major system flow routes, all proposed minor system infrastructure and the 4 proposed SWM ponds. The proposed SWM ponds were appropriately sized to ensure the release rates from the ponds would not increase peak flows into the Beaver Pond and would also not increase peak water levels within the existing infrastructure both upstream and downstream of the development. The full ***JFSA SWM Plan*** (provided under separate cover) provides the reporting, modelling, analysis and recommendations within the development. For ease of reference, the body text for the memo associated with the stormwater management pond sizing and preliminary stormwater management plan is provided in ***Appendix D***. For detailed modelling files the JFSA report should be referenced.

The following table summarizes pond volumes and outflow rates based on the detailed modelling:

Table 9: Pond Size and Outflow Summary (1)

Pond	Tributary Area (ha)	5-Year Chicago (3hr)		100-Year Chicago (3hr)		100-Year SCS (24hr)	
		Peak Outflow (m^3/s)	Storage (m^3)	Peak Outflow (m^3/s)	Storage (m^3)	Peak Outflow (m^3/s)	Storage (m^3)
Pond 1	57.87	0.091	11,020	0.157	21,430	0.173	25,150
Pond 2	26.22	0.084	5,702	0.383	12,642	0.400	13,392
Pond 4	45.50	0.094	10,340	0.161	22,440	0.173	25,560
Pond 5	12.66	0.082	2,885	0.137	6,036	0.147	8,267

1) Pond outflow and storage values are derived directly from the JFSA modelling files provided with the 7000 Campeau Drive Subdivision – Preliminary Stormwater Management Plan technical memo (See Appendix D for the body of that report).

The following table summarizes peak inflow to the Beaver Pond under pre and post-development conditions based on the detailed PCSWMM modelling.

Table 10: Peak Flow Summary – Inflow to Beaver Pond

Return Period	Pre-Development		Post-Development	
	Peak Inflow (m^3/s)	Inflow Volume (m^3)	Peak Inflow (m^3/s)	Inflow Volume (m^3)
5 Year (Chicago 3Hr)	6.707	21,190	6.315	34,590
100 Year Chicago (3Hr)	10.030	44,580	9.933	81,230
100 Year SCS (24Hr)	10.24	61,690	10.200	113,000

The proposed development will discharge to the Beaver Pond which ultimately discharges to Watts Creek. As demonstrated above, the peak inflow to the Beaver Pond for the simulated design storms are either equal to or less than the pre-development conditions. As anticipated the total inflow volume to the Beaver Pond will be increased due to the development. The impacts of the increased volume is assessed in JFSA's "*Downstream of 7000 Campeau Drive – Hydrologic Assessment*" (July 2020) and review downstream impacts.

4.1 Impacts Downstream of Beaver Pond

To ensure that the development will have no adverse impacts on the receiving watercourse, the existing and proposed operations of the receiving watercourse were assessed using a higher level hydrologic (SWMHYMO) model per the ***JFSA Hydrologic Assessment***. The model used in this analysis contains all sub-catchments that drain to Watts Creek down to the Rideau River. The original model was developed by MVCA as a part of their 2017 floodplain mapping study of Watts Creek and JFSA has updated the model based on available field data to reflect the inclusion of the proposed development within it and assess pre and post development flows on the Kizell Drain and Watts Creek under design storm circumstances (2-year to 100-year events) as well as continuous simulations to assess the potential for erosion concerns.

As a side note, the Environmental Compliance Approval associated with the Beaver Pond (Approval Number 5190-7L6RRY found in ***Appendix D***) specifies a controlled release rate of 0.960m^3/s to the Kizell Drain.

The following is a brief description of the scenarios assessed by JFSA:

- **MVCA Existing Conditions -** *(MVCAEX):*
    - MVCA model of record reflective of the current conditions
- **Existing Conditions -** *(KWEX):*
    - Reflective of the current conditions (2019) with various model parameters adjusted to reflect the field-collected data more accurately.
- **KNL Development -** (KWEX_KNL9):
    - Reflective of existing conditions with the inclusion of the KNL Development Stage 9 in place as per IBI's detailed design. Stage 7 & 8 of the KNL have been left undeveloped as directed by City staff.
- **The Kanata Golf and Country Club with SWM controls -** (KWEX_KGC):
    - Reflective of existing conditions with the proposed redevelopment of the Kanata Golf and Country Club in place with four SWM ponds in place and appropriately sized to mitigate impacts upstream and downstream of the redevelopment.

- **The Kanata Golf and Country Club Development with SWM controls + KNL Development** - (KWEX_KGC_KNL9):
  - Reflective of existing conditions with the KNL Development Stage 9 in place and the proposed redevelopment of the Kanata Golf and Country Club with four SWM ponds in place and appropriately sized to mitigate impacts upstream and downstream of the redevelopment.
- **The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDS** - (KWEX_KGC_LIDs3mm):
  - Reflective of existing conditions with the proposed redevelopment of the Kanata Golf and Country Club in place with four SWM ponds in place and appropriately sized to mitigate impacts upstream and downstream of the redevelopment along with LIDs implemented within the site to capture 3mm of runoff.
- **The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDS** - (KWEX_KGC_LIDs5mm):
  - Same description as above except with LID capture of 5mm of runoff.
- **The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDS + KNL Development** - (KWEX_KGC_LIDs3mm_KNL9):
  - Reflective of existing conditions with the proposed redevelopment of the Kanata Golf and Country Club with four SWM ponds in place and sized to mitigate impacts upstream and downstream of the redevelopment along with LIDs implemented within the site to capture 3mm of runoff. Includes the KNL Development Stage 9 in place as per IBI's detailed design. Stage 7 & 8 of the KNL have been left undeveloped as directed by City staff.
- **The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDS + KNL Development** - (KWEX_KGC_LIDs5mm_KNL9):
  - Same description as above except with LID capture of 5mm of runoff.

4.1.1 Erosion Threshold Assessment (Kizell Drain)

GEO Morphix completed an Erosion Threshold Assessment on the Kizell Drain downstream of the Beaver Pond outlet. Section 5.2.1 of the ***GEO Morphix Assessment*** identified two (2) critical erosion locations along the watercourse:

- "KDR-4" which extends from the outlet of Beaver Pond to a partially confined wetland area upstream of the CN Rail to the North;
- The second location referred to as "KDR-3" extends from March Road to Legget Drive and is located between two large parking areas which drain directly to the riparian zone of the Kizell Drain.

From this analysis it was determined that the bed material has been relatively resilient to erosion over time with the bank materials more susceptible to erosion, as bank undercutting and sloughing were the most common forms of erosion observed throughout the watercourse. The erosion thresholds were calculated for the bank materials at these two locations, as they were determined to be the most sensitive reaches within the watercourse to erosion based on the field observations. The critical discharge to entrain materials within both KDR-4 (just downstream of the Beaver Pond) and KDR-3 (March Road and Legget Drive) was determined to be 0.3 m³/s in Table 3 of the GEO Morphix report. Full details of this study findings can be found in in the ***GEO Morphix Assessment***.

4.1.2 Beaver Pond Outflow Results

The following table outlines the resulting outflows from the Beaver Pond as taken from the ***JFSA Hydrologic Assessment*** (the full tables and comparisons can be found in ***Appendix D*** for reference) based on the model scenarios summarized in Section 4.1. It is noted that the results from the Chicago 3Hr storm have not been tabulated below since the flows generated are consistently lower than the SCS storms shown and the worst case results are shown.

Table 11A: SCS 12-Hr Peak Outflow from Beaver Pond to Kizell Drain

	Peak Flow (m^3/s) based on SCS 12 hour Design Storm					
Scenario	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
MVCAEX	0.454	0.615	0.671	0.775	0.859	0.924
KWEX	0.314	0.486	0.599	0.718	0.792	0.854
KWEX_KNL9	0.369	0.538	0.640	0.757	0.826	0.889
KWEX_KGC	0.301	0.486	0.598	0.710	0.776	0.829
KWEX_KGC_KNL9	0.354	0.541	0.644	0.754	0.817	0.873
KWEX_KGC-LIDs3mm	0.293	0.479	0.594	0.708	0.774	0.828
KWEX_KGC-LIDs5mm	0.288	0.474	0.591	0.706	0.772	0.827
KWEX_KGC-LIDs3mm_KNL9	0.342	0.530	0.638	0.750	0.814	0.871
KWEX_KGC-LIDs5mm_KNL9	0.334	0.523	0.634	0.748	0.813	0.869

Table 11B: SCS 24-Hr Peak Outflow from Beaver Pond to Kizell Drain

	Peak Flow (m^3/s) based on SCS 24 hour Design Storm					
Scenario	**2-year**	**5-year**	**10-year**	**25-year**	**50-year**	**100-year**
MVCAEX	n/a	n/a	n/a	n/a	n/a	n/a
KWEX	0.358	0.548	0.642	0.745	0.813	0.881
KWEX_KNL9	0.414	0.589	0.684	0.783	0.846	0.911
KWEX_KGC	0.345	0.550	0.644	0.740	0.804	0.863
KWEX_KGC_KNL9	0.401	0.593	0.690	0.786	0.846	0.905
KWEX_KGC-LIDs3mm	0.337	0.545	0.641	0.738	0.802	0.861
KWEX_KGC-LIDs5mm	0.332	0.540	0.638	0.736	0.801	0.860
KWEX_KGC-LIDs3mm_KNL9	0.389	0.587	0.683	0.782	0.843	0.903
KWEX_KGC-LIDs5mm_KNL9	0.382	0.583	0.683	0.780	0.842	0.902

Table 11C: <u>100Yr SCS 24-Hr+20%</u> Peak Outflow from Beaver Pond to Kizell Drain

Scenario	Peak Flow (m^3/s) based on 100Yr SCS 24 hour + 20% Design Storm
MVCAEX	n/a
KWEX	1.007
KWEX_KNL9	1.039
KWEX_KGC	0.969
KWEX_KGC_KNL9	1.020
KWEX_KGC-LIDs3mm	0.968
KWEX_KGC-LIDs5mm	0.967
KWEX_KGC-LIDs3mm_KNL9	1.019
KWEX_KGC-LIDs5mm_KNL9	1.018

The following is summarized from the preceding tables (complete ***JFSA Hydrologic Assessment*** tables can be found in ***Appendix D*** for reference):

- The 2017 MVCA existing conditions model (MVCAEX) is provided for context for the calibration process,
- The updated calibrated existing conditions model (KWEX) is considered as the baseline scenario;
- Scenario KWEX_KNL9 is considered to be the baseline condition for that development
- Comparing KWEX to KWEX_KGC the peak flows are generally reduced or equal to the pre-development levels;
- With both Kanata Golf and Country Club re-development and KNL Ph9 in place (KWEX_KGC_KNL9) the peak flows are slightly less than KNL Ph9 (KWEX_KNL9) alone;
- KWEX_KGC_KNL9 sees an increase over the existing condition but is still less than the Certificate of Approval rate of 0.96 m^3/s for the Beaver Pond;
- When LIDs are implemented there is a reduction in the outflows as would be expected.

The ***JFSA Hydrologic Assessment*** should be referenced for the full modelling, discussion and results summary.

4.2 Infiltration (Low Impact Development)

The City of Ottawa does not have City-wide standards related to the analysis or implementation of Low Impact Development installations (LIDs). As such, on a site-by-site basis, designers are expected to rely on guidance from the MECP, *the Low Impact Development Stormwater Planning and Design Guide* prepared on behalf of the Toronto and Region Conservation Authority (TRCA) and Credit Valley Conservation Authority (CVC) (TRCA/CVC, 2010 or updated Wiki document that is amended from time to time), or other sources. The City has also indicated in the past that any LID used within the sub-catchment to meet retention targets should be within City ownership or within an easement in favour of the City, so that the LID could be maintained if required. For this site it is proposed that a minimum of 3mm capture is to be targeted.

The following are high-level screening questions that can be used to determine appropriateness of implementation of LID targets:

- *Does the site have a pollution hot spot (location on the site with high potential for contaminated runoff)?*
- *What is the Soil Texture and borehole data? Can the underlying soils infiltrate runoff?*
- *What is the water table depth? If water table depth is less than 1m from grade, LID should not be implemented and/or should be flagged for further assessment.*
- *What is the bedrock depth? If too high, infiltration will be difficult. Should be more than 1 m from the lowest point of the LID measure.*
- *How does the topography of the site affect the flow?*
- *Any trees or other features that might affect the installation of an LID measure?*
- *Is there a receiving system that could be connected via buried pipes or under drains?*
- *Is the available space for LID measures too small to yield any benefit of controlling inflows?*

Based on the ***Paterson Geotechnical Investigation*** the site is quite varied in terms of the soil profile. Some areas have bedrock at, or near, the surface while others have stiff silty clay deposits up to 20m below ground surface and glacial tills under the silty clay.

As per the functional grading plan found in ***Appendix E*** the site consists of both fill and cut areas. Ultimately the location of rock, in-situ silty clay soils and imported fill materials will determine the effectiveness, location and type of LID methods to be used.

It is expected that in the post-development condition for the development area much of the infiltration will be addressed through evapotranspiration and infiltration, using techniques such as:

- Rear-yard swales designed with minimum grades where possible, to promote infiltration;
- Rear-yard catchbasin leads/subdrain will be perforated (except for the last segment connecting to the storm sewer within the right-of-way), to promote infiltration; and,

- Where eavestroughs are provided on residential units, they are to be directed to landscaped surfaces, to promote infiltration.

LID measures within the proposed right-of-ways (ROW) could be the implementation of a subsurface chamber such as a Stormbrixx product (see brochure in Appendix D) however this would have to be coordinated with City staff as there is no standard preferred location or configuration for this type of installation within City ROWs.

5.0 SITE GRADING

A geotechnical investigation of the subject property was undertaken by Paterson Group and is provided under separate cover. The development area has locations that will be constrained by grade raise restrictions of 2 m to 2.5m as documented in the investigation. The *Permissible Grade Raise Plans* are provided in ***Appendix E*** for reference. A preliminary overall grading plan is also provided for context.

The servicing and grading have been designed as low as possible, at this FSR level of design, in order to minimize the proposed grade raise required and follow site topography. Should mitigation measures be required due to grade raise exceedance, alternatives are proposed in the ***Paterson Report*** as follows:

1. Lightweight fill around housing units.
2. Preloading or Surcharging within right of way areas.

Details of these options are provided in the ***Paterson Report*** excerpts in ***Appendix E*** along with the *Permissible Grade Raise Plan*.

6.0 CONCLUSION AND RECOMMENDATIONS

Minto Communities on behalf of ClubLink Corporation ULC has proposed the redevelopment of the existing Kanata Golf and Country Club lands. A review of the functional servicing for the subject area yields the following conclusions:

- Based on the review of available background materials, and surrounding water infrastructure boundary conditions, there is sufficient potable water to support the development area;
- Wastewater services will be provided through a network of gravity sewers that will outlet to the Kanata Lakes Trunk sanitary sewer at several locations. Through review of the City of Ottawa modifications to the March Road Pump Station, Signature Ridge Pump Station and analysis of the Kanata Lakes Trunk sanitary sewer, there will be sufficient capacity to accommodate the anticipated wastewater flow from the subject property.
- Stormwater services will be provided through gravity sewers that outlet to four new stormwater management ponds and five OGS units in order to mitigate any impacts on downstream existing infrastructure and facilities. The combination of quality and quantity control measures will be implemented to meet MECP and City of Ottawa criteria.
- LIDs could be implemented but would have to be coordinated with the City for preferred alternative locations at the time of detailed design.
- An erosion assessment at critical locations along the Kizell Drain by GEO Morphix, along with a hydrologic assessment completed by JFSA, has concluded that there would be no adverse impacts to peak flows out of the Beaver Pond and on the downstream watercourse. Increases in erosion due to the redevelopment have been quantified and were found to be manageable.
- Grade raise restrictions do exist on the subject property. Where they cannot be met, potential mitigation measures detailed within the geotechnical report (ie. preload/surcharging of areas or use of lightweight fill) are suggested.

Prepared by,
David Schaeffer Engineering Ltd.

LICENSED PROFESSIONAL ENGINEER
K.L. MURPHY
90475369
July 9/20
PROVINCE OF ONTARIO

Per: Kevin Murphy, P.Eng.

Reviewed by,
David Schaeffer Engineering Ltd.

Per: Stephen J. Pichette, P. Eng.

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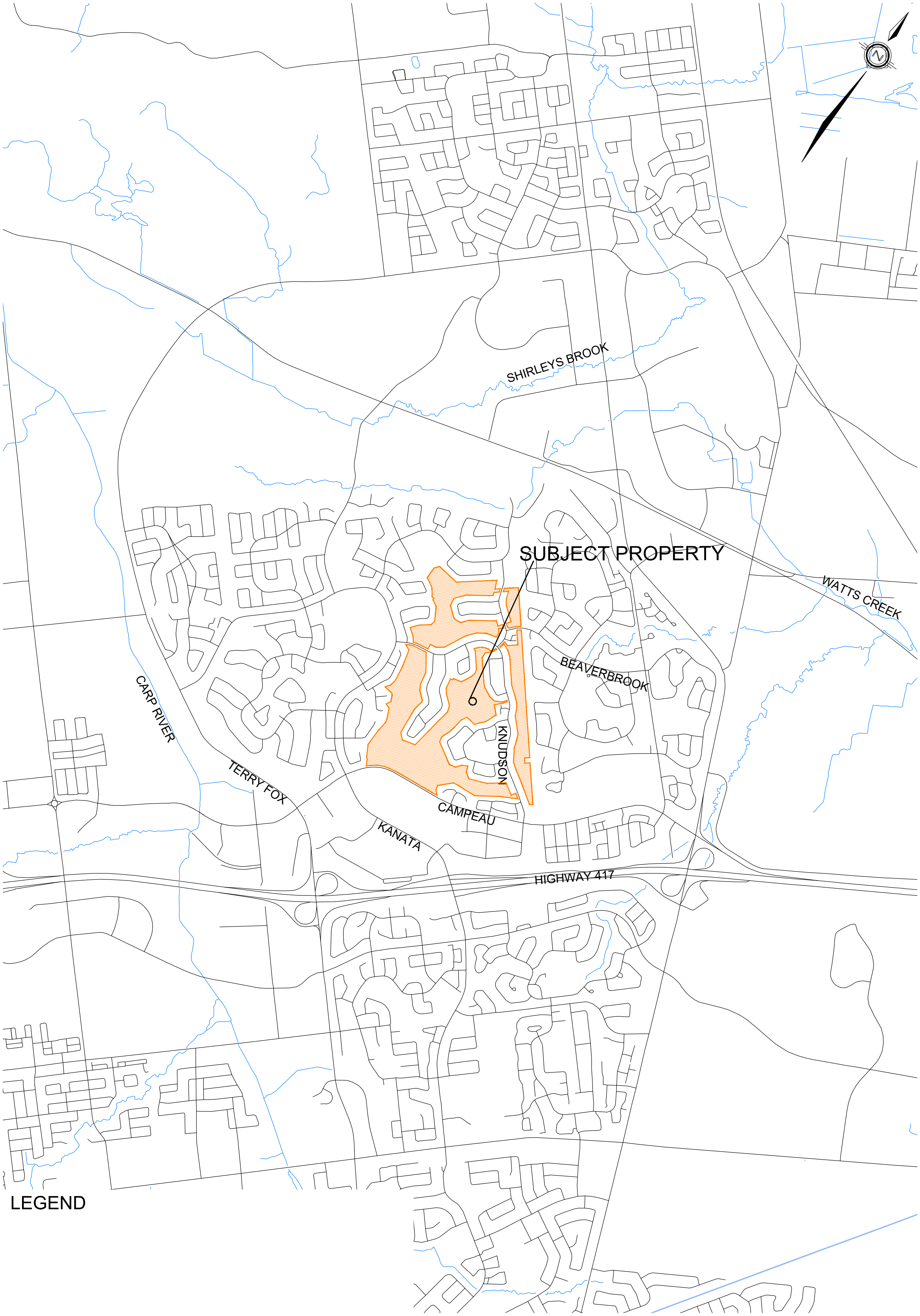
APPENDIX A

GENERAL



DSEL
david schaeffer engineering ltd

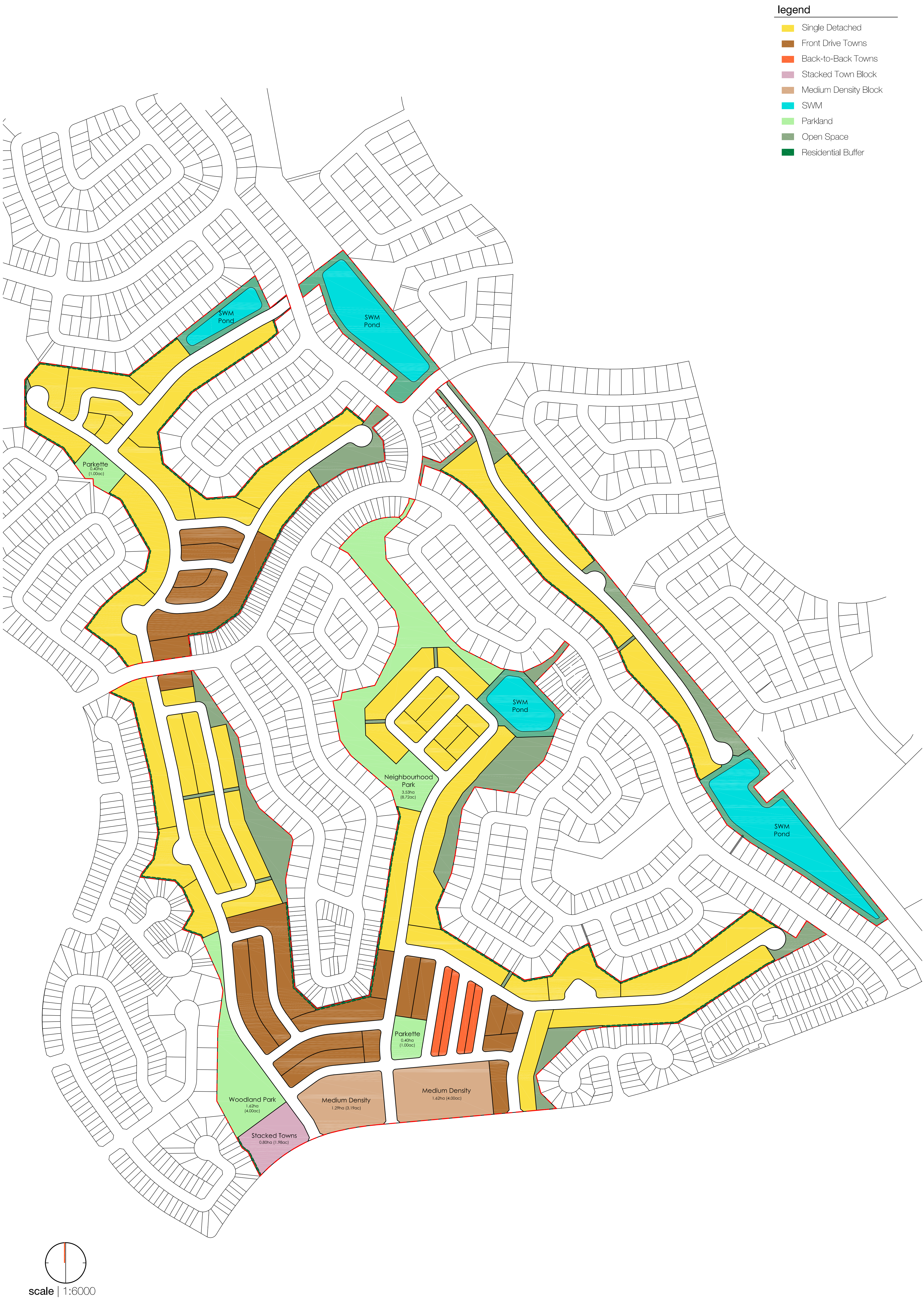
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

SITE LOCATION

SCALE:	NTS	PROJECT No.:	18-1061
DATE:	AUGUST 2019	FIGURE:	01F



CLUBLINK CORPORATION ULC

minto Communities

RICHCRAFT Group of Companies

FIGURE 2

MINTO | 7000 Campeau Dr

land use concept plan

2nd Submission
14 May, 2020

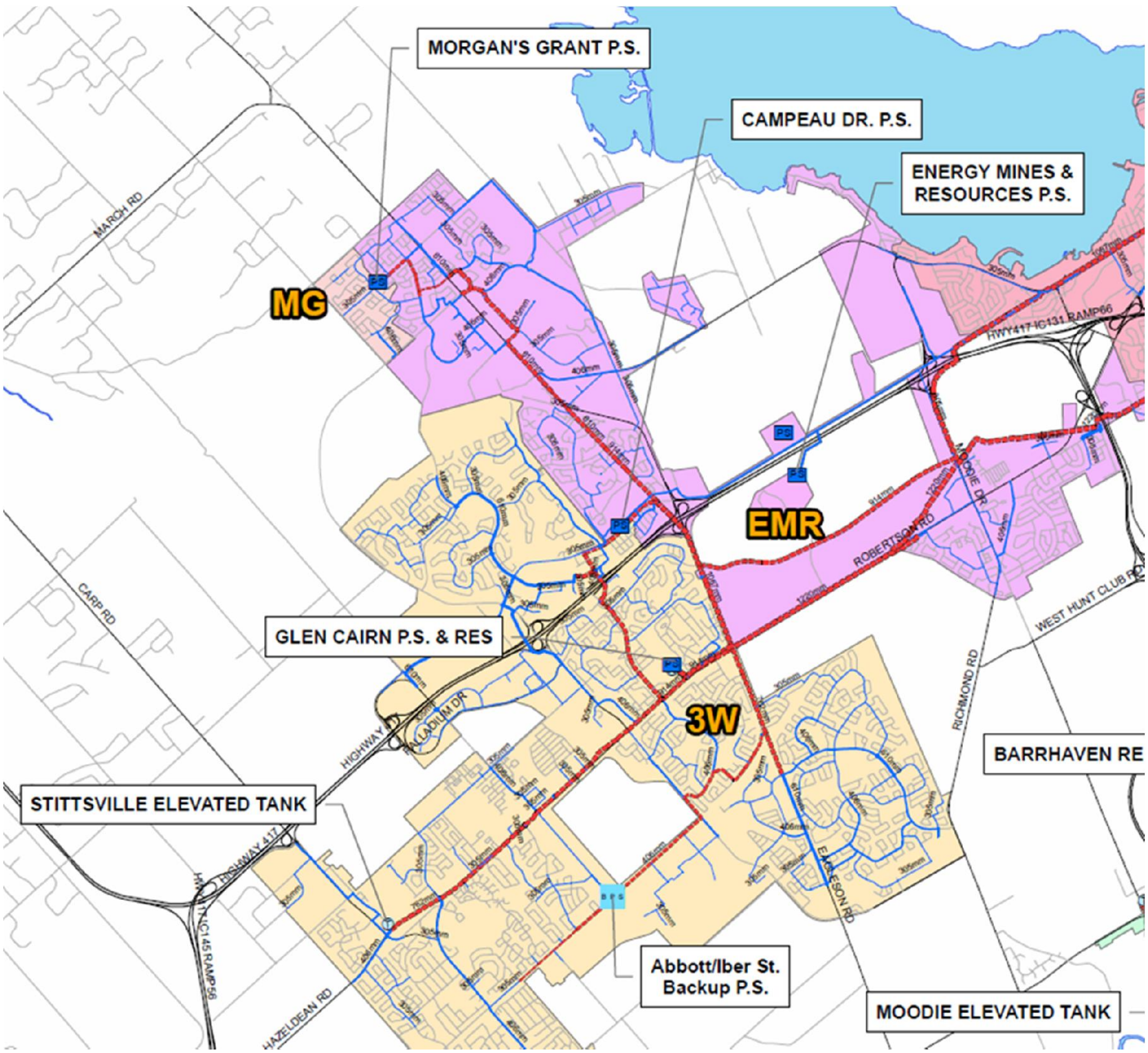
NAK design strategies

APPENDIX B

WATER SUPPLY

City of Ottawa Pressure Zone Map (excerpt)

Water Supply



Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata

Final Report

Prepared for:
David Schaeffer Engineering Ltd.
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

Prepared by:
GeoAdvice Engineering Inc.
Unit 203, 2502 St. John's Street
Port Moody, BC V3H 2B4

Submission Date: July 19th, 2019

Contact: Mr. Werner de Schaetzen, Ph.D., P.Eng.
Project: 2019-054-DSE

Document History and Version Control

Revision No.	Date	Document Description	Revised By	Reviewed By
R0	May 27, 2019	Draft	Renaud Dufays	Werner de Schaetzen
R1	July 19, 2019	Final	Renaud Dufays	Werner de Schaetzen

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 study the feasibility of a proposed water main network for the 7000 Campeau Drive development project in the Kanata North Ward ("Development") in the City of Ottawa, ON ("City").

The proposed development consists of 70.9 ha of golf courses lands (zoned O1A) and is planned to be rezoned to accommodate residential development. The development involves the construction of single family dwellings, traditional townhomes, back-to-back townhomes and high density buildings.

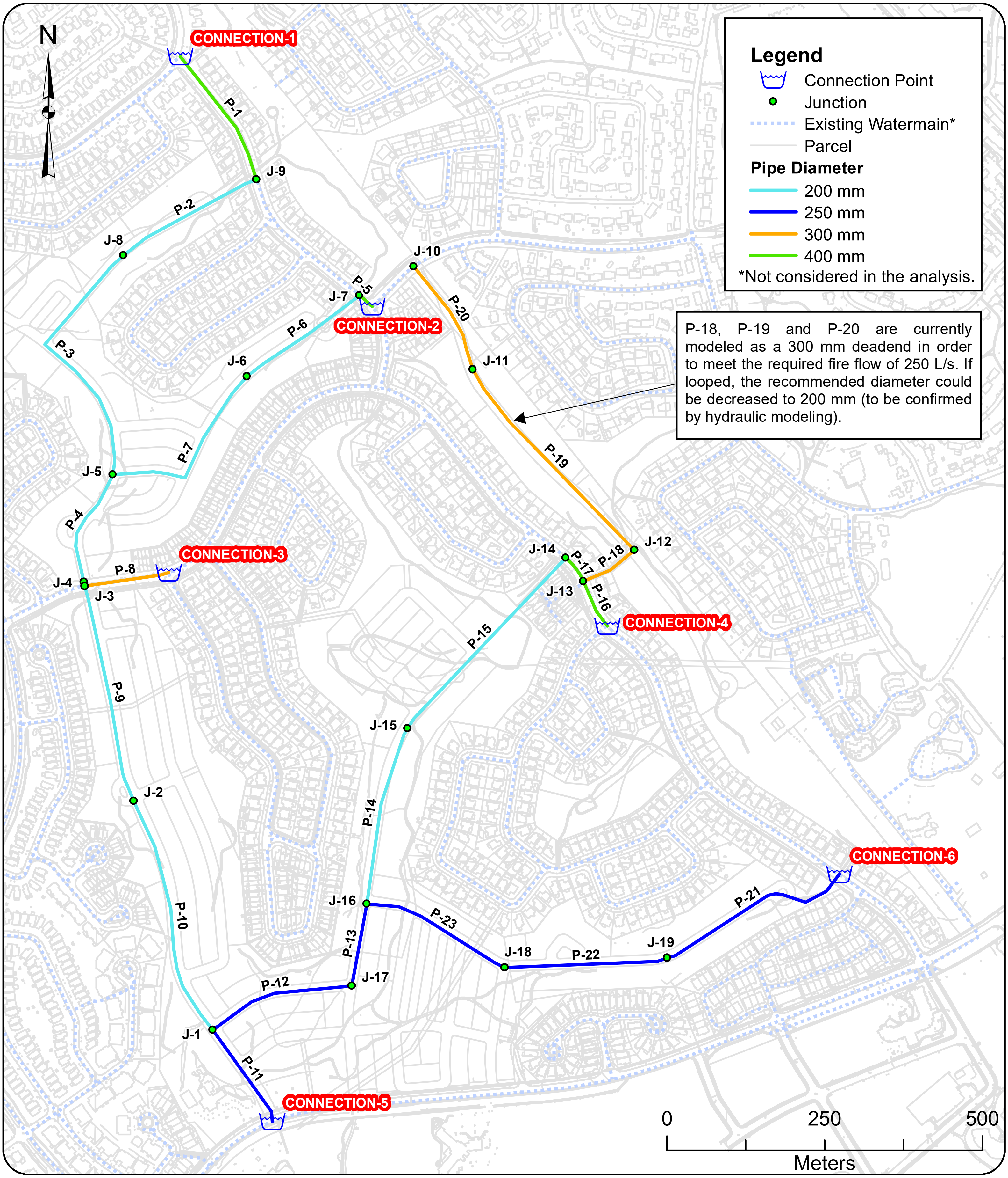
The development will have six (6) connections to the City water distribution system:

- Connection 1: Weslock Way and Walden Drive
- Connection 2: Weslock Way and Beaverbrook Road
- Connection 3: Knudson Drive and Shaugnessy Crescent
- Connection 4: Knudson Drive and Sherk Crescent
- Connection 5: 6738 Campeau Drive
- Connection 6: Knudson Drive and Morenz Terrace

The development site is shown in **Figure 1.1** on the following page, with the 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 report 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 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

Site Layout and Connection Points

Figure 1.1

2 Modeling Considerations

2.1 Water Main Configuration

The water main network was modeled based on the pipe network layout prepared by DSEL (2019-05-21_1061_Wtr_coord.dwg) and provided to GeoAdvice on May 21st, 2019.

2.2 Elevations

Elevations of the modeled junctions were assigned according to a site grading plan prepared by DSEL (01D_1061_Grad-01D.pdf) and provided to GeoAdvice on May 21st, 2019.

2.3 Consumer Demands

Demand calculations were performed by DSEL and checked by GeoAdvice. The assumptions used for the demand calculations are summarized in **Table 2.1** below.

Table 2.1: Demand Calculation Assumptions

Item	Assumption
Development Area	70.9 ha
Residential Unit Density	28 unit/ha
Residential Units	39.6% Single Family 44.0% Townhome 16.4% Medium Density
Population Density	Single Family: 3.4 cap/unit Townhome: 2.7 cap/unit Medium Density: 1.8 cap/unit
Residential Average Day Demand	280 L/cap/day
Residential Maximum Daily Demand	2.5 x avg. day
Residential Peak Hour Demand	2.2 x max. day

Water demands are shown in in **Table 2.2** below.

Table 2.2: Demand Calculations

Demand Area	Connections	Average Day Demand (L/s)	Maximum Day Demand (L/s)	Peak Hour Demand (L/s)
1	1 and 2	4.7	11.8	25.9
2	3, 4, 5 and 6	13.5	33.8	74.4
Total		**18.2**	**45.6**	**100.3**

Demands were grouped in two demand areas and evenly applied to all the nodes within each demand area. For this analysis, the two demand areas are not hydraulically connected to each other. This is due to the boundary conditions provided by the City (see **Section 2.5**). The demand areas are shown in **Appendix A**.

2.4 Fire Flow Demand

Fire flow calculations were also completed by DSEL for each demand area and are summarized in **Table 2.3** below.

Table 2.3: Required Fire Flows

Demand Area	Connections	Required Fire Flow (L/s)
1	1 and 2	167
2	3, 4, 5 and 6	250

Fire flow simulations were completed at each node except for J-4 as J-3 and J-4 are redundant. The locations of nodes do not necessarily represent hydrant locations.

The spatial allocation of the required fire flows is shown in **Appendix B**.

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: Weslock Way and Walden Drive
- Connection 2: Weslock Way and Beaverbrook Road
- Connection 3: Knudson Drive and Shaugnessy Crescent
- Connection 4: Knudson Drive and Sherk Crescent
- Connection 5: 6738 Campeau Drive
- Connection 6: Knudson Drive and Morenz Terrace

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

Boundary conditions were provided for Average Day, Maximum Day plus Fire and Peak Hour Demand conditions and can be found in **Appendix C**.

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

Table 2.4: Boundary Conditions

Condition	Connection 1 HGL (m)	Connection 2 HGL (m)	Connection 3 HGL (m)	Connection 4 HGL (m)	Connection 5 HGL (m)	Connection 6 HGL (m)
Average Day (max. pressure)	161.7	162.1	162.1	161.7	161.8	161.8
Peak Hour (min. pressure)	158.3	157.3	157.3	158.5	159.1	159.1
Max Day + Fire Flow (167 L/s)	156.4	157.5	-	-	-	-
Max Day + Fire Flow (250 L/s)	-	-	156.1	155.5	157.2	157.2

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	297	120
400	400	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 average day, peak hour and maximum day plus fire flow using InfoWater.

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

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

Average Day Demand Maximum Pressure	Peak Hour Demand Minimum Pressure
656 kPa (95 psi)	532 kPa (77 psi)

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). As such, based on the City boundary conditions, pressure reducing valves may be required.

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

4.2 Development Fire Flow Analysis

Summaries of the minimum available fire flows are shown below in **Table 4.2**.

Table 4.2: Summary of Minimum Available Fire Flows

Required Fire Flow	Minimum Available Flow	Junction ID
167 L/s	219 L/s	J-5
250 L/s	273 L/s	J-2

As shown in **Table 4.2**, the fire flow requirements can be met at all junctions within the development.

Summaries of the residual pressures are shown below in **Table 4.3**. The minimum allowable pressure under fire flow conditions is 140 kPa (20 psi) at the location of the fire.

Table 4.3: Summary of Residual Pressures (MDD + FF)

Maximum Residual Pressure	Average Residual Pressure	Minimum Residual Pressure
190 kPa (28 psi)	412 kPa (60 psi)	596 kPa (86 psi)

As shown in **Table 4.3**, there is sufficient residual pressure at all the junctions within the development.

Detailed fire flow results and figures illustrating the fire flow results can be found in **Appendix F**.

5 Conclusions

The hydraulic capacity and modeling analysis of 7000 Campeau Drive development project in the Kanata North Ward yielded the following conclusions:

- The proposed water main network can deliver all domestic flows, with service pressures expected to range between 532 kPa (77 psi) and 656 kPa (95 psi).
- The proposed water main network is able to deliver fire flows at all junctions.
- Pressure reducing valves may be required, since maximum pressures are predicted to exceed the City of Ottawa Design Guidelines.

Finally, please note that the development was analyzed as two disconnected water networks due to the boundary conditions provided by the City. This analysis may have oversized some water mains. For example, pipes P-18, P-19 and P-20 (proposed size 300 mm) were modeled as a deadend. Those pipes will likely be looped and may require smaller diameters.

Submission

Prepared by:

Renaud Dufays
Hydraulic Modeler

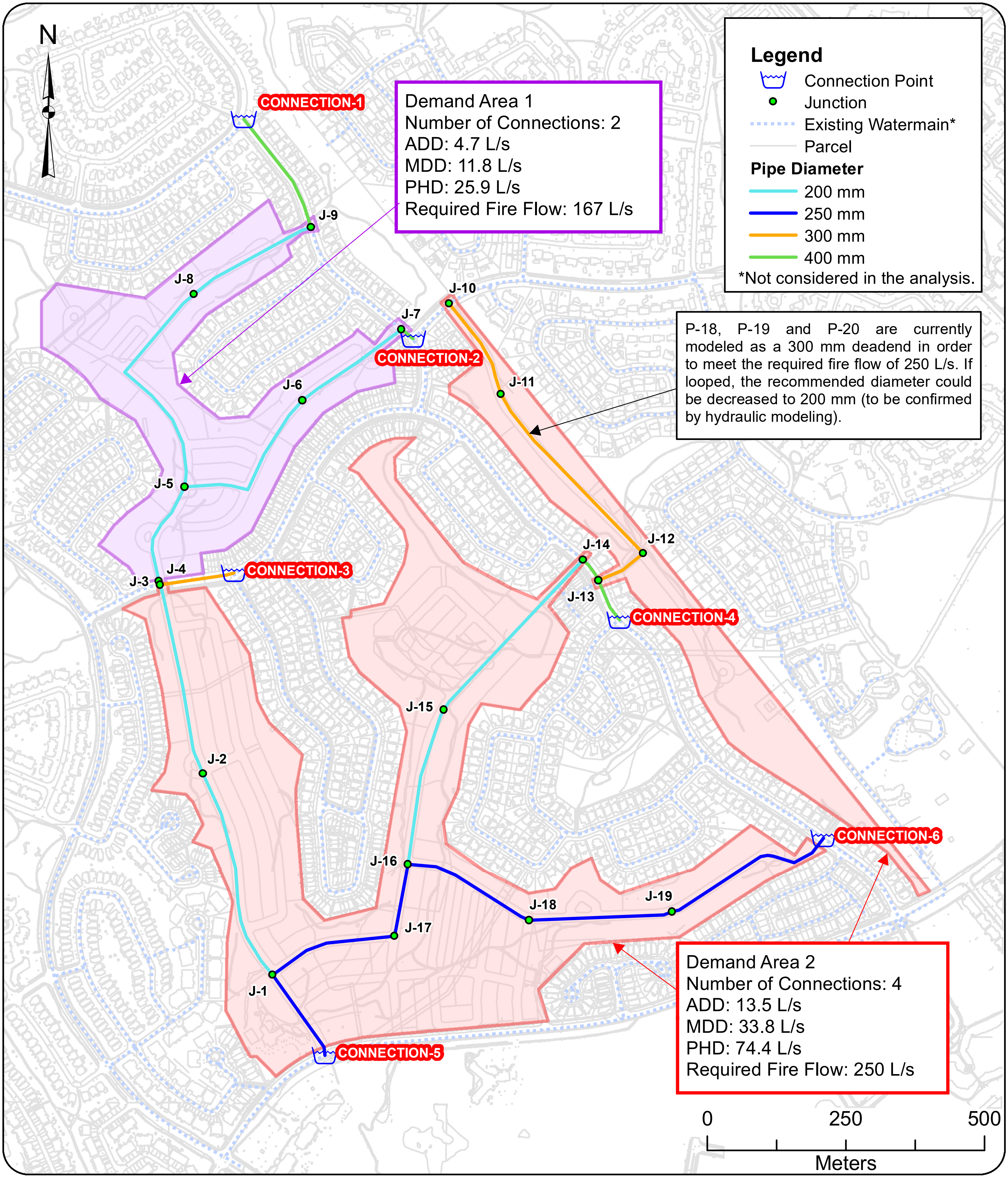
Approved by:

LICENSED PROFESSIONAL ENGINEER
W. B. F. de Schaetzen
100116349
PROVINCE OF ONTARIO

July 19, 2019

Werner de Schaetzen, Ph.D., P.Eng.
Senior Modeling Review / Project Manager

Appendix A Domestic Water Demand Calculations and Allocation



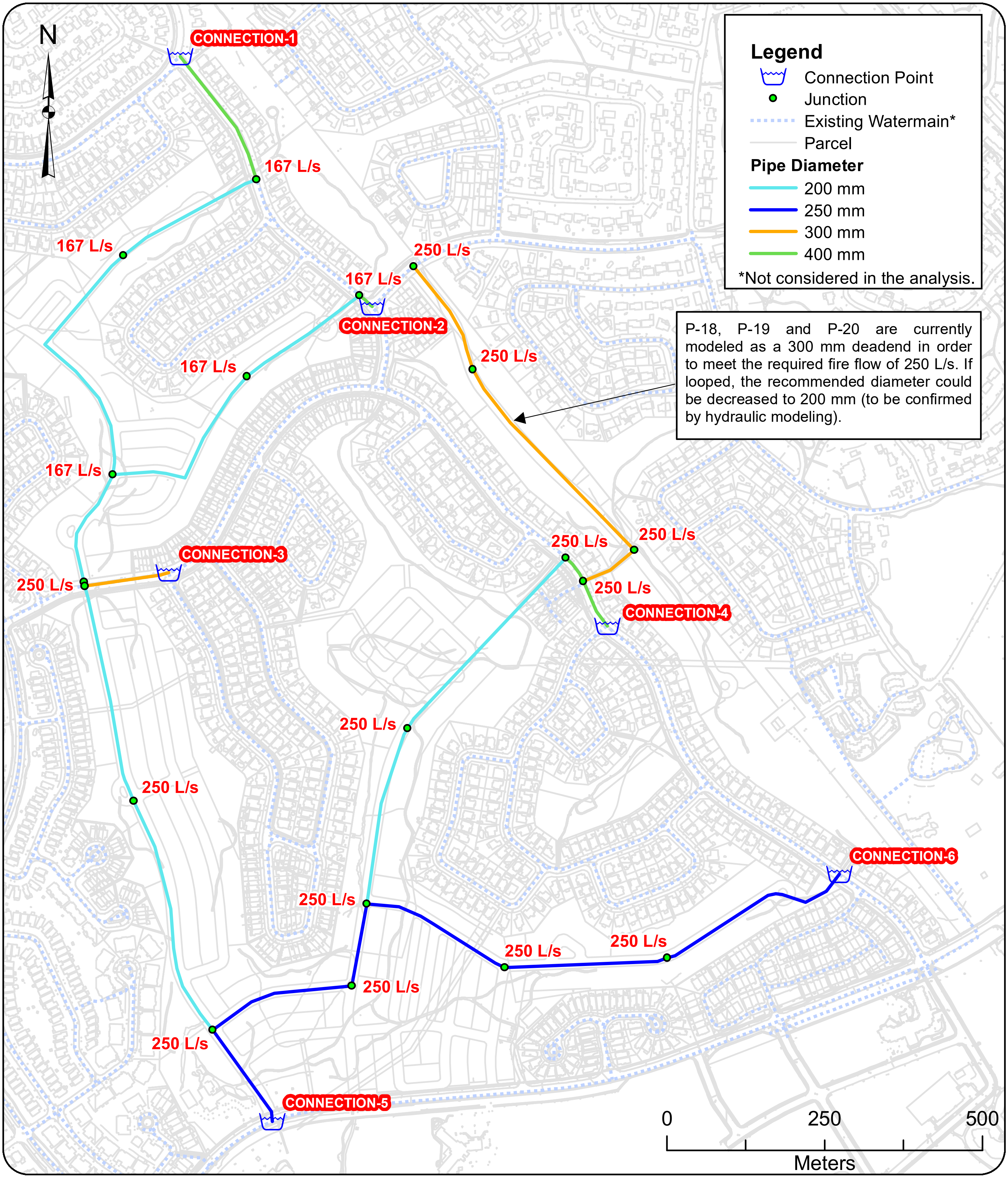
GeoAdvice Engineering Inc.

Project: **Hydraulic Capacity and Modeling Analysis 7000 Campeau Drive Development Area - Kanata**
Project ID: **2019-054-DSE**
Client: **David Schaeffer Engineering Ld.**
Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

Demand Allocation

Figure A.1

Appendix B FUS Fire Flow Calculations and Allocation



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Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

Required Fire Flow

Figure B.1

Appendix C Boundary Conditions

BOUNDARY CONDITIONS

Boundary Conditions For: 1061 7000 Campeau Drive

Date of Boundary Conditions: 2019-Apr-09

Provided Information:

Scenario	Demand	
	L/min	L/s
Average Daily Demand	282.9	4.7
Maximum Daily Demand	707.3	11.8
Peak Hour	1556.0	25.9
Fire Flow #1 Demand	10,000	166.7

Number Of Connections: 2

Scenario	Demand	
	L/min	L/s
Average Daily Demand	811.6	13.5
Maximum Daily Demand	2029.0	33.8
Peak Hour	4463.9	74.4
Fire Flow #1 Demand	15,000	250.0

Number Of Connections: 3

Location:

BOUNDARY CONDITIONS

Results:

Connection #: 1

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.7	92.3
Peak Hour	158.3	87.5
Max Day Plus Fire (10,000) L/min	156.4	84.8

[1]Elevation: **96.710 m**

Connection #: 2

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.1	93.0
Peak Hour	157.3	86.2
Max Day Plus Fire (10,000) L/min	157.5	86.4

[1]Elevation: **96.620 m**

Connection #: 3

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	162.1	85.2
Peak Hour	157.3	78.4
Max Day Plus Fire (15,000) L/min	156.1	76.7

[1]Elevation: **102.110 m**

Connection #: 4

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.7	92.2
Peak Hour	158.5	87.6
Max Day Plus Fire (15,000) L/min	155.5	83.4

BOUNDARY CONDITIONS

[1]Elevation: **96.800 m**

Connection #: 5

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.8	85.2
Peak Hour	159.1	81.4
Max Day Plus Fire (15,000) L/min	157.2	78.7

[1]Elevation: **101.790 m**

Connection #: 6

Demand Scenario	Head (m)	Pressure[1] (psi)
Maximum HGL	161.8	85.4
Peak Hour	159.1	81.6
Max Day Plus Fire (15,000) L/min	157.2	78.9

[1]Elevation: **101.670 m**

Notes:

1) As per the Ontario Building Code in areas that may be occupied, the static pressure at any fixture shall not exceed 552 kPa (80 psi.) Pressure control measures to be considered are as follows, in order of preference:

a) If possible, systems to be designed to residual pressures of 345 to 552 kPa (50 to 80 psi) in all occupied areas outside of the public right-of-way without special pressure control equipment.
b) Pressure reducing valves to be installed immediately downstream of the isolation valve in the home/ building, located downstream of the meter so it is owner maintained.

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.

Appendix D Pipe and Junction Model Inputs

Model Inputs

ID	From Node	To Node	Length (m)	Diameter (mm)	Roughness ()
P-1	CONNECTION-1	J-9	232	400	120
P-2	J-9	J-8	243	204	110
P-3	J-8	J-5	435	204	110
P-4	J-5	J-4	189	204	110
P-5	CONNECTION-2	J-7	27	400	120
P-6	J-7	J-6	220	204	110
P-7	J-6	J-5	305	204	110
P-8	CONNECTION-3	J-3	135	297	120
P-9	J-3	J-2	350	204	110
P-10	J-2	J-1	390	204	110
P-11	CONNECTION-5	J-1	175	250	110
P-12	J-1	J-17	238	250	110
P-13	J-17	J-16	132	250	110
P-14	J-16	J-15	287	204	110
P-15	J-15	J-14	369	204	110
P-16	CONNECTION-4	J-13	81	400	120
P-17	J-13	J-14	47	400	120
P-18	J-13	J-12	96	297	120
P-19	J-12	J-11	385	297	120
P-20	J-11	J-10	191	297	120
P-21	CONNECTION-6	J-19	321	250	110
P-22	J-19	J-18	259	250	110
P-23	J-18	J-16	245	250	110

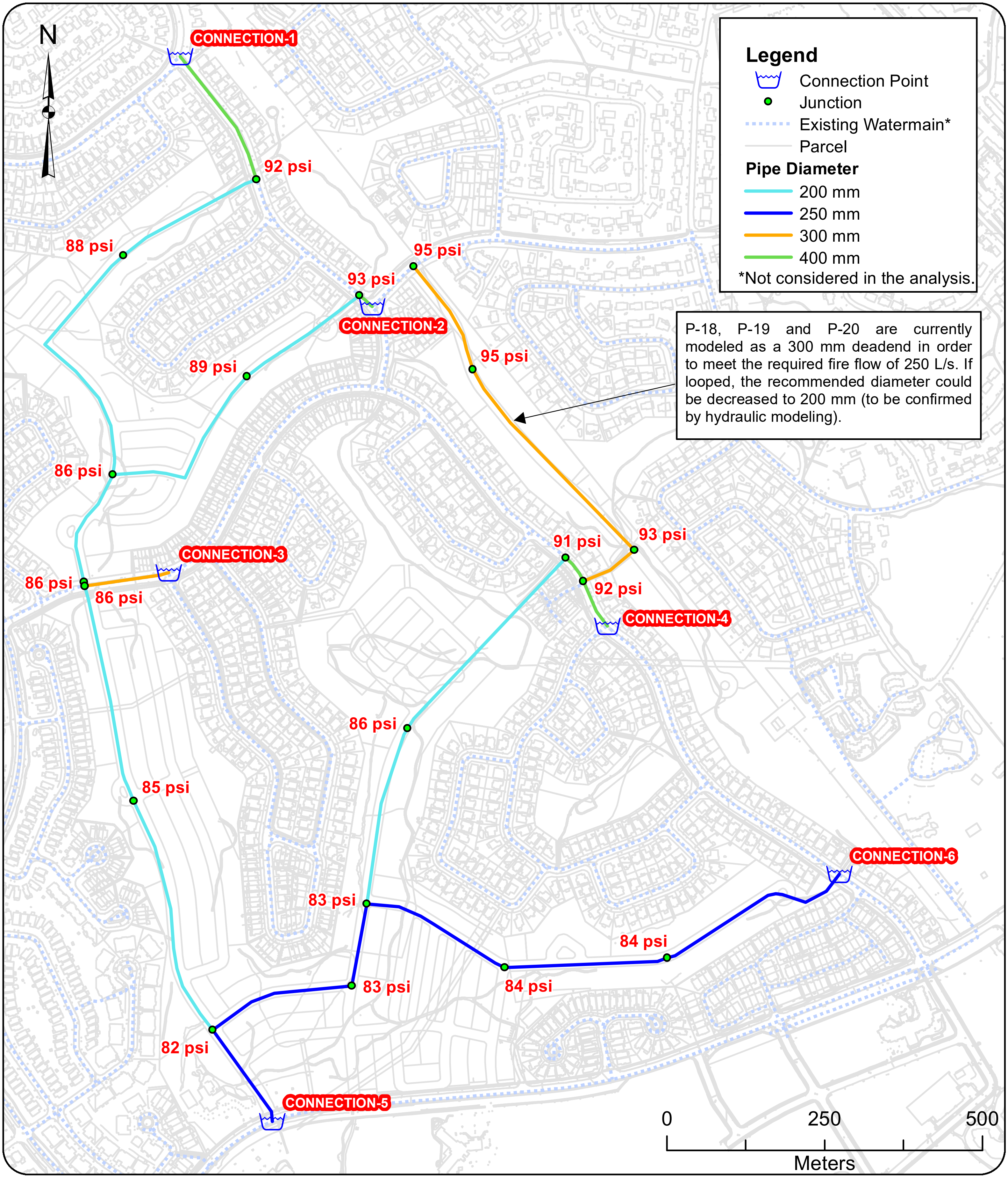
ID	Elevation (m)	ADD (L/s)
J-1	104.42	1.04
J-2	102.16	1.04
J-3	101.50	1.04
J-4	101.47	0.78
J-5	101.30	0.78
J-6	99.10	0.78
J-7	96.57	0.78
J-8	99.73	0.78
J-9	96.72	0.78
J-10	94.75	1.04
J-11	95.00	1.04
J-12	96.08	1.04
J-13	96.67	1.04
J-14	97.75	1.04
J-15	101.06	1.04
J-16	103.21	1.04
J-17	103.21	1.04
J-18	102.88	1.04
J-19	102.66	1.04

Appendix E MHD and PHD Model Results

Average Day 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)
P-1	CONNECTION-1	J-9	232.0	400	120	-3.87	0.03	0.00	0.00
P-2	J-9	J-8	243.1	204	110	-4.65	0.14	0.05	0.20
P-3	J-8	J-5	435.3	204	110	-5.43	0.17	0.11	0.26
P-4	J-5	J-4	188.6	204	110	0.78	0.02	0.00	0.01
P-5	CONNECTION-2	J-7	26.8	400	120	8.55	0.07	0.00	0.02
P-6	J-7	J-6	219.7	204	110	7.77	0.24	0.11	0.51
P-7	J-6	J-5	304.5	204	110	6.99	0.21	0.13	0.42
P-8	CONNECTION-3	J-3	134.7	297	120	8.34	0.12	0.01	0.08
P-9	J-3	J-2	349.8	204	110	7.30	0.22	0.16	0.45
P-10	J-2	J-1	390.0	204	110	6.26	0.19	0.13	0.34
P-11	CONNECTION-5	J-1	174.5	250	110	-0.57	0.01	0.00	0.00
P-12	J-1	J-17	237.5	250	110	4.65	0.09	0.02	0.07
P-13	J-17	J-16	131.9	250	110	3.61	0.07	0.01	0.05
P-14	J-16	J-15	286.8	204	110	4.09	0.13	0.04	0.15
P-15	J-15	J-14	368.6	204	110	3.05	0.09	0.03	0.09
P-16	CONNECTION-4	J-13	81.0	400	120	2.15	0.02	0.00	0.00
P-17	J-13	J-14	47.0	400	120	-2.01	0.02	0.00	0.00
P-18	J-13	J-12	95.7	297	120	3.12	0.05	0.00	0.01
P-19	J-12	J-11	385.4	297	120	2.08	0.03	0.00	0.01
P-20	J-11	J-10	190.8	297	120	1.04	0.02	0.00	0.00
P-21	CONNECTION-6	J-19	321.4	250	110	3.60	0.07	0.01	0.05
P-22	J-19	J-18	258.7	250	110	2.56	0.05	0.01	0.02
P-23	J-18	J-16	245.0	250	110	1.52	0.03	0.00	0.01

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-1	1.04	104.42	162	82
J-2	1.04	102.16	162	85
J-3	1.04	101.50	162	86
J-4	0.78	101.47	162	86
J-5	0.78	101.30	162	86
J-6	0.78	99.10	162	89
J-7	0.78	96.57	162	93
J-8	0.78	99.73	162	88
J-9	0.78	96.72	162	92
J-10	1.04	94.75	162	95
J-11	1.04	95.00	162	95
J-12	1.04	96.08	162	93
J-13	1.04	96.67	162	92
J-14	1.04	97.75	162	91
J-15	1.04	101.06	162	86
J-16	1.04	103.21	162	83
J-17	1.04	103.21	162	83
J-18	1.04	102.88	162	84
J-19	1.04	102.66	162	84



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Date: **May 2019**
Created by: **RD**
Reviewed by: **WdS**

DISCLAIMER: GeoAdvice does not warrant in any way the accuracy and completeness of the information shown on this map. Field verification of the accuracy and completeness of the information shown on this map is the sole responsibility of the user.

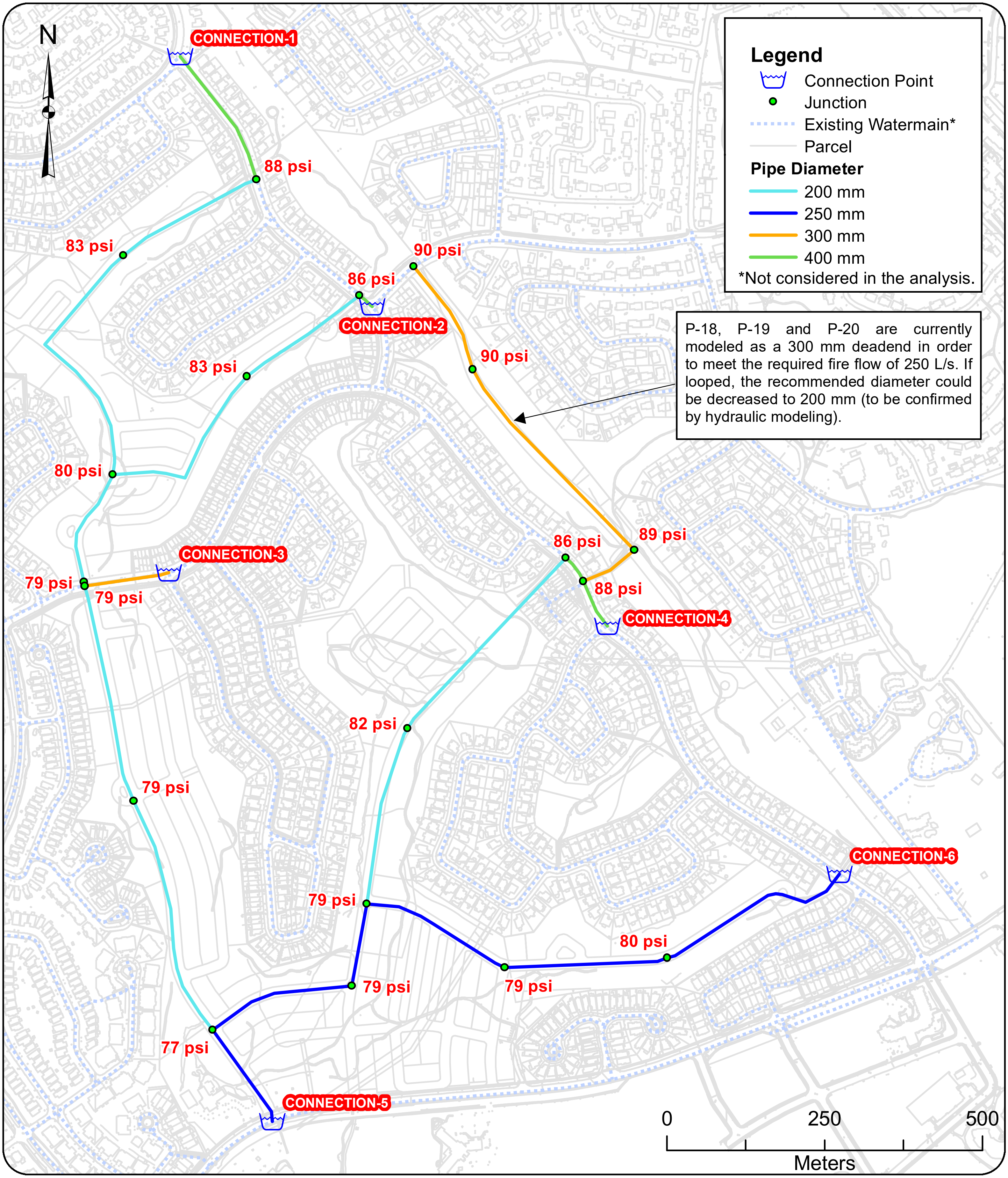
ADD Pressure Results

Figure E.1

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)
P-1	CONNECTION-1	J-9	232.0	400	120	20.41	0.16	0.02	0.10
P-2	J-9	J-8	243.1	204	110	16.11	0.49	0.47	1.95
P-3	J-8	J-5	435.3	204	110	11.81	0.36	0.48	1.10
P-4	J-5	J-4	188.6	204	110	4.30	0.13	0.03	0.17
P-5	CONNECTION-2	J-7	26.8	400	120	5.39	0.04	0.00	0.01
P-6	J-7	J-6	219.7	204	110	1.09	0.03	0.00	0.01
P-7	J-6	J-5	304.5	204	110	-3.21	0.10	0.03	0.10
P-8	CONNECTION-3	J-3	134.7	297	120	-6.44	0.09	0.01	0.05
P-9	J-3	J-2	349.8	204	110	-12.16	0.37	0.40	1.16
P-10	J-2	J-1	390.0	204	110	-17.88	0.55	0.92	2.36
P-11	CONNECTION-5	J-1	174.5	250	110	32.63	0.66	0.47	2.67
P-12	J-1	J-17	237.5	250	110	9.03	0.18	0.06	0.25
P-13	J-17	J-16	131.9	250	110	3.31	0.07	0.01	0.04
P-14	J-16	J-15	286.8	204	110	5.81	0.18	0.08	0.29
P-15	J-15	J-14	368.6	204	110	0.09	0.00	0.00	0.00
P-16	CONNECTION-4	J-13	81.0	400	120	28.51	0.23	0.01	0.18
P-17	J-13	J-14	47.0	400	120	5.63	0.04	0.00	0.01
P-18	J-13	J-12	95.7	297	120	17.16	0.25	0.03	0.30
P-19	J-12	J-11	385.4	297	120	11.44	0.17	0.05	0.14
P-20	J-11	J-10	190.8	297	120	5.72	0.08	0.01	0.04
P-21	CONNECTION-6	J-19	321.4	250	110	19.66	0.40	0.34	1.05
P-22	J-19	J-18	258.7	250	110	13.94	0.28	0.14	0.55
P-23	J-18	J-16	245.0	250	110	8.22	0.17	0.05	0.21

ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (psi)
J-1	5.72	104.42	159	77
J-2	5.72	102.16	158	79
J-3	5.72	101.50	157	79
J-4	4.30	101.47	157	79
J-5	4.30	101.30	157	80
J-6	4.30	99.10	157	83
J-7	4.30	96.57	157	86
J-8	4.30	99.73	158	83
J-9	4.30	96.72	158	88
J-10	5.72	94.75	158	90
J-11	5.72	95.00	158	90
J-12	5.72	96.08	158	89
J-13	5.72	96.67	158	88
J-14	5.72	97.75	158	86
J-15	5.72	101.06	158	82
J-16	5.72	103.21	159	79
J-17	5.72	103.21	159	79
J-18	5.72	102.88	159	79
J-19	5.72	102.66	159	80



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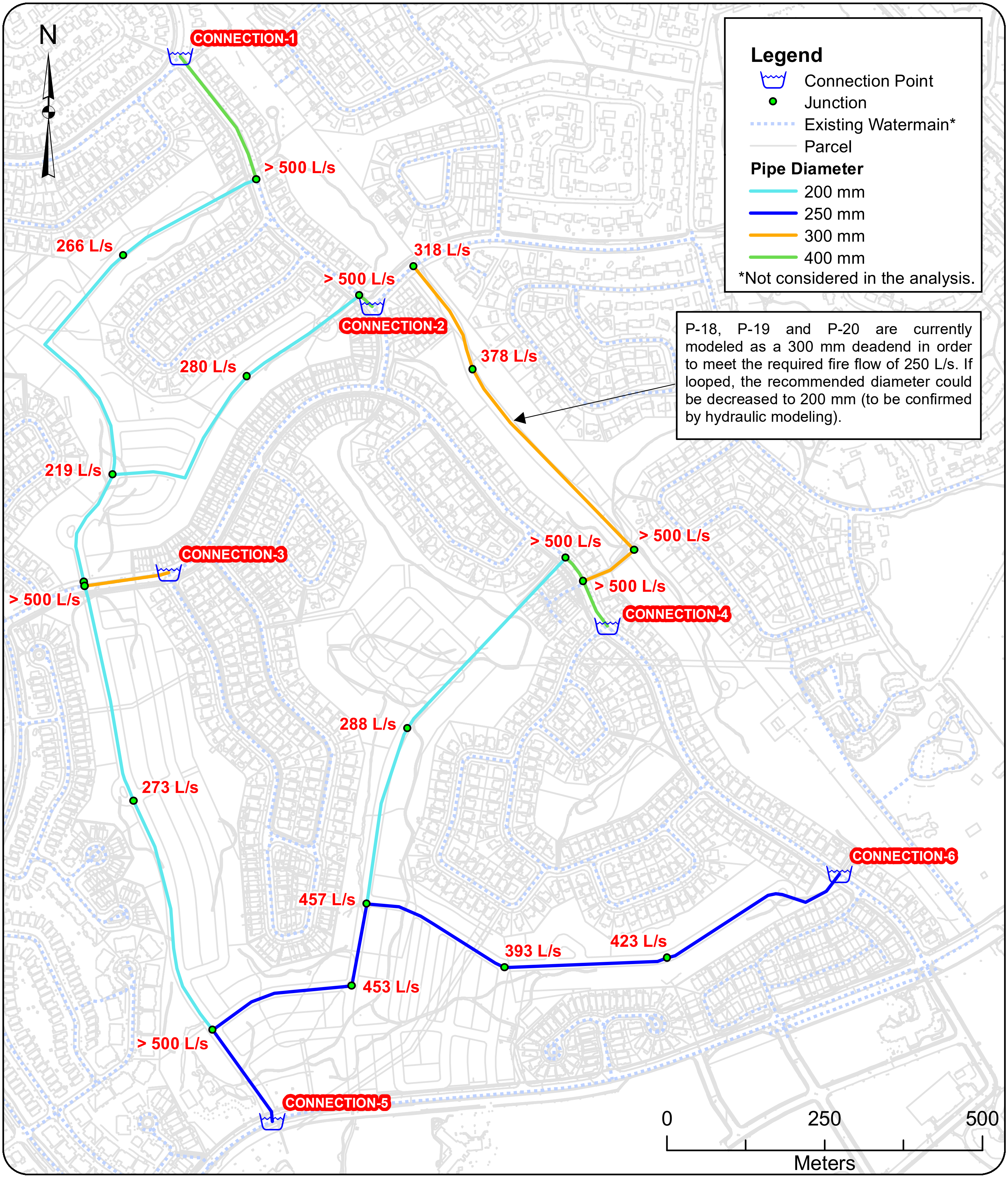
PHD Pressure Results

Figure E.2

Appendix F MDD+FF Model Results

Fire Flow Modeling Results

ID	Static Demand (L/s)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (psi)	Available Flow at Hydrant (L/s)	Available Flow Pressure (psi)
J-1	2.60	75	157	250	63	> 500	20
J-2	2.60	77	156	250	28	273	20
J-3	2.60	78	156	250	71	> 500	20
J-5	1.97	79	157	167	42	219	20
J-6	1.97	83	157	167	58	280	20
J-7	1.97	87	158	167	86	> 500	20
J-8	1.97	81	157	167	54	266	20
J-9	1.97	85	156	167	83	> 500	20
J-10	2.60	86	155	250	43	318	20
J-11	2.60	86	155	250	54	378	20
J-12	2.60	84	155	250	77	> 500	20
J-13	2.60	84	156	250	83	> 500	20
J-14	2.60	82	156	250	80	> 500	20
J-15	2.60	78	156	250	33	288	20
J-16	2.60	76	157	250	57	457	20
J-17	2.60	76	157	250	57	453	20
J-18	2.60	77	157	250	51	393	20



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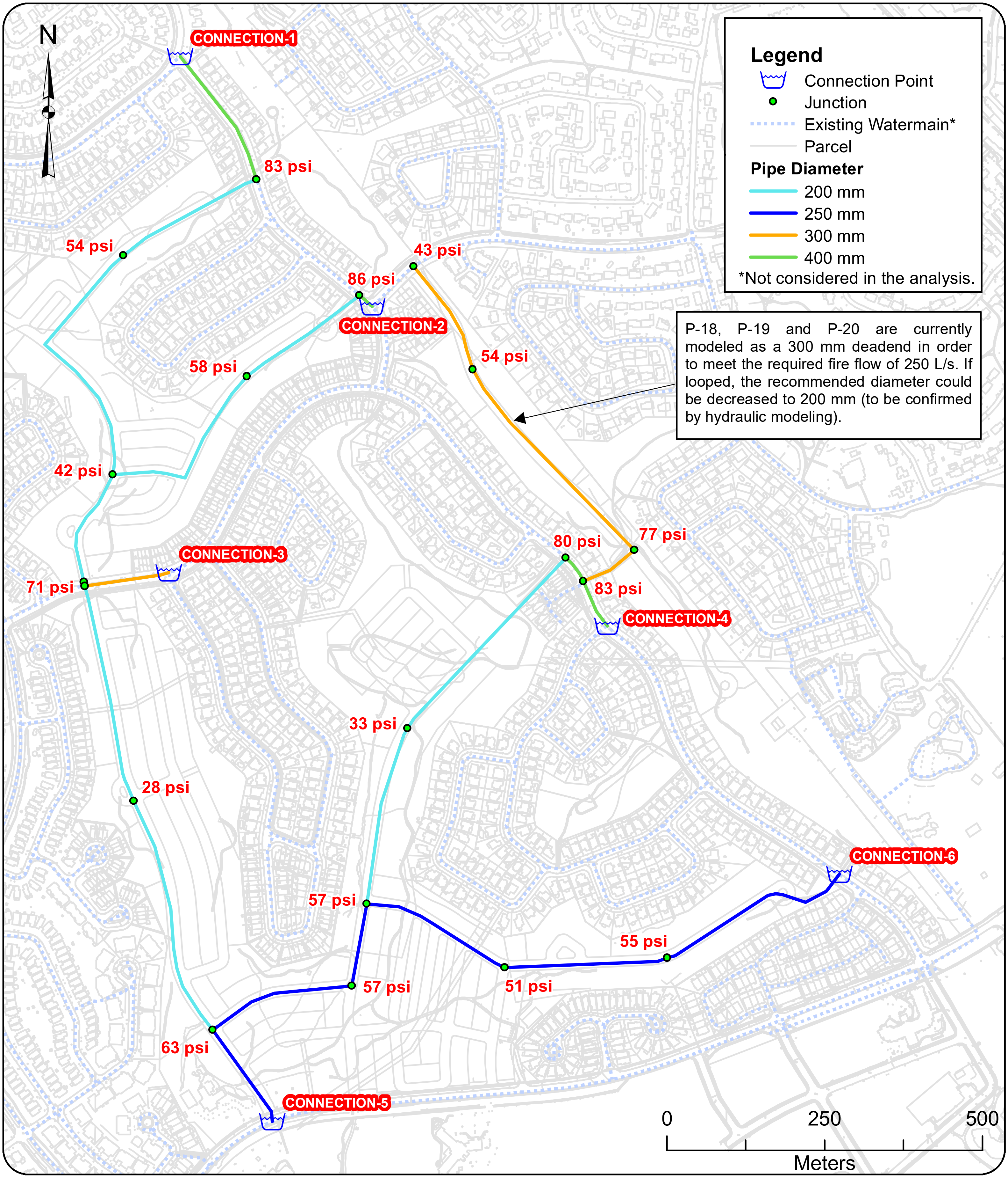
Available Fire Flow @ 20 psi

Figure F.1



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Reviewed by: **WdS**

Residual Pressure @ Required Fire Flow

Figure F.2

Kevin Murphy

From: Adam Fobert
Sent: Tuesday, February 05, 2019 2:53 PM
To: Moodie, Derrick
Cc: Steve Pichette; Beth Henderson; Susan Murphy
Subject: 1061 Minto - Kanata Golf and Country Club: Water and Wastewater Service Review
Attachments: kanata_water.pdf

Hello Derrick,

DSEL has been retained by Minto to investigate the availability of services to support the potential redevelopment of the Kanata Lakes Golf and Country Club. Since we have not had a formal pre-consultation with your staff on this application, we are requesting your support in coordinating the following request.

Water Supply
Please see the attached figure illustrating potential connection points.

Connection points 1 and 2 would have the following demands:

- Average Daily: 282.9L/min
- Max Day: 707.3 L/min
- Peak Hour: 1556.0 L/min
- Fire Flow: 10,000L/min

Connection points 3, 4, 5, and 6 would have the following demands:

- Average Daily: 811.6L/min
- Max Day: 2029.0L/min
- Peak Hour: 4463.9L/min
- Fire Flow: 15,000L/min

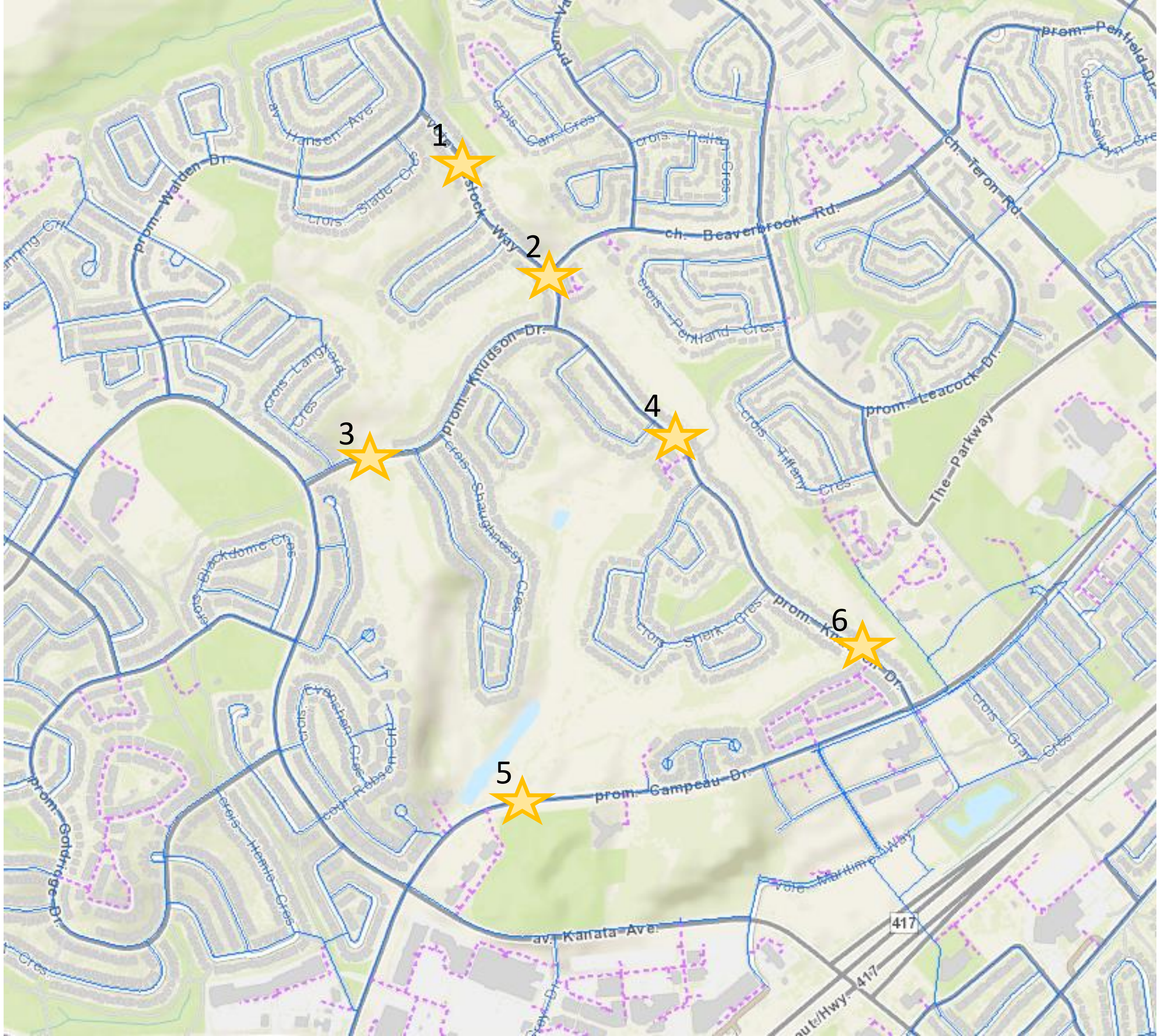
Wastewater
We have completed a desktop review of the available capacity in the receiving sanitary sewer system. Does the City have a model of the trunk sewer system? Furthermore, the contemplated development would add 73.71 L/s peak wet weather wastewater flow to the March Road PS. It is my understanding that the March Road PS has gone or is going through upgrades. We would need confirmation of the available capacity in the trunk sewer and receiving pump station.

Thank you for your assistance.

Adam Fobert, P.Eng.
DSEL
david schaeffer engineering ltd.

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca



1
2
3
4
5
6
ch. Beaverbrook Rd.
Knudson Dr.
prom. Knudson
prom. Campeau Dr.
av. Kanata Ave.
ch. Teron Rd.
The Parkway
prom. Leacock Dr.
Walden Dr.
Hansen Ave
Penkland Cres.
Tiffany Cres.
Shaughnessy Cres.
Blackdome Cres.
Goldridge Dr.
Maritime Way
417

APPENDIX C

SANITARY

SANITARY SEWER CALCULATION SHEET - EXISTING CONDITIONS

PROJECT: **Kanata Golf and Country Club**
LOCATION: **7000 Campeau Drive**
FILE REF: **18-1061**
DATE: **28-May-20**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280 L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8		Infiltration / Inflow	0.33 L/s/ha
Avg. Daily Flow Comm.	28,000 L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	28,000 L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust.	35,000 L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013
Ex. Population Per Hectare*	69 Pop/Ha	Peak Fact. Indust. per MOE graph			

*Based on an average from Areas 2, 12 and 10.

DSEL

Location			Residential Area and Population						Commercial		Institutional		Industrial		Infiltration				Pipe Data											
Area ID	Up	Down	Area	Pop.	Cumulative		Peak.	Q_{res}	Area	Accu.	Area	Accu.	Area	Accu.	Q_{C+I+I}	Total	Accu.	Infiltration	Total	DIA	Upstream	Downstream	Length	Slope	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	Qresidual
					Area	Pop.	Fact.			Area		Area		Area		Area	Area	Flow	Flow		Invert	Invert								
			(ha)		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(m)	(m)	(m)	(%)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)
Campeau Drive																														
	1	2		0	0.000	0	3.80	0.00		0.00		0.00		0.00	0.0	0.000	0.000	0.000	0.00	525	97.57	97.52	16.9	0.296	0.216	0.131	1.08	233.9	0.00	233.9
2	2	3	7.53	520	7.53	520	3.37	5.68	0.07	0.07		0.00		0.00	0.0	7.600	7.600	2.508	8.21	525	97.52	97.33	78.2	0.243	0.216	0.131	0.98	212.0	0.04	203.8
	3	4		0	7.530	520	3.37	5.68		0.07		0.00		0.00	0.0	0.000	7.600	2.508	8.21	525	97.3	97.09	76.4	0.275	0.216	0.131	1.04	225.5	0.04	217.3
4	4	5	12.88	889	20.41	1408	3.16	14.42		0.07		0.00		0.00	0.0	12.880	20.480	6.758	21.20	525	97.09	97.02	24.1	0.290	0.216	0.131	1.07	231.8	0.09	210.6
5	5	6	1.31	0	21.72	1408	3.16	14.42	0.11	0.18		0.00		0.00	0.1	1.420	21.900	7.227	21.70	525	97.02	96.79	91.7	0.251	0.216	0.131	0.99	215.4	0.10	193.7
	6	7		0	21.72	1408	3.16	14.42		0.18		0.00		0.00	0.1	0.000	21.900	7.227	21.70	525	96.76	96.51	100.6	0.249	0.216	0.131	0.99	214.4	0.10	192.7
Private Property																														
	7	8		0	21.72	1408	3.16	14.42		0.18		0.00		0.00	0.1	0.000	21.900	7.227	21.70	525	96.48	96.11	149.6	0.247	0.216	0.131	0.99	213.9	0.10	192.2
	8	9		0	21.72	1408	3.16	14.42		0.18		0.00		0.00	0.1	0.000	21.900	7.227	21.70	525	96.09	95.73	125.4	0.287	0.216	0.131	1.06	230.4	0.09	208.7
9	9	10	5.52	381	27.24	1789	3.10	17.96		0.18		0.00		0.00	0.1	5.520	27.420	9.049	27.07	525	95.73	95.37	149.8	0.240	0.216	0.131	0.97	210.8	0.13	183.8
Rosenfield Crescent																														
10	10	11	3.39	234	30.63	2023	3.07	20.10		0.18		0.00		0.00	0.1	3.390	30.810	10.167	30.32	525	95.29	95.24	19.1	0.262	0.216	0.131	1.02	220.0	0.14	189.7
	11	12		0	30.63	2023	3.07	20.10		0.18		0.00		0.00	0.1	0.000	30.810	10.167	30.32	525	95.19	94.99	80.9	0.247	0.216	0.131	0.99	213.8	0.14	183.5
Sherk Crescent																														
12	12	13	6.53	450	37.16	2473	3.01	24.12		0.18		0.00		0.00	0.1	6.530	37.340	12.322	36.50	525	94.97	94.9	23.2	0.302	0.216	0.131	1.09	236.2	0.15	199.7
	13	14		0	37.16	2473	3.01	24.12		0.18		0.00		0.00	0.1	0.000	37.340	12.322	36.50	525	94.88	94.73	50.5	0.297	0.216	0.131	1.08	234.4	0.16	197.9
	14	15		0	37.16	2473	3.01	24.12		0.18		0.00		0.00	0.1	0.000	37.340	12.322	36.50	525	94.7	94.47	92.2	0.249	0.216	0.131	0.99	214.8	0.17	178.3
	15	16		0	37.16	2473	3.01	24.12		0.18		0.00		0.00	0.1	0.000	37.340	12.322	36.50	525	94.45	94.37	37.8	0.212	0.216	0.131	0.91	197.8	0.18	161.3
	16	17		0	37.16	2473	3.01	24.12		0.18		0.00		0.00	0.1	0.000	37.340	12.322	36.50	525	94.36	94.12	88.5	0.271	0.216	0.131	1.03	224.0	0.16	187.5
Knudson Drive																														
			6.95	480	44.11	2953																								
17&17A	17	18	2.79	193	46.90	3146	2.94	29.97		0.18		0.00		0.00	0.1	2.790	40.130	13.243	43.27	525	94.1	93.97	42.8	0.304	0.216	0.131	1.09	237.0	0.18	193.7
	18	19		0	46.90	3146	2.94	29.97		0.18		0.00		0.00	0.1	0.000	40.130	13.243	43.27	525	93.95	93.71	57.9	0.415	0.216	0.131	1.28	276.9	0.16	233.6
19	19	20	1.86	128	48.76	3274	2.93	31.07		0.18		0.00		0.00	0.1	1.860	41.990	13.857	44.98	525	93.69	93.49	83.5	0.240	0.216	0.131	0.97	210.5	0.21	165.5
	20	21		0	48.76	3274	2.93	31.07		0.18		0.00		0.00	0.1	0.000	41.990	13.857	44.98	525	93.47	93.34	51.2	0.254	0.216	0.131	1.00	216.7	0.21	171.7
	21	22		0	48.76	3274	2.93	31.07		0.18		0.00		0.00	0.1	0.000	41.990	13.857	44.98	525	93.33	93.12	71.9	0.292	0.216	0.131	1.07	232.4	0.19	187.4
22	22	23	5.17	356	53.93	3630	2.90	34.08		0.18		0.00		0.00	0.1	5.170	47.160	15.563	49.70	525	93.1	93	37.5	0.267	0.216	0.131	1.03	222.1	0.22	172.4
	23	25		0	53.93	3630	2.90	34.08		0.18		0.00		0.00	0.1	0.000	47.160	15.563	49.70	600	92.93	92.83	61.6	0.210	0.283	0.150	1.00	281.4	0.18	231.7
	25	26		0	53.93	3630	2.90	34.08		0.18		0.00		0.00	0.1	0.000	47.160	15.563	49.70	600	92.8	92.72	31.3	0.256	0.283	0.150	1.10	310.4	0.16	260.7
26	26	27	4.99	344	58.92	3974	2.87	36.95		0.18		0.00		0.00	0.1	4.990	52.150	17.210	54.22	600	92.67	92.56	57.5	0.191	0.283	0.150	0.95	268.6	0.20	214.3
	27	28		0	58.92	3974	2.87	36.95		0.18		0.00		0.00	0.1	0.000	52.150	17.210	54.22	600	92.54	92.37	51.4	0.331	0.283	0.150	1.25	353.1	0.15	298.9
	28	29		0	58.92	3974	2.87	36.95		0.18		0.00		0.00	0.1	0.000	52.150	17.210	54.22	600	92.37	92.15	100.6	0.219	0.283	0.150	1.02	287.1	0.19	232.9
	29	30		0	58.92	3974	2.87	36.95		0.18		0.00		0.00	0.1	0.000	52.150	17.210	54.22	600	92.13	91.91	94.3	0.233	0.283	0.150	1.05	296.6	0.18	242.4
30	30	31	1.85	127	60.77	4101	2.86	38.00		0.18		0.00		0.00	0.1	1.850	54.000	17.820	55.88	600	91.8	91.69	51.3	0.214	0.283	0.150	1.01	284.3	0.20	228.4
	31	32		0	60.77	4101	2.86	38.00		0.18		0.00		0.00	0.1	0.000	54.000	17.820	55.88	600	91.67	91.56	40.1	0.274	0.283	0.150	1.14	321.6	0.17	265.7
32	101	102	35.65	2460	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	35.650	35.650	11.765	35.77	375	95.7	95.59	40.3	0.273	0.110	0.094	0.83	91.6	0.39	55.8
	102	103		0	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	0.000	35.650	11.765	35.77	375	95.57	95.27	110.5	0.271	0.110	0.094	0.83	91.4	0.39	55.6
	103	104		0	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	0.000	35.650	11.765	35.77	375	95.22	95.14	31.5	0.254	0.110	0.094	0.80	88.4	0.40	52.6
	104	105		0	35.65	2460	3.01	24.01		0.00		0.00		0.00	0.0	0.000	35.650	11.765	35.77	375	95.12	95.04	33.7	0.237	0.110	0.094	0.77	85.4	0.42	49.7
32A	105	106	12.60	870	48.25	3330	2.92	31.54		0.00		0.00		0.00	0.0	12.600	48.250	15.923	47.46	375	94.98	94.87	19.7	0.558	0.110	0.094	1.19	131.0	0.36	83.6
	106	107		0	48.25	3330	2.92	31.54		0.00		0.00		0.00	0.0	0.000	48.250	15.923	47.46	375	94.86	94.82	17.4	0.230	0.110	0.094	0.76	84.1	0.56	36.6
	107	108		0	48.25	3330	2.92	31.54		0.00		0.00		0.00	0.0	0.000	48.250	15.923	47.46	375	94.77	94.6	67.5	0.252	0.110	0.094	0.80	88.0	0.54	40.5
32B	108	109	9.12	630	57.37	3960	2.87	36.83		0.00		0.00		0.00	0.0	9.120	57.370	18.932	55.76	375	94.59	94.38	70.2	0.299	0.110	0.094	0.87	95.9	0.58	40.1
	109	110		0	57.37	3960	2.87	36.83		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.76	375	94.38	94.22	57.0	0.281	0.110	0.094	0.84	92.9	0.60	37.1

SANITARY SEWER CALCULATION SHEET - EXISTING CONDITIONS

PROJECT: **Kanata Golf and Country Club**
LOCATION: **7000 Campeau Drive**
FILE REF: **18-1061**
DATE: **28-May-20**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280 L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =3.8		Infiltration / Inflow	0.33 L/s/ha
Avg. Daily Flow Comm.	28,000 L/ha/d	Harmon Correction Factor	0.8	Min. Pipe Velocity	0.60 m/s full flowing
Avg. Daily Flow Instit.	28,000 L/ha/d	Peak Fact. Comm.	1 (< 20% ICI)	Max. Pipe Velocity	3.00 m/s full flowing
Avg. Daily Flow Indust.	35,000 L/ha/d	Peak Fact. Instit.	1 (< 20% ICI)	Mannings N	0.013
Ex. Population Per Hectare*	69 Pop/Ha	Peak Fact. Indust. per MOE graph			

*Based on an average from Areas 2, 12 and 10.

DSEL

Location			Residential Area and Population						Commercial		Institutional		Industrial		Infiltration				Pipe Data											
Area ID	Up	Down	Area (ha)	Pop.	Cumulative Area (ha)	Cumulative Pop.	Peak. Fact. (-)	Q_{res} (L/s)	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Area (ha)	Accu. Area (ha)	Q_{C+I+I} (L/s)	Total Area (ha)	Accu. Area (ha)	Infiltration Flow (L/s)	Total Flow (L/s)	DIA (mm)	Upstream Invert (m)	Downstream Invert (m)	Length (m)	Slope (%)	$A_{hydraulic}$ (m^2)	R (m)	Velocity (m/s)	Q_{cap} (L/s)	Q / Q full (-)	Qresidual (L/s)
	110	111		0	57.37	3960	2.87	36.83		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.76	375	94.18	93.94	57.0	0.421	0.110	0.094	1.03	113.8	0.49	58.0
	111	112		0	57.37	3960	2.87	36.83		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.76	375	93.9	93.77	43.0	0.302	0.110	0.094	0.87	96.4	0.58	40.6
	112	113		0	57.37	3960	2.87	36.83		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.76	375	93.76	93.63	42.0	0.310	0.110	0.094	0.88	97.5	0.57	41.8
	113	32		0	57.37	3960	2.87	36.83		0.00		0.00		0.00	0.0	0.000	57.370	18.932	55.76	375	93.63	93.4	43.0	0.535	0.110	0.094	1.16	128.2	0.43	72.5
Weslock Way																														
	32	33		0	118.14	8061	2.64	68.91		0.18		0.00		0.00	0.1	0.000	111.370	36.752	105.72	600	91.496	91.374	52.0	0.235	0.283	0.150	1.05	297.4	0.36	191.7
	33	34		0	118.14	8061	2.64	68.91		0.18		0.00		0.00	0.1	0.000	111.370	36.752	105.72	600	91.334	91.249	41.0	0.207	0.283	0.150	0.99	279.6	0.38	173.9
	34	35		0	118.14	8061	2.64	68.91		0.18		0.00		0.00	0.1	0.000	111.370	36.752	105.72	600	91.243	91.162	41.9	0.193	0.283	0.150	0.95	270.0	0.39	164.3
	35	36		0	118.14	8061	2.64	68.91		0.18		0.00		0.00	0.1	0.000	111.370	36.752	105.72	600	91.084	90.91	65.2	0.267	0.283	0.150	1.12	317.2	0.33	211.5
	36	37		0	118.14	8061	2.64	68.91		0.18		0.00		0.00	0.1	0.000	111.370	36.752	105.72	600	90.91	90.792	64.6	0.183	0.283	0.150	0.93	262.4	0.40	156.7
37	37	38	3.52	243	121.66	8304	2.63	70.71		0.18		0.00		0.00	0.1	3.520	114.890	37.914	108.68	600	90.792	90.613	45.6	0.393	0.283	0.150	1.36	384.7	0.28	276.0
	38	39		0	121.66	8304	2.63	70.71		0.18		0.00		0.00	0.1	0.000	114.890	37.914	108.68	600	90.61	90.509	38.0	0.266	0.283	0.150	1.12	316.6	0.34	207.9
39	39	40	5.02	349	126.68	8653	2.61	73.29		0.18		0.00		0.00	0.1	5.020	119.910	39.570	112.92	600	90.509	90.278	89.3	0.259	0.283	0.150	1.10	312.3	0.36	199.4
	40	41		0	126.68	8653	2.61	73.29		0.18		0.00		0.00	0.1	0.000	119.910	39.570	112.92	600	90.278	90.14	51.5	0.268	0.283	0.150	1.12	317.8	0.36	204.9
	41	42		0	126.68	8653	2.61	73.29		0.18		0.00		0.00	0.1	0.000	119.910	39.570	112.92	600	90.14	90.02	78.7	0.152	0.283	0.150	0.85	239.8	0.47	126.8
	42	43		0	126.68	8653	2.61	73.29		0.18		0.00		0.00	0.1	0.000	119.910	39.570	112.92	600	90	89.8	79.9	0.250	0.283	0.150	1.09	307.2	0.37	194.3
Walden Drive																														
43	43	44	10.63	733	137.31	9386	2.59	78.65		0.18		0.00		0.00	0.1	10.630	130.540	43.078	121.79	600	89.76	89.6	55.3	0.289	0.283	0.150	1.17	330.3	0.37	208.5
	44	45		0	137.31	9386	2.59	78.65		0.18		0.00		0.00	0.1	0.000	130.540	43.078	121.79	600	89.59	89.48	46.3	0.238	0.283	0.150	1.06	299.4	0.41	177.6
	45	46		0	137.31	9386	2.59	78.65		0.18		0.00		0.00	0.1	0.000	130.540	43.078	121.79	600	89.48	89.141	129.4	0.262	0.283	0.150	1.11	314.3	0.39	192.5
46A	46	47		0	0.00	0	3.80	0.00		0.00	5.22	5.22		0.00	1.7	5.220	135.760	44.801	46.49											
46	46	47	95.85	6613	233.16	15999	2.40	124.44		0.18	0.81	6.03		0.00	2.0	96.660	362.960	119.777	246.23	675	86.294	86.019	84.0	0.327	0.358	0.169	1.34	481.0	0.51	234.7
Kimmins Court																														
	47	48		0	233.16	15999	2.40	124.44		0.18		6.03		0.00	2.0	0.000	362.960	119.777	246.23	675	85.903	85.788	50.8	0.226	0.358	0.169	1.12	399.9	0.62	153.6
48	48	49	2.93	202	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	2.930	365.890	120.744	248.54	675	85.788	85.678	31.4	0.351	0.358	0.169	1.39	497.9	0.50	249.4
	49	50		0	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	0.000	365.890	120.744	248.54	675	85.678	85.603	26.2	0.286	0.358	0.169	1.26	449.7	0.55	201.2
	50	51		0	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	0.000	365.890	120.744	248.54	675	85.603	85.345	93.2	0.277	0.358	0.169	1.24	442.2	0.56	193.7
	51	52		0	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	0.000	365.890	120.744	248.54	675	85.315	85.201	40.7	0.280	0.358	0.169	1.24	444.9	0.56	196.3
	52	53		0	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	0.000	365.890	120.744	248.54	675	85.168	85.041	65.8	0.193	0.358	0.169	1.03	369.4	0.67	120.9
	53	54		0	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	0.000	365.890	120.744	248.54	675	85.01	84.875	54.5	0.248	0.358	0.169	1.17	418.4	0.59	169.8
	54	55		0	236.09	16202	2.40	125.78		0.18		6.03		0.00	2.0	0.000	365.890	120.744	248.54	675	81.286	80.992	47.3	0.622	0.358	0.169	1.85	662.7	0.38	414.2
Station Road																														
Future Development	55	56	180.03	10805	416.12	27007	2.22	194.11		0.18		6.03		0.00	2.0	180.030	545.920	180.154	376.27	750	81.286	80.992	96.4	0.305	0.442	0.188	1.39	614.8	0.61	238.5
	56	57		0	416.12	27007	2.22	194.11		0.18		6.03		0.00	2.0	0.000	545.920	180.154	376.27	750	80.971	80.673	111.1	0.268	0.442	0.188	1.31	576.6	0.65	200.3
	57	57A		0	416.12	27007	2.22	194.11		0.18		6.03		0.00	2.0	0.000	545.920	180.154	376.27	750	80.673	80.096	54.1	1.067	0.442	0.188	2.60	1149.7	0.33	773.4
	57A	58		0	416.12	27007	2.22	194.11		0.18		6.03		0.00	2.0	0.000	545.920	180.154	376.27	750	78.316	78.038	56.5	0.492	0.442	0.188	1.77	780.9	0.48	404.6
58	58	59	11.65	0	427.77	27007	2.22	194.11	2.86	3.04		6.03		0.00	2.9	14.510	560.430	184.942	381.99	750	76.138	75.961	63.4	0.279	0.442	0.188	1.33	588.2	0.65	206.2
	59	60		0	427.77	27007	2.22	194.11		3.04		6.03		0.00	2.9	0.000	560.430	184.942	381.99	750	76.138	75.666	95.1	0.496	0.442	0.188	1.78	784.3	0.49	402.3
60	60	61	24.02	0	451.79	27007	2.22	194.11	4.05	7.09		6.03		0.00	4.3	28.070	588.500	194.205	392.56	750	75.659	75.413	43.1	0.571	0.442	0.188	1.90	841.1	0.47	448.5
	61	62		0	451.79	27007	2.22	194.11		7.09		6.03		0.00	4.3	0.000	588.500	194.205	392.56	750	75.36	75.062	96.8	0.308	0.442	0.188	1.40	617.7	0.64	225.1
62	62	63	2.08	0	453.87	27007	2.22	194.11	1.20	8.29		6.03		0.00	4.6	3.280	591.780	195.287	394.03	750	74.999	74.779	79.8	0.276	0.442	0.188	1.32	584.5	0.67	190.5
	63	64		0	453.87	27007	2.22	194.11		8.29		6.03		0.00	4.6	0.000	591.780	195.287	394.03	750	74.748	74.581	54.3	0.308	0.442	0.188	1.40	617.4	0.64	223.4
	64	65		0	453.87	27007	2.22	194.11		8.29		6.03		0.00	4.6	0.000	591.780	195.287	394.03	750	74.562	74.413	47.1	0.316	0.442	0.188	1.42	626.2	0.63	232.1
	65	66	0.32	22	454.19	27029	2.22	194.24	0.22	8.51		6.03		0.00	4.7	0.540	592.320	195.466	394.42	750	74.368	74.128	76.8	0.312	0.442	0.188	1.41	622.3	0.63	227.9
	66	67		0	454.19	27029	2.22	194.24		8.51		6.03		0.00	4.7	0.000	592.320	195.466	394.42	750	74.121	73.824	81.2	0.366	0.442	0.188	1.52	673.3	0.59	278.9
	67	68		0	454.19	27029	2.22	194.24		8.51		6.03		0.00	4.7	0.000	592.320	195.466	394.42	750	73.787	73.727	17.2	0.349	0.442	0.188	1.49	657.5	0.60	263.1
	68	69		0	454.19	27029	2.22	194.24		8.51		6.03		0.00	4.7	0.000	592.320	195.466	394.42	750	73.7	73.466	81.8	0.286	0.442	0.188	1.35	595.4	0.66	201.0

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

Ottawa

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
CAMPEAU DRIVE																											
CONSTANT FLOW PER KANATA LAKES & MARCHWOOD TRUNK SEWER HGL ANALYSIS PREPARED BY THE CITY OF OTTAWA																				43.8							
	1	2				0.00	0				0.00		0.00		0.00	0.00	0.00	0.00	0.00	43.83	16.9	525	0.296	233.98	0.19	1.08	0.82
2	2	3	7.53		520	7.53	520	3.4	5.68	0.07	0.07		0.00		0.00	0.02	7.60	7.60	2.51	52.04	78.2	525	0.243	212.00	0.25	0.98	0.81
	3	4				7.53	520	3.4	5.68		0.07		0.00		0.00	0.02	0.00	7.60	2.51	52.04	76.4	525	0.275	225.53	0.23	1.04	0.84
4	4	5	12.88		889	20.41	1409	3.2	14.43		0.07		0.00		0.00	0.02	12.88	20.48	6.76	65.04	24.1	525	0.290	231.60	0.28	1.07	0.92
5	5	6	1.31			21.72	1409	3.2	14.43	0.11	0.18		0.00		0.00	0.06	1.42	21.90	7.23	65.54	91.7	525	0.251	215.46	0.30	1.00	0.87
	6	1020A				21.72	1409	3.2	14.43		0.18		0.00		0.00	0.06	0.00	21.90	7.23	65.54	100.6	525	0.249	214.60	0.31	0.99	0.87
To STREET 7, Pipe 1020A - 1021A						21.72	1409				0.18		0.00		0.00			21.90									
STREET 19																											
Contribution From STREET 1, Pipe 4019A - 4020A						1.45	100				0.00		0.00		0.00		1.45	1.45									
	4020A	4021A	0.58		40	2.03	140	3.6	1.62		0.00		0.00		0.00	0.00	0.58	2.03	0.67	2.29	92.5	200	0.35	19.40	0.12	0.62	0.41
	4021A	4022A				2.03	140	3.6	1.62		0.00		0.00		0.00	0.00	0.00	2.03	0.67	2.29	16.5	200	0.35	19.40	0.12	0.62	0.41
	4022A	4023A	0.41		28	2.44	168	3.5	1.93		0.00		0.00		0.00	0.00	0.41	2.44	0.81	2.73	37.0	200	4.40	68.80	0.04	2.19	1.06
To STREET 18, Pipe 4023A - 4024A						2.44	168				0.00		0.00		0.00			2.44									
STREET 15																											
	4013A	4014A	0.41		28	0.41	28	3.7	0.33		0.00		0.00		0.00	0.00	0.41	0.41	0.14	0.47	53.0	200	1.35	38.11	0.01	1.21	0.41
	4014A	4015A	0.06		4	0.47	32	3.7	0.38		0.00		0.00		0.00	0.00	0.06	0.47	0.16	0.54	10.5	200	1.10	34.40	0.02	1.09	0.40
	4015A	4016A	0.13		9	0.60	41	3.7	0.49		0.00		0.00		0.00	0.00	0.13	0.60	0.20	0.68	32.5	200	6.00	80.34	0.01	2.56	0.78
To STREET 18, Pipe 4016A - 4023A						0.60	41				0.00		0.00		0.00			0.60									
STREET 18																											
Contribution From STREET 1, Pipe 4003A - 4007A						0.70	49				0.00		0.00		0.00		0.70	0.70									
Contribution From STREET 1, Pipe 4006A - 4007A						1.41	98				0.00		0.00		0.00		1.41	2.11									
	4007A	4008A	0.31		21	2.42	168	3.5	1.93		0.00		0.00		0.00	0.00	0.31	2.42	0.80	2.73	11.0	200	0.35	19.40	0.14	0.62	0.43
	4008A	4009A				2.42	168	3.5	1.93		0.00		0.00		0.00	0.00	0.00	2.42	0.80	2.73	22.5	200	0.35	19.40	0.14	0.62	0.43
	4009A	4010A	0.22		15	2.64	183	3.5	2.09		0.00		0.00		0.00	0.00	0.22	2.64	0.87	2.96	26.0	200	0.35	19.40	0.15	0.62	0.44
	4010A	4011A	0.29		20	2.93	203	3.5	2.31		0.00		0.00		0.00	0.00	0.29	2.93	0.97	3.28	31.0	200	0.35	19.40	0.17	0.62	0.46
	4011A	4012A	0.30		21	3.23	224	3.5	2.54		0.00		0.00		0.00	0.00	0.30	3.23	1.07	3.61	35.5	200	0.35	19.40	0.19	0.62	0.47
	4012A	4016A	0.34		23	3.57	247	3.5	2.79		0.00		0.00		0.00	0.00	0.34	3.57	1.18	3.97	50.0	200	0.35	19.40	0.20	0.62	0.48
Contribution From STREET 15, Pipe 4015A - 4016A						0.60	41				0.00		0.00		0.00		0.60	4.17									
	4016A	4023A	0.38		26	4.55	314	3.5	3.52		0.00		0.00		0.00	0.00	0.38	4.55	1.50	5.02	70.0	200	0.35	19.40	0.26	0.62	0.52
Contribution From STREET 19, Pipe 4022A - 4023A						2.44	168				0.00		0.00		0.00		2.44	6.99									
	4023A	4024A	0.16		11	7.15	493	3.4	5.40		0.00		0.00		0.00	0.00	0.16	7.15	2.36	7.76	37.0	250	0.35	35.18	0.22	0.72	0.57
	4024A	4025A	0.38		26	7.53	519	3.4	5.67		0.00		0.00		0.00	0.00	0.38	7.53	2.48	8.16	40.5	250	0.35	35.18	0.23	0.72	0.58
	4025A	4026A	0.41		28	7.94	547	3.4	5.96		0.00		0.00		0.00	0.00	0.41	7.94	2.62	8.58	39.0	250	0.35	35.18	0.24	0.72	0.59
	4026A	4027A	0.37		26	8.31	573	3.4	6.23		0.00		0.00		0.00	0.00	0.37	8.31	2.74	8.97	48.5	250	0.35	35.18	0.26	0.72	0.60
			0.40		28	8.71	601				0.00		0.00		0.00		0.40	8.71									
	4027A	4028A	0.40		28	9.11	629	3.3	6.80		0.00		0.00		0.00	0.00	0.40	9.11	3.01	9.81	71.5	250	0.25	29.73	0.33	0.61	0.54
To BLOCK 5, Pipe 4028A - 4029A						9.11	629				0.00		0.00		0.00			9.11									
BLOCK 5																											
Contribution From STREET 18, Pipe 4027A - 4028A						9.11	629				0.00		0.00		0.00		9.11	9.11									
	4028A	4029A	0.49		34	9.60	663	3.3	7.15		0.00		0.00		0.00	0.00	0.49	9.60	3.17	10.32	99.5	250	0.25	29.73	0.35	0.61	0.55
To WESLOCK WAY, Pipe 6013A - 34						9.60	663				0.00		0.00		0.00			9.60									
STREET 17																											
	6000A	6001A	0.44		30	0.44	30	3.7	0.36		0.00		0.00		0.00	0.00	0.44	0.44	0.15	0.50	41.0	200	0.65	26.44	0.02	0.84	0.33
	6001A	6002A	0.34		23	0.78	53	3.6	0.63		0.00		0.00		0.00	0.00	0.34	0.78	0.26	0.88	45.0	250	0.25	29.73	0.03	0.61	0.27
	6002A	6003A	0.44		30	1.22	83	3.6	0.97		0.00		0.00		0.00	0.00	0.44	1.22	0.40	1.37	63.0	250	0.25	29.73	0.05	0.61	0.31
	6003A	6004A	0.56		39	1.78	122	3.6	1.41		0.00		0.00		0.00	0.00	0.56	1.78	0.59	2.00	73.5	250	0.25	29.73	0.07	0.61	0.34
	6004A	6005A	0.70		49	2.48	171	3.5	1.96		0.00		0.00		0.00	0.00	0.70	2.48	0.82	2.78	94.0	250	0.25	29.73	0.09	0.61	0.38
	6005A	6006A	0.35		24	2.83	195	3.5	2.23		0.00		0.00		0.00	0.00	0.35	2.83	0.93	3.16	54.0	250	0.25	29.73	0.11	0.61	0.39
	6006A	6007A	0.65		45	3.48	240	3.5	2.72		0.00		0.00		0.00	0.00	0.65	3.48	1.15	3.87	81.0	250	0.25	29.73	0.13	0.61	0.41
	6007A	6008A	0.70		49	4.18	289	3.5	3.25		0.00		0.00		0.00	0.00	0.70	4.18	1.38	4.63	74.0	250	0.25	29.73	0.16	0.61	0.44
	6008A	6009A	1.07		75	5.25	364	3.4	4.05		0.00		0.00		0.00	0.00	1.07	5.25	1.73	5.78	116.0	250	0.25	29.73	0.19	0.61	0.47
	6009A	6010A	1.02		71	6.27	435	3.4	4.80		0.00		0.00		0.00	0.00	1.02	6.27	2.07	6.87	21.0	250	0.25	29.73	0.23	0.61	0.49

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha						
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph					
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha		
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s		
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc)	0.013	
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7			
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4			

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2	File Ref: 18-1061	Date: **22 May 2020**	Sheet No. 1 of 9

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

Ottawa

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	6010A	6011A	0.33		23	6.60	458	3.4	5.04		0.00		0.00		0.00	0.00	0.33	6.60	2.18	7.22	76.5	250	0.25	29.73	0.24	0.61	0.50
To BLOCK 6, Pipe 6011A - 6012A						6.60	458				0.00		0.00		0.00			6.60									
BLOCK 6																											
Contribution From STREET 17, Pipe 6010A - 6011A						6.60	458				0.00		0.00		0.00		6.60	6.60									
	6011A	6012A				6.60	458	3.4	5.04		0.00		0.00		0.00	0.00	0.00	6.60	2.18	7.22	92.5	250	0.25	29.73	0.24	0.61	0.50
	6012A	6013A				6.60	458	3.4	5.04		0.00		0.00		0.00	0.00	0.00	6.60	2.18	7.22	44.5	250	0.35	35.18	0.21	0.72	0.56
To WESLOCK WAY, Pipe 6013A - 34						6.60	458				0.00		0.00		0.00			6.60									
STREET 8																											
	2012A	2013A	0.26		18	0.26	18	3.7	0.22		0.00		0.00		0.00	0.00	0.26	0.26	0.09	0.30	52.0	200	0.65	26.44	0.01	0.84	0.28
	2013A	2014A	0.34		23	0.60	41	3.7	0.49		0.00		0.00		0.00	0.00	0.34	0.60	0.20	0.68	65.0	200	0.35	19.40	0.04	0.62	0.29
To STREET 7, Pipe 2014A - 2015A						0.60	41				0.00		0.00		0.00			0.60									
STREET 7																											
			0.47		33	0.47	33				0.00		0.00		0.00		0.47	0.47									
	2005A	2006A	0.83		58	1.30	91	3.6	1.06		0.00		0.00		0.00	0.00	0.83	1.30	0.43	1.49	64.5	200	1.70	42.76	0.03	1.36	0.63
	2006A	2007A	0.64		44	1.94	135	3.6	1.56		0.00		0.00		0.00	0.00	0.64	1.94	0.64	2.20	72.5	200	0.35	19.40	0.11	0.62	0.41
To STREET 7, Pipe 2007A - 2008A						1.94	135				0.00		0.00		0.00			1.94									
	2009A	2010A	1.41		99	1.41	99	3.6	1.15		0.00		0.00		0.00	0.00	1.41	1.41	0.47	1.62	115.0	200	0.80	29.34	0.06	0.93	0.49
	2010A	2011A	1.61		113	3.02	212	3.5	2.41		0.00		0.00		0.00	0.00	1.61	3.02	1.00	3.41	11.0	200	0.35	19.40	0.18	0.62	0.46
	2011A	2014A	0.54		37	3.56	249	3.5	2.82		0.00		0.00		0.00	0.00	0.54	3.56	1.17	3.99	64.5	200	0.40	20.74	0.19	0.66	0.51
Contribution From STREET 8, Pipe 2013A - 2014A						0.60	41				0.00		0.00		0.00		0.60	4.16									
	2014A	2015A	0.37		26	4.53	316	3.5	3.54		0.00		0.00		0.00	0.00	0.37	4.53	1.49	5.03	72.5	200	0.35	19.40	0.26	0.62	0.52
To STREET 7, Pipe 2015A - 2016A						4.53	316				0.00		0.00		0.00			4.53									
BLOCK 8																											
Contribution From STREET 7, Pipe 2015A - 2016A						11.03	769				0.00		0.00		0.00		11.03	11.03									
	2016A	2017A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	12.5	250	0.25	29.73	0.40	0.61	0.57
	2017A	2018A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	29.5	250	0.25	29.73	0.40	0.61	0.57
	2018A	2019A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	58.5	250	0.25	29.73	0.40	0.61	0.57
	2019A	2020A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	37.5	250	0.25	29.73	0.40	0.61	0.57
	2020A	2021A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	69.0	250	0.25	29.73	0.40	0.61	0.57
	2021A	2022A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	5.5	250	0.25	29.73	0.40	0.61	0.57
	2022A	2023A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	61.0	250	0.25	29.73	0.40	0.61	0.57
	2023A	2024A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	46.0	250	0.25	29.73	0.40	0.61	0.57
To KNUDSON DRIVE, Pipe 2024A - 27						11.03	769				0.00		0.00		0.00			11.03									
BLOCK 11																											
	1046A	1047A				0.00					0.00		0.00		0.00	0.00	0.00	0.00	0.00	0.00	60.0	200	0.65	26.44	0.00	0.84	0.05
To STREET 11, Pipe 1047A - 1048A						0.00	0				0.00		0.00		0.00			0.00									
STREET 11																											
	1043A	1044A	0.59		41	0.59	41	3.7	0.49		0.00		0.00		0.00	0.00	0.59	0.59	0.19	0.68	61.5	200	0.65	26.44	0.03	0.84	0.36
	1044A	1045A	0.22		15	0.81	56	3.6	0.66		0.00		0.00		0.00	0.00	0.22	0.81	0.27	0.93	29.5	250	0.25	29.73	0.03	0.61	0.27
	1045A	1047A	0.33		23	1.14	79	3.6	0.93		0.00		0.00		0.00	0.00	0.33	1.14	0.38	1.30	49.0	250	0.30	32.57	0.04	0.66	0.32
Contribution From BLOCK 11, Pipe 1046A - 1047A						0.00	0				0.00		0.00		0.00		0.00	1.14									
	1047A	1048A				1.14	79	3.6	0.93		0.00		0.00		0.00	0.00	0.00	1.14	0.38	1.30	38.0	250	0.90	56.42	0.02	1.15	0.46

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2	File Ref: 18-1061	Date: **22 May 2020**	Sheet No. 2 of 9

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	1048A	1051A	0.44		30	1.58	109	3.6	1.27		0.00		0.00		0.00	0.00	0.44	1.58	0.52	1.79	10.0	250	1.60	75.22	0.02	1.53	0.63
To STREET 9, Pipe 1051A - 1052A						1.58	109				0.00		0.00		0.00			1.58									
STREET 12																											
	1039A	1040A	0.21		14	0.21	14	3.7	0.17		0.00		0.00		0.00	0.00	0.21	0.21	0.07	0.24	48.0	200	0.70	27.44	0.01	0.87	0.27
	1040A	1041A				0.21	14	3.7	0.17		0.00		0.00		0.00	0.00	0.00	0.21	0.07	0.24	61.0	200	0.70	27.44	0.01	0.87	0.27
	1041A	1042A	0.36		25	0.57	39	3.7	0.46		0.00		0.00		0.00	0.00	0.36	0.57	0.19	0.65	9.0	200	0.35	19.40	0.03	0.62	0.29
To STREET 9, Pipe 1042A - 1053A						0.57	39				0.00		0.00		0.00			0.57									
STREET 13																											
	1035A	1036A	0.30		21	0.30	21	3.7	0.25		0.00		0.00		0.00	0.00	0.30	0.30	0.10	0.35	61.0	200	0.65	26.44	0.01	0.84	0.29
	1036A	1037A	0.35		24	0.65	45	3.7	0.53		0.00		0.00		0.00	0.00	0.35	0.65	0.21	0.75	76.0	250	0.25	29.73	0.03	0.61	0.25
	1037A	1038A				0.65	45	3.7	0.53		0.00		0.00		0.00	0.00	0.00	0.65	0.21	0.75	9.0	250	0.25	29.73	0.03	0.61	0.25
To STREET 9, Pipe 1038A - 1042A						0.65	45				0.00		0.00		0.00			0.65									
STREET 14																											
	1030A	1031A	0.34		23	0.34	23	3.7	0.28		0.00		0.00		0.00	0.00	0.34	0.34	0.11	0.39	82.5	200	0.65	26.44	0.01	0.84	0.29
	1031A	1032A				0.34	23	3.7	0.28		0.00		0.00		0.00	0.00	0.00	0.34	0.11	0.39	79.5	250	0.25	29.73	0.01	0.61	0.21
	1032A	1033A				0.34	23	3.7	0.28		0.00		0.00		0.00	0.00	0.00	0.34	0.11	0.39	3.0	250	0.25	29.73	0.01	0.61	0.21
	1033A	1034A	0.49		34	0.83	57	3.6	0.67		0.00		0.00		0.00	0.00	0.49	0.83	0.27	0.95	10.5	250	0.25	29.73	0.03	0.61	0.27
To STREET 9, Pipe 1034A - 1038A						0.83	57				0.00		0.00		0.00			0.83									
STREET 5																											
Contribution From STREET 1, Pipe 1001A - 1002A						1.25	87				0.00		0.00		0.00		1.25	1.25									
	1002A	1006A	0.28		19	1.53	106	3.6	1.23		0.00		0.00		0.00	0.00	0.28	1.53	0.50	1.74	74.5	200	0.35	19.40	0.09	0.62	0.38
Contribution From STREET 2, Pipe 1005A - 1006A						0.68	47				0.00		0.00		0.00		0.68	2.21									
	1006A	1007A				2.21	153	3.6	1.76		0.00		0.00		0.00	0.00	0.00	2.21	0.73	2.49	14.5	200	0.35	19.40	0.13	0.62	0.42
	1007A	1008A	0.29		20	2.50	173	3.5	1.98		0.00		0.00		0.00	0.00	0.29	2.50	0.83	2.81	29.0	200	0.35	19.40	0.14	0.62	0.44
	1008A	1025A	0.83		58	3.33	231	3.5	2.62		0.00		0.00		0.00	0.00	0.83	3.33	1.10	3.72	118.0	200	0.35	19.40	0.19	0.62	0.47
To STREET 7, Pipe 1025A - 1026A						3.33	231				0.00		0.00		0.00			3.33									
STREET 6																											
	1015A	1016A	0.11		8	0.11	8	3.7	0.10		0.00		0.00		0.00	0.00	0.11	0.11	0.04	0.13	15.0	200	2.30	49.74	0.00	1.58	0.32
	1016A	1017A	0.16		11	0.27	19	3.7	0.23		0.00		0.00		0.00	0.00	0.16	0.27	0.09	0.32	46.0	200	2.30	49.74	0.01	1.58	0.43
	1017A	1018A	0.71		50	0.98	69	3.6	0.81		0.00		0.00		0.00	0.00	0.71	0.98	0.32	1.13	46.0	200	0.35	19.40	0.06	0.62	0.33
	1018A	1019A	0.50		35	1.48	104	3.6	1.21		0.00		0.00		0.00	0.00	0.50	1.48	0.49	1.70	45.5	200	0.35	19.40	0.09	0.62	0.37
	1019A	1023A	0.50		35	1.98	139	3.6	1.60		0.00		0.00		0.00	0.00	0.50	1.98	0.65	2.26	68.0	200	0.35	19.40	0.12	0.62	0.41
To STREET 7, Pipe 1023A - 1024A						1.98	139				0.00		0.00		0.00			1.98									
Contribution From STREET 1, Pipe 1010A - 1012A						1.32	92				0.00		0.00		0.00		1.32	1.32									
Contribution From STREET 1, Pipe 1011A - 1012A						0.92	64				0.00		0.00		0.00		0.92	2.24									
	1012A	1013A	0.26		18	2.50	174	3.5	1.99		0.00		0.00		0.00	0.00	0.26	2.50	0.83	2.82	64.0	200	0.35	19.40	0.15	0.62	0.44
	1013A	1014A	0.10		7	2.60	181	3.5	2.07		0.00		0.00		0.00	0.00	0.10	2.60	0.86	2.93	19.0	200	0.35	19.40	0.15	0.62	0.44
	1014A	1023A	1.33		93	3.93	274	3.5	3.09		0.00		0.00		0.00	0.00	1.33	3.93	1.30	4.38	104.0	200	0.35	19.40	0.23	0.62	0.50
To STREET 7, Pipe 1023A - 1024A						3.93	274				0.00		0.00		0.00			3.93									
STREET 7																											
	2000A	2001A	0.79		55	0.79	55	3.6	0.65		0.00		0.00		0.00	0.00	0.79	0.79	0.26	0.91	89.0	200	0.65	26.44	0.03	0.84	0.39
	2001A	2002A	0.84		59	1.63	114	3.6	1.32		0.00		0.00		0.00	0.00	0.84	1.63	0.54	1.86	77.5	200	0.35	19.40	0.10	0.62	0.39
	2002A	2003A	0.70		49	2.33	163	3.5	1.87		0.00		0.00		0.00	0.00	0.70	2.33	0.77	2.64	62.5	200	0.35	19.40	0.14	0.62	0.43
	2003A	2004A				2.33	163	3.5	1.87		0.00		0.00		0.00	0.00	0.00	2.33	0.77	2.64	48.0	200	0.35	19.40	0.14	0.62	0.43
	2004A	2007A	0.64		44	2.97	207	3.5	2.36		0.00		0.00		0.00	0.00	0.64	2.97	0.98	3.34	24.5	200	0.35	19.40	0.17	0.62	0.46
Contribution From STREET 7, Pipe 2006A - 2007A						1.94	135				0.00		0.00		0.00		1.94	4.91									
	2007A	2008A	0.56		39	5.47	381	3.4	4.23		0.00		0.00		0.00	0.00	0.56	5.47	1.81	6.03	65.0	200	0.35	19.40	0.31	0.62	0.54
	2008A	2015A	1.03		72	6.50	453	3.4	4.99		0.00		0.00		0.00	0.00	1.03	6.50	2.15	7.13	65.0	200	0.35	19.40	0.37	0.62	0.57
Contribution From STREET 7, Pipe 2014A - 2015A						4.53	316				0.00		0.00		0.00		4.53	11.03									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha	
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow = 0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity = 0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc) 0.013 (Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff= 2.7
Institutional =	0.32	l/s/Ha			Single house coeff= 3.4

Designed: SLM

Checked: ADF

Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2

PROJECT: **7000 Campeau Drive**

LOCATION: **City of Ottawa**

File Ref: 18-1061

Date: **22 May 2020**

Sheet No. 3 of 9

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

Ottawa

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	2015A	2016A				11.03	769	3.3	8.22		0.00		0.00		0.00	0.00	0.00	11.03	3.64	11.86	4.5	250	0.25	29.73	0.40	0.61	0.57
To BLOCK 8, Pipe 2016A - 2017A						11.03	769				0.00		0.00		0.00			11.03									
Contribution From CAMPEAU DRIVE, Pipe 6 - 1020A						21.72	1409				0.18		0.00		0.00		0.00	21.90									
			0.56		0	22.28	1409				0.18		0.00		0.00		0.56	22.46									
	1020A	1021A				22.28	1409	3.2	14.43		0.18		0.00		0.00	0.06	0.00	22.46	7.41	65.73	35.0	525	0.15	166.56	0.39	0.77	0.72
	1021A	1022A				22.28	1409	3.2	14.43		0.18		0.00		0.00	0.06	0.00	22.46	7.41	65.73	15.0	525	0.10	136.00	0.48	0.63	0.62
	1022A	1023A	0.75		52	23.03	1461	3.2	14.92		0.18		0.00		0.00	0.06	0.75	23.21	7.66	66.46	98.0	525	0.10	136.00	0.49	0.63	0.62
Contribution From STREET 6, Pipe 1014A - 1023A						3.93	274				0.00		0.00		0.00		3.93	27.14									
Contribution From STREET 6, Pipe 1019A - 1023A						1.98	139				0.00		0.00		0.00		1.98	29.12									
	1023A	1024A	0.12		8	29.06	1882	3.1	18.82		0.18		0.00		0.00	0.06	0.12	29.24	9.65	72.35	31.5	525	0.10	136.00	0.53	0.63	0.64
	1024A	1025A	0.18		12	29.24	1894	3.1	18.92		0.18		0.00		0.00	0.06	0.18	29.42	9.71	72.52	42.0	525	0.10	136.00	0.53	0.63	0.64
Contribution From STREET 5, Pipe 1008A - 1025A						3.33	231				0.00		0.00		0.00		3.33	32.75									
	1025A	1026A	0.16		11	32.73	2136	3.1	21.12		0.18		0.00		0.00	0.06	0.16	32.91	10.86	75.87	43.0	525	0.10	136.00	0.56	0.63	0.64
	1026A	1027A	0.67		47	33.40	2183	3.0	21.54		0.18		0.00		0.00	0.06	0.67	33.58	11.08	76.51	91.5	525	0.10	136.00	0.56	0.63	0.65
To STREET 9, Pipe 1027A - 1028A						33.40	2183				0.18		0.00		0.00			33.58		0.00							
BLOCK 10																											
Contribution From STREET 9, Pipe 1042A - 1053A						36.42	2392				0.18		0.00		0.00		36.60	36.60		0.00							
Contribution From STREET 9, Pipe 1052A - 1053A						3.30	229				0.00		0.00		0.00		3.30	39.90									
	1053A	1054A				39.72	2621	3.0	25.42		0.18		0.00		0.00	0.06	0.00	39.90	13.17	82.48	86.0	525	0.26	219.29	0.38	1.01	0.94
To ROSENFIELD CRESCENT, Pipe 1054A - 11						39.72	2621				0.18		0.00		0.00			39.90		82.48							
ROSENFIELD CRESCENT																											
Contribution From STREET 9, Pipe 1052A - 1053A						39.72	2621				0.18		0.00		0.00		39.90	39.90									
	1054A	11	3.39		234	43.11	2855	3.0	27.47		0.18		0.00		0.00	0.06	3.39	43.29	14.29	85.64	19.1	525	0.262	220.13	0.39	1.02	0.95
	11	12				43.11	2855	3.0	27.47		0.18		0.00		0.00	0.06	0.00	43.29	14.29	85.64	80.9	525	0.247	213.74	0.40	0.99	0.93
To SHERK CRESCENT, Pipe 12 - 13						43.11	2855				0.18		0.00		0.00			43.29		85.64							
SHERK CRESCENT																											
Contribution From ROSENFIELD CRESCENT, Pipe 11 - 12						43.11	2855				0.18		0.00		0.00		43.29	43.29									
	12	13	6.53		450	49.64	3305	2.9	31.33		0.18		0.00		0.00	0.06	6.53	49.82	16.44	91.66	23.2	525	0.302	236.34	0.39	1.09	1.02
	13	14				49.64	3305	2.9	31.33		0.18		0.00		0.00	0.06	0.00	49.82	16.44	91.66	50.5	525	0.297	234.37	0.39	1.08	1.01
	14	15				49.64	3305	2.9	31.33		0.18		0.00		0.00	0.06	0.00	49.82	16.44	91.66	92.2	525	0.249	214.60	0.43	0.99	0.95
	15	16				49.64	3305	2.9	31.33		0.18		0.00		0.00	0.06	0.00	49.82	16.44	91.66	37.8	525	0.212	198.02	0.46	0.91	0.89
	16	17				49.64	3305	2.9	31.33		0.18		0.00		0.00	0.06	0.00	49.82	16.44	91.66	88.5	525	0.271	223.88	0.41	1.03	0.98
To KNUDSON DRIVE, Pipe 17 - 18						49.64	3305				0.18		0.00		0.00			49.82		91.66							
STREET 9																											
	1055A	1056A	0.91		64	0.91	64	3.6	0.75		0.00		0.00		0.00	0.00	0.91	0.91	0.30	1.05	113.0	200	0.65	26.44	0.04	0.84	0.41
	1056A	1057A	0.34		23	1.25	87	3.6	1.02		0.00		0.00		0.00	0.00	0.34	1.25	0.41	1.43	30.0	200	0.35	19.40	0.07	0.62	0.36
	1057A	1058A	0.81		57	2.06	144	3.6	1.66		0.00		0.00		0.00	0.00	0.81	2.06	0.68	2.34	89.5	200	0.35	19.40	0.12	0.62	0.41
	1058A	1059A	0.88		61	2.94	205	3.5	2.34		0.00		0.00		0.00	0.00	0.88	2.94	0.97	3.31	89.5	200	0.35	19.40	0.17	0.62	0.46
	1059A	1060A				2.94	205	3.5	2.34		0.00		0.00		0.00	0.00	0.00	2.94	0.97	3.31	4.0	200	0.35	19.40	0.17	0.62	0.46
To BLOCK 14, Pipe 1060A - 1061A						2.94	205				0.00		0.00		0.00			2.94									
	1049A	1050A	1.40		98	1.40	98	3.6	1.14		0.00		0.00		0.00	0.00	1.40	1.40	0.46	1.60	86.0	200	0.90	31.12	0.05	0.99	0.51
	1050A	1051A	0.07		5	1.47	103	3.6	1.20		0.00		0.00		0.00	0.00	0.07	1.47	0.49	1.68	15.0	200	0.70	27.44	0.06	0.87	0.48
Contribution From STREET 11, Pipe 1048A - 1051A						1.58	109				0.00		0.00		0.00		1.58	3.05									
	1051A	1052A	0.05		3	3.10	215	3.5	2.45		0.00		0.00		0.00	0.00	0.05	3.10	1.02	3.47	15.0	250	0.50	42.05	0.08	0.86	0.51
	1052A	1053A	0.20		14	3.30	229	3.5	2.60		0.00		0.00		0.00	0.00	0.20	3.30	1.09	3.69	47.5	250	0.85	54.83	0.07	1.12	0.63
To BLOCK 10, Pipe 1053A - 1054A						3.30	229				0.00		0.00		0.00			3.30									
Contribution From STREET 7, Pipe 1026A - 1027A						33.40	2183				0.18		0.00		0.00		33.58	33.58									
	1027A	1028A	0.19		13	33.59	2196	3.0	21.66		0.18		0.00		0.00	0.06	0.19	33.77	11.14	76.69	42.5	525	0.10	136.00	0.56	0.63	0.65
	1028A	1029A				33.59	2196	3.0	21.66		0.18		0.00		0.00	0.06	0.00	33.77	11.14	76.69	30.5	525	0.10	136.00	0.56	0.63	0.65
	1029A	1034A	0.23		16	33.82	2212	3.0	21.80		0.18		0.00		0.00	0.06	0.23	34.00	11.22	76.91	7.0	525	0.10	136.00	0.57	0.63	0.65
Contribution From STREET 14, Pipe 1033A - 1034A						0.83	57				0.00		0.00		0.00		0.83	34.83									
	1034A	1038A	0.23		16	34.88	2285	3.0	22.45		0.18		0.00		0.00	0.06	0.23	35.06	11.57	77.91	47.0	525	0.10	136.00	0.57	0.63	0.65

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2	File Ref: 18-1061	Date: **22 May 2020**	Sheet No. 4 of 9

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
Contribution From STREET 13, Pipe 1037A - 1038A						0.65	45				0.00		0.00		0.00		0.65	35.71									
	1038A	1042A	0.23		16	35.76	2346	3.0	23.00		0.18		0.00		0.00	0.06	0.23	35.94	11.86	78.74	48.0	525	0.10	136.00	0.58	0.63	0.65
Contribution From STREET 12, Pipe 1041A - 1042A						0.57	39				0.00		0.00		0.00		0.57	36.51									
	1042A	1053A	0.09		7	36.42	2392	3.0	23.40		0.18		0.00		0.00	0.06	0.09	36.60	12.08	79.37	18.5	525	0.10	136.00	0.58	0.63	0.65
To BLOCK 10, Pipe 1053A - 1054A						36.42	2392				0.18		0.00		0.00			36.60		0.00							
BLOCK 14																											
Contribution From STREET 9, Pipe 1059A - 1060A						2.94	205				0.00		0.00		0.00		2.94	2.94									
	1060A	1061A	0.32		22	3.26	227	3.5	2.58		0.00		0.00		0.00	0.00	0.32	3.26	1.08	3.65	54.5	200	0.35	19.40	0.19	0.62	0.47
	1061A	1062A	0.14		10	3.40	237	3.5	2.69		0.00		0.00		0.00	0.00	0.14	3.40	1.12	3.81	50.0	200	0.35	19.40	0.20	0.62	0.48
	1062A	1063A				3.40	237	3.5	2.69		0.00		0.00		0.00	0.00	0.00	3.40	1.12	3.81	13.0	200	0.35	19.40	0.20	0.62	0.48
To KNUDSON DRIVE, Pipe 1063A - MH 17B						3.40	237				0.00		0.00		0.00			3.40		0.00							
STREET 2																											
	3008A	3009A	0.26		18	0.26	18	3.7	0.22		0.00		0.00		0.00	0.00	0.26	0.26	0.09	0.30	66.0	200	0.65	26.44	0.01	0.84	0.28
To STREET 1, Pipe 3009A - 3010A						0.26	18				0.00		0.00		0.00			0.26									
	3008A	3013A	0.29		20	0.29	20	3.7	0.24		0.00		0.00		0.00	0.00	0.29	0.29	0.10	0.34	12.5	200	0.65	26.44	0.01	0.84	0.28
	3013A	3014A	1.40		98	1.69	118	3.6	1.37		0.00		0.00		0.00	0.00	1.40	1.69	0.56	1.93	112.0	200	0.40	20.74	0.09	0.66	0.41
	3014A	3015A	0.96		67	2.65	185	3.5	2.12		0.00		0.00		0.00	0.00	0.96	2.65	0.87	2.99	107.5	200	0.45	22.00	0.14	0.70	0.49
	3015A	3016A	0.85		59	3.50	244	3.5	2.76		0.00		0.00		0.00	0.00	0.85	3.50	1.16	3.92	103.5	200	0.40	20.74	0.19	0.66	0.50
	3016A	3017A	0.14		10	3.64	254	3.5	2.87		0.00		0.00		0.00	0.00	0.14	3.64	1.20	4.07	10.5	200	0.35	19.40	0.21	0.62	0.49
	3017A	3018A	0.26		18	3.90	272	3.5	3.06		0.00		0.00		0.00	0.00	0.26	3.90	1.29	4.35	67.0	200	0.45	22.00	0.20	0.70	0.54
To STREET 1, Pipe 3018A - 3019A						3.90	272				0.00		0.00		0.00			3.90									
STREET 2																											
	1003A	1004A	0.19		13	0.19	13	3.7	0.16		0.00		0.00		0.00	0.00	0.19	0.19	0.06	0.22	17.0	200	2.60	52.89	0.00	1.68	0.40
	1004A	1005A	0.19		13	0.38	26	3.7	0.31		0.00		0.00		0.00	0.00	0.19	0.38	0.13	0.44	22.0	200	2.50	51.86	0.01	1.65	0.50
	1005A	1006A	0.30		21	0.68	47	3.7	0.56		0.00		0.00		0.00	0.00	0.30	0.68	0.22	0.78	52.0	200	3.45	60.92	0.01	1.94	0.65
To STREET 5, Pipe 1006A - 1007A						0.68	47				0.00		0.00		0.00			0.68									
	3000A	3001A	0.48		33	0.48	33	3.7	0.39		0.00		0.00		0.00	0.00	0.48	0.48	0.16	0.55	54.5	200	0.65	26.44	0.02	0.84	0.33
	3001A	3002A	0.28		19	0.76	52	3.6	0.61		0.00		0.00		0.00	0.00	0.28	0.76	0.25	0.87	36.5	200	0.35	19.40	0.04	0.62	0.31
	3002A	3003A	0.24		16	1.00	68	3.6	0.80		0.00		0.00		0.00	0.00	0.24	1.00	0.33	1.13	12.0	200	0.35	19.40	0.06	0.62	0.33
	3003A	3006A	0.26		18	1.26	86	3.6	1.01		0.00		0.00		0.00	0.00	0.26	1.26	0.42	1.42	64.5	200	0.35	19.40	0.07	0.62	0.36
To STREET 1, Pipe 3006A - 3007A						1.26	86				0.00		0.00		0.00			1.26									
STREET4																											
	5007A	5008A	0.33		23	0.33	23	3.7	0.28		0.00		0.00		0.00	0.00	0.33	0.33	0.11	0.38	38.5	200	0.65	26.44	0.01	0.84	0.29
	5008A	5009A	0.19		13	0.52	36	3.7	0.43		0.00		0.00		0.00	0.00	0.19	0.52	0.17	0.60	11.0	200	0.35	19.40	0.03	0.62	0.28
	5009A	5010A	0.38		26	0.90	62	3.6	0.73		0.00		0.00		0.00	0.00	0.38	0.90	0.30	1.03	51.0	200	0.60	25.41	0.04	0.81	0.39
	5010A	5011A				0.90	62	3.6	0.73		0.00		0.00		0.00	0.00	0.00	0.90	0.30	1.03	4.0	200	0.35	19.40	0.05	0.62	0.33
	5011A	5012A	0.31		21	1.21	83	3.6	0.97		0.00		0.00		0.00	0.00	0.31	1.21	0.40	1.37	45.0	200	2.25	49.20	0.03	1.57	0.67
To STREET 16, Pipe 5012A - 5013A						1.21	83				0.00		0.00		0.00			1.21									
STREET 1																											
	1011A	1012A	0.92		64	0.92	64	3.6	0.75		0.00		0.00		0.00	0.00	0.92	0.92	0.30	1.06	63.5	200	0.80	29.34	0.04	0.93	0.43
To STREET 6, Pipe 1012A - 1013A						0.92	64				0.00		0.00		0.00			0.92									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM

Checked: ADF

Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2

PROJECT: **7000 Campeau Drive**

LOCATION: **City of Ottawa**

File Ref: 18-1061

Date: **22 May 2020**

Sheet No. 5 of 9

1061_SAN.xlsx

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
	5005A	5006A	0.36		25	0.36	25	3.7	0.30		0.00		0.00		0.00	0.00	0.36	0.36	0.12	0.42	27.0	200	1.05	33.61	0.01	1.07	0.36
To STREET 16, Pipe 5006A - 5012A						0.36	25				0.00		0.00		0.00			0.36									
	1000A	1001A	0.39		27	0.39	27	3.7	0.32		0.00		0.00		0.00	0.00	0.39	0.39	0.13	0.45	52.5	200	1.70	42.76	0.01	1.36	0.43
	1001A	1002A	0.86		60	1.25	87	3.6	1.02		0.00		0.00		0.00	0.00	0.86	1.25	0.41	1.43	72.0	200	2.35	50.28	0.03	1.60	0.70
To STREET 5, Pipe 1002A - 1006A						1.25	87				0.00		0.00		0.00			1.25									
	1009A	1010A	0.14		10	0.14	10	3.7	0.12		0.00		0.00		0.00	0.00	0.14	0.14	0.05	0.17	24.0	200	0.65	26.44	0.01	0.84	0.23
	1010A	1012A	1.18		82	1.32	92	3.6	1.07		0.00		0.00		0.00	0.00	1.18	1.32	0.44	1.51	59.5	200	0.35	19.40	0.08	0.62	0.36
To STREET 6, Pipe 1012A - 1013A						1.32	92				0.00		0.00		0.00			1.32									
	4004A	4005A	0.72		50	0.72	50	3.7	0.59		0.00		0.00		0.00	0.00	0.72	0.72	0.24	0.83	53.0	200	0.65	26.44	0.03	0.84	0.38
	4005A	4006A	0.52		36	1.24	86	3.6	1.01		0.00		0.00		0.00	0.00	0.52	1.24	0.41	1.41	24.0	200	0.35	19.40	0.07	0.62	0.36
	4006A	4007A	0.17		12	1.41	98	3.6	1.14		0.00		0.00		0.00	0.00	0.17	1.41	0.47	1.61	32.0	200	0.35	19.40	0.08	0.62	0.37
To STREET 18, Pipe 4007A - 4008A						1.41	98				0.00		0.00		0.00			1.41									
	4017A	4018A	0.52		36	0.52	36	3.7	0.43		0.00		0.00		0.00	0.00	0.52	0.52	0.17	0.60	42.0	200	0.65	26.44	0.02	0.84	0.34
	4018A	4019A	0.35		24	0.87	60	3.6	0.71		0.00		0.00		0.00	0.00	0.35	0.87	0.29	0.99	32.5	200	0.35	19.40	0.05	0.62	0.32
	4019A	4020A	0.58		40	1.45	100	3.6	1.17		0.00		0.00		0.00	0.00	0.58	1.45	0.48	1.64	52.0	200	2.00	46.38	0.04	1.48	0.68
To STREET 19, Pipe 4020A - 4021A						1.45	100				0.00		0.00		0.00			1.45									
	4000A	4001A	0.23		16	0.23	16	3.7	0.19		0.00		0.00		0.00	0.00	0.23	0.23	0.08	0.27	26.5	200	0.65	26.44	0.01	0.84	0.27
	4001A	4002A	0.13		9	0.36	25	3.7	0.30		0.00		0.00		0.00	0.00	0.13	0.36	0.12	0.42	27.5	200	0.35	19.40	0.02	0.62	0.25
	4002A	4003A	0.17		12	0.53	37	3.7	0.44		0.00		0.00		0.00	0.00	0.17	0.53	0.17	0.62	35.0	200	0.35	19.40	0.03	0.62	0.28
	4003A	4007A	0.17		12	0.70	49	3.7	0.58		0.00		0.00		0.00	0.00	0.17	0.70	0.23	0.81	37.5	200	4.35	68.41	0.01	2.18	0.73
To STREET 18, Pipe 4007A - 4008A						0.70	49				0.00		0.00		0.00			0.70									
	5000A	5001A	0.55		38	0.55	38	3.7	0.45		0.00		0.00		0.00	0.00	0.55	0.55	0.18	0.63	35.5	200	1.00	32.80	0.02	1.04	0.41
	5001A	5002A				0.55	38	3.7	0.45		0.00		0.00		0.00	0.00	0.00	0.55	0.18	0.63	5.0	200	1.80	44.00	0.01	1.40	0.49
	5002A	5003A	0.40		28	0.95	66	3.6	0.78		0.00		0.00		0.00	0.00	0.40	0.95	0.31	1.09	69.0	200	0.80	29.34	0.04	0.93	0.44
	5003A	5004A	0.21		14	1.16	80	3.6	0.94		0.00		0.00		0.00	0.00	0.21	1.16	0.38	1.32	41.0	200	0.70	27.44	0.05	0.87	0.44
	5004A	5006A	0.22		15	1.38	95	3.6	1.11		0.00		0.00		0.00	0.00	0.22	1.38	0.46	1.56	33.5	200	3.25	59.13	0.03	1.88	0.80
To STREET 16, Pipe 5006A - 5012A						1.38	95				0.00		0.00		0.00			1.38									
	3004A	3005A	0.21		14	0.21	14	3.7	0.17		0.00		0.00		0.00	0.00	0.21	0.21	0.07	0.24	27.0	200	0.65	26.44	0.01	0.84	0.26
	3005A	3006A	0.38		26	0.59	40	3.7	0.48		0.00		0.00		0.00	0.00	0.38	0.59	0.19	0.67	60.0	200	1.15	35.17	0.02	1.12	0.43
Contribution From STREET 2, Pipe 3003A - 3006A						1.26	86				0.00		0.00		0.00		1.26	1.85									
	3006A	3007A	0.42		29	2.27	155	3.5	1.78		0.00		0.00		0.00	0.00	0.42	2.27	0.75	2.53	64.5	200	0.35	19.40	0.13	0.62	0.42
	3007A	3009A				2.27	155	3.5	1.78		0.00		0.00		0.00	0.00	0.00	2.27	0.75	2.53	8.5	200	1.85	44.61	0.06	1.42	0.76
Contribution From STREET 2, Pipe 3008A - 3009A						0.26	18				0.00		0.00		0.00		0.26	2.53									
	3009A	3010A	0.42		29	2.95	202	3.5	2.30		0.00		0.00		0.00	0.00	0.42	2.95	0.97	3.28	64.5	200	0.35	19.40	0.17	0.62	0.46
	3010A	3011A	0.90		63	3.85	265	3.5	2.99		0.00		0.00		0.00	0.00	0.90	3.85	1.27	4.26	64.5	200	0.35	19.40	0.22	0.62	0.49
	3011A	3012A	0.83		58	4.68	323	3.5	3.61		0.00		0.00		0.00	0.00	0.83	4.68	1.54	5.16	109.5	200	0.35	19.40	0.27	0.62	0.52
	3012A	3018A	0.84		59	5.52	382	3.4	4.24		0.00		0.00		0.00	0.00	0.84	5.52	1.82	6.06	109.5	200	0.75	28.40	0.21	0.90	0.71
Contribution From STREET 2, Pipe 3017A - 3018A						3.90	272				0.00		0.00		0.00		3.90	9.42									
	3018A	3019A	0.58		40	10.00	694	3.3	7.46		0.00		0.00		0.00	0.00	0.58	10.00	3.30	10.76	75.5	200	0.35	19.40	0.55	0.62	0.63
To KNUDSON STREET, Pipe 3019A - 101						10.00	694				0.00		0.00		0.00			10.00									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha				
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph			
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =		0.330	L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =		0.600	m/s
Max Res. Peak Factor =	4.00				Manning's n =	(Conc)	0.013	(Pvc) 0.013
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=		2.7	
Institutional =	0.32	l/s/Ha			Single house coeff=		3.4	

Designed: SLM	PROJECT: **7000 Campeau Drive**
Checked: ADF	LOCATION: **City of Ottawa**
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2	File Ref: 18-1061 · Date: **22 May 2020** · Sheet No. 6 of 9

1061_SAN.xlsx

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
STREET 16																											
Contribution From STREET 1, Pipe 5004A - 5006A						1.38	95				0.00		0.00		0.00		1.38	1.38									
Contribution From STREET 1, Pipe 5005A - 5006A						0.36	25				0.00		0.00		0.00		0.36	1.74									
	5006A	5012A	0.50		35	2.24	155	3.5	1.78		0.00		0.00		0.00	0.00	0.50	2.24	0.74	2.52	89.0	200	0.35	19.40	0.13	0.62	0.42
Contribution From STREET4, Pipe 5011A - 5012A						1.21	83				0.00		0.00		0.00		1.21	3.45									
	5012A	5013A	0.76		53	4.21	291	3.5	3.27		0.00		0.00		0.00	0.00	0.76	4.21	1.39	4.66	92.0	200	0.35	19.40	0.24	0.62	0.50
	5013A	5014A	0.42		29	4.63	320	3.5	3.58		0.00		0.00		0.00	0.00	0.42	4.63	1.53	5.11	47.5	200	0.70	27.44	0.19	0.87	0.67
	5014A	5015A	0.60		42	5.23	362	3.4	4.03		0.00		0.00		0.00	0.00	0.60	5.23	1.73	5.75	107.5	200	0.90	31.12	0.18	0.99	0.75
	5015A	5016A	0.28		19	5.51	381	3.4	4.23		0.00		0.00		0.00	0.00	0.28	5.51	1.82	6.05	57.5	200	1.00	32.80	0.18	1.04	0.80
	5016A	5017A				5.51	381	3.4	4.23		0.00		0.00		0.00	0.00	0.00	5.51	1.82	6.05	39.5	200	1.00	32.80	0.18	1.04	0.80
To WESLOCK WAY, Pipe 5017A - 41						5.51	381				0.00		0.00		0.00			5.51									
KNUDSON DRIVE																											
	17A	1062A	6.95		480	6.95	480	3.4	5.27		0.00		0.00		0.00	0.00	6.95	6.95	2.29	7.56	81.0	250	0.339	34.62	0.22	0.71	0.56
Contribution From BLOCK 14, Pipe 1062A - 1063A						3.40	237.00				0.00		0.00		0.00		0.00	3.40									
	1062A	17B				10.35	717	3.3	7.69		0.00		0.00		0.00	0.00	0.00	10.35	3.42	11.11	29.0	250	0.339	34.62	0.32	0.71	0.62
	17B	17				10.35	717	3.3	7.69		0.00		0.00		0.00	0.00	0.00	10.35	3.42	11.11	228.1	250	0.300	32.57	0.34	0.66	0.60
Contribution From SHERK CRESCENT, Pipe 16 - 17						49.64	3305				0.18		0.00		0.00		49.82	49.82									
	17	18	2.79		193	62.78	4215	2.9	38.93		0.18		0.00		0.00	0.06	2.79	62.96	20.78	103.60	42.8	525	0.304	237.12	0.44	1.10	1.06
	18	19				62.78	4215	2.9	38.93		0.18		0.00		0.00	0.06	0.00	62.96	20.78	103.60	57.9	525	0.415	277.05	0.37	1.28	1.18
	19	20	1.86		128	64.64	4343	2.8	39.98		0.18		0.00		0.00	0.06	1.86	64.82	21.39	105.26	83.5	525	0.240	210.69	0.50	0.97	0.97
	20	21				64.64	4343	2.8	39.98		0.18		0.00		0.00	0.06	0.00	64.82	21.39	105.26	51.2	525	0.254	216.74	0.49	1.00	0.99
	21	22				64.64	4343	2.8	39.98		0.18		0.00		0.00	0.06	0.00	64.82	21.39	105.26	71.9	525	0.292	232.39	0.45	1.07	1.04
	22	23	5.17		356	69.81	4699	2.8	42.88		0.18		0.00		0.00	0.06	5.17	69.99	23.10	109.87	37.5	525	0.267	222.22	0.49	1.03	1.02
	23	25				69.81	4699	2.8	42.88		0.18		0.00		0.00	0.06	0.00	69.99	23.10	109.87	61.6	600	0.210	281.38	0.39	1.00	0.93
	25	2024A				69.81	4699	2.8	42.88		0.18		0.00		0.00	0.06	0.00	69.99	23.10	109.87	31.3	600	0.256	310.67	0.35	1.10	1.00
Contribution From BLOCK 8, Pipe 2023A - 2024A						11.03	769.00				0.00		0.00		0.00		0.00	11.03									
	2024A	27	4.99		344	85.83	5812	2.7	51.74		0.18		0.00		0.00	0.06	4.99	86.01	28.38	124.01	57.5	600	0.191	378.21	0.33	1.34	1.19
	27	28				85.83	5812	2.7	51.74		0.18		0.00		0.00	0.06	0.00	86.01	28.38	124.01	51.4	600	0.331	353.26	0.35	1.25	1.13
	28	29				85.83	5812	2.7	51.74		0.18		0.00		0.00	0.06	0.00	86.01	28.38	124.01	100.6	600	0.219	287.34	0.43	1.02	0.97
	29	30				85.83	5812	2.7	51.74		0.18		0.00		0.00	0.06	0.00	86.01	28.38	124.01	94.3	600	0.233	296.38	0.42	1.05	1.00
	30	31	1.85		127	87.68	5939	2.7	52.73		0.18		0.00		0.00	0.06	1.85	87.86	28.99	125.62	51.3	600	0.214	284.04	0.44	1.00	0.97
	31	32				87.68	5939	2.7	52.73		0.18		0.00		0.00	0.06	0.00	87.86	28.99	125.62	40.1	600	0.274	321.40	0.39	1.14	1.06
						87.68	5939				0.18		0.00		0.00			87.86									
To WESLOCK WAY, Pipe 32 - 6013A																											
Contribution From STREET 1, Pipe 3018A - 3019A						10.00	694.00				0.00		0.00		0.00		0.00	10.00									
	3019A	101	35.65		2460	45.65	3154	2.9	30.04		0.00		0.00		0.00	0.00	35.65	45.65	15.06	45.11	12.0	375	0.273	91.61	0.49	0.83	0.83
	101	102				45.65	3154	2.9	30.04		0.00		0.00		0.00	0.00	0.00	45.65	15.06	45.11	40.3	375	0.273	91.61	0.49	0.83	0.83
	102	103				45.65	3154	2.9	30.04		0.00		0.00		0.00	0.00	0.00	45.65	15.06	45.11	110.5	375	0.271	91.27	0.49	0.83	0.82
	103	104				45.65	3154	2.9	30.04		0.00		0.00		0.00	0.00	0.00	45.65	15.06	45.11	31.5	375	0.254	88.36	0.51	0.80	0.80
	104	105				45.65	3154	2.9	30.04		0.00		0.00		0.00	0.00	0.00	45.65	15.06	45.11	33.7	375	0.237	85.36	0.53	0.77	0.78
	105	106	12.60		870	58.25	4024	2.9	37.36		0.00		0.00		0.00	0.00	12.60	58.25	19.22	56.58	19.7	375	0.558	130.97	0.43	1.19	1.14
	106	107				58.25	4024	2.9	37.36		0.00		0.00		0.00	0.00	0.00	58.25	19.22	56.58	17.4	375	0.230	84.09	0.67	0.76	0.82
	107	108				58.25	4024	2.9	37.36		0.00		0.00		0.00	0.00	0.00	58.25	19.22	56.58	67.5	375	0.252	88.02	0.64	0.80	0.84
	108	109	9.12		630	67.37	4654	2.8	42.52		0.00		0.00		0.00	0.00	9.12	67.37	22.23	64.75	70.2	375	0.299	95.87	0.68	0.87	0.93
	109	110				67.37	4654	2.8	42.52		0.00		0.00		0.00	0.00	0.00	67.37	22.23	64.75	57.0	375	0.281	92.94	0.70	0.84	0.91
	110	111				67.37	4654	2.8	42.52		0.00		0.00		0.00	0.00	0.00	67.37	22.23	64.75	57.0	375	0.421	113.76	0.57	1.03	1.06
	111	112				67.37	4654	2.8	42.52		0.00		0.00		0.00	0.00	0.00	67.37	22.23	64.75	43.0	375	0.302	96.35	0.67	0.87	0.94
	112	113				67.37	4654	2.8	42.52		0.00		0.00		0.00	0.00	0.00	67.37	22.23	64.75	42.0	375	0.310	97.62	0.66	0.88	0.94
	113	32				67.37	4654	2.8	42.52		0.00		0.00		0.00	0.00	0.00	67.37	22.23	64.75	53.0	375	0.535	128.24	0.50	1.16	1.16
To WESLOCK WAY, Pipe 32 - 6013A						67.37	4654				0.00		0.00		0.00			67.37									

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha
Average Daily Flow =	280	l/p/day		
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha
Max Res. Peak Factor =	4.00			
Commercial/Inst./Park Peak Factor =	1.00			
Institutional =	0.32	l/s/Ha		

Industrial Peak Factor = as per MOE Graph
Extraneous Flow = 0.330 L/s/ha
Minimum Velocity = 0.600 m/s
Manning's n = (Conc) 0.013 (Pvc) 0.013
Townhouse coeff= 2.7
Single house coeff= 3.4

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2	File Ref: 18-1061	Date: **22 May 2020**	Sheet No. 7 of 9

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION: STREET	FROM M.H.	TO M.H.	RESIDENTIAL AREA AND POPULATION: AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	COMM AREA (ha)	COMM ACCU. AREA (ha)	INSTIT AREA (ha)	INSTIT ACCU. AREA (ha)	PARK AREA (ha)	PARK ACCU. AREA (ha)	C+I+I PEAK FLOW (l/s)	INFILTRATION TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	PIPE DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
WESLOCK WAY																											
Contribution From KNUDSON DRIVE, Pipe 31 - 32						87.68	5939.00				0.18		0.00		0.00		0.00	87.86									
Contribution From KNUDSON DRIVE, Pipe 113 - 32						67.37	4654.00				0.00		0.00		0.00		0.00	67.37									
	32	6013A				155.05	10593	2.5	87.33		0.18		0.00		0.00	0.06	0.00	155.23	51.23	182.44	52.0	600	0.235	297.65	0.61	1.05	1.11
Contribution From BLOCK 6, Pipe 6012A - 6013A						6.60	458.00				0.00		0.00		0.00		0.00	6.60									
	6013A	34				161.65	11051	2.5	90.58		0.18		0.00		0.00	0.06	0.00	161.83	53.40	187.87	41.0	600	0.207	461.80	0.41	1.63	1.54
	34	35				161.65	11051	2.5	90.58		0.18		0.00		0.00	0.06	0.00	161.83	53.40	187.87	41.9	600	0.193	269.75	0.70	0.95	1.03
	35	4029A				161.65	11051	2.5	90.58		0.18		0.00		0.00	0.06	0.00	161.83	53.40	187.87	65.2	600	0.267	317.27	0.59	1.12	1.17
Contribution From BLOCK 5, Pipe 4028A - 4029A						9.60	663.00				0.00		0.00		0.00		0.00	9.60									
	4029A	37				171.25	11714	2.5	95.24		0.18		0.00		0.00	0.06	0.00	171.43	56.57	195.70	64.6	600	0.183	450.53	0.43	1.59	1.54
	37	38	3.52		243	174.77	11957	2.5	96.94		0.18		0.00		0.00	0.06	3.52	174.95	57.73	198.56	45.6	600	0.393	384.92	0.52	1.36	1.37
	38	39				174.77	11957	2.5	96.94		0.18		0.00		0.00	0.06	0.00	174.95	57.73	198.56	38.0	600	0.266	316.68	0.63	1.12	1.18
	39	5017A	5.02		349	179.79	12306	2.5	99.37		0.18		0.00		0.00	0.06	5.02	179.97	59.39	202.65	89.3	600	0.259	312.48	0.65	1.11	1.17
Contribution From STREET 16, Pipe 5016A - 5017A						5.51	381.00				0.00		0.00		0.00		0.00	5.51									
	5017A	41				185.30	12687	2.5	102.01		0.18		0.00		0.00	0.06	0.00	185.48	61.21	207.11	51.5	600	0.268	520.52	0.40	1.84	1.73
	41	42				185.30	12687	2.5	102.01		0.18		0.00		0.00	0.06	0.00	185.48	61.21	207.11	78.7	600	0.152	239.39	0.87	0.85	0.95
	42	43				185.30	12687	2.5	102.01		0.18		0.00		0.00	0.06	0.00	185.48	61.21	207.11	79.9	600	0.250	307.01	0.67	1.09	1.16
To WALDEN DRIVE, Pipe 43 - 44						185.30	12687				0.18		0.00		0.00			185.48									
WALDEN DRIVE																											
Contribution From WESLOCK WAY, Pipe 42 - 43						185.30	12687.00				0.18		0.00		0.00		0.00	185.48									
	43	44	10.63		733	195.93	13420	2.5	107.05		0.18		0.00		0.00	0.06	10.63	196.11	64.72	215.66	55.3	600	0.289	330.08	0.65	1.17	1.24
	44	45				195.93	13420	2.5	107.05		0.18		0.00		0.00	0.06	0.00	196.11	64.72	215.66	46.3	600	0.238	299.55	0.72	1.06	1.15
	45	46				195.93	13420	2.5	107.05		0.18		0.00		0.00	0.06	0.00	196.11	64.72	215.66	129.4	600	0.262	314.29	0.69	1.11	1.20
	46	47	95.85		6613	291.78	20033	2.3	150.71		0.18	0.81	0.81		0.00	0.32	96.66	292.77	96.61	291.47	84.0	675	0.327	480.68	0.61	1.34	1.41
To KIMMINS COURT, Pipe 47 - 48						291.78	20033				0.18		0.81		0.00			292.77									
KIMMINS COURT																											
Contribution From WALDEN WAY, Pipe 46 - 47						291.78	20033.00				0.18		0.81		0.00		0.00	292.77									
	47	48				291.78	20033	2.3	150.71		0.18		0.81		0.00	0.32	0.00	292.77	96.61	291.47	50.8	675	0.226	399.61	0.73	1.12	1.22
	48	49	2.93		202	294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	2.93	295.70	97.58	293.73	31.4	675	0.351	498.01	0.59	1.39	1.45
	49	50				294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	0.00	295.70	97.58	293.73	26.2	675	0.286	449.54	0.65	1.26	1.34
	50	51				294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	0.00	295.70	97.58	293.73	93.2	675	0.277	442.41	0.66	1.24	1.32
	51	52				294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	0.00	295.70	97.58	293.73	40.7	675	0.280	444.80	0.66	1.24	1.33
	52	53				294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	0.00	295.70	97.58	293.73	65.8	675	0.193	369.29	0.80	1.03	1.14
	53	54				294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	0.00	295.70	97.58	293.73	54.5	675	0.248	418.61	0.70	1.17	1.26
	54	55				294.71	20235	2.3	152.00		0.18		0.81		0.00	0.32	0.00	295.70	97.58	293.73	47.3	675	0.622	662.95	0.44	1.85	1.79
To STATION ROAD, Pipe 55-56						294.71	20235				0.18		0.81		0.00			295.70									
STATION ROAD																											
Contribution From KIMMINS COURT, Pipe54 - 55						294.71	20235.00				0.18		0.81		0.00		0.00	295.70									
	55	56	180.03		10805	474.74	31040	2.2	218.30		0.18		0.81		0.00	0.32	180.03	475.73	156.99	419.44	96.4	750	0.305	614.83	0.68	1.39	1.50
	56	57				474.74	31040	2.2	218.30		0.18		0.81		0.00	0.32	0.00	475.73	156.99	419.44	111.1	750	0.268	576.33	0.73	1.30	1.42
	57	58				474.74	31040	2.2	218.30		0.18		0.81		0.00	0.32	0.00	475.73	156.99	419.44	110.6	750	0.492	780.88	0.54	1.77	1.80
	58	59	11.65			486.39	31040	2.2	218.30	2.86	3.04		0.81		0.00	1.25	14.51	490.24	161.78	425.16	63.4	750	0.279	588.04	0.72	1.33	1.45
	59	60				486.39	31040	2.2	218.30		3.04		0.81		0.00	1.25	0.00	490.24	161.78	425.16	95.1	750	0.496	784.05	0.54	1.77	1.80
	60	61	24.02			510.41	31040	2.2	218.30	4.05	7.09		0.81		0.00	2.56	28.07	518.31	171.04	435.73	43.1	750	0.571	841.24	0.52	1.90	1.92

DESIGN PARAMETERS

Park Flow =	9300	L/ha/da	0.10764	l/s/Ha		
Average Daily Flow =	280	l/p/day			Industrial Peak Factor = as per MOE Graph	
Comm/Inst Flow =	28000	L/ha/da	0.3241	l/s/Ha	Extraneous Flow =	0.330 L/s/ha
Industrial Flow =	35000	L/ha/da	0.40509	l/s/Ha	Minimum Velocity =	0.600 m/s
Max Res. Peak Factor =	4.00				Manning's n = (Conc) 0.013 (Pvc) 0.013	
Commercial/Inst./Park Peak Factor =	1.00				Townhouse coeff=	2.7
Institutional =	0.32	l/s/Ha			Single house coeff=	3.4

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2	File Ref: 18-1061	Date: **22 May 2020**	Sheet No. 8 of 9

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION							COMM		INSTIT		PARK		C+I+I	INFILTRATION				PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	POP.	CUMULATIVE AREA (ha)	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW (l/s)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	AREA (ha)	ACCU. AREA (ha)	PEAK FLOW (l/s)	TOTAL AREA (ha)	ACCU. AREA (ha)	INFILT. FLOW (l/s)	TOTAL FLOW (l/s)	DIST (m)	DIA (mm)	SLOPE (%)	CAP. (FULL) (l/s)	RATIO Q act/Q cap	VEL. (FULL) (m/s)	VEL. (ACT.) (m/s)
STATION ROAD																											
	61	62				510.41	31040	2.2	218.30		7.09		0.81		0.00	2.56	0.00	518.31	171.04	435.73	96.8	750	0.308	617.84	0.71	1.40	1.51
	62	63	2.08			512.49	31040	2.2	218.30	1.20	8.29		0.81		0.00	2.95	3.28	521.59	172.12	437.21	79.8	750	0.278	586.98	0.74	1.33	1.45
	63	64				512.49	31040	2.2	218.30		8.29		0.81		0.00	2.95	0.00	521.59	172.12	437.21	54.3	750	0.308	617.84	0.71	1.40	1.52
	64	65				512.49	31040	2.2	218.30		8.29		0.81		0.00	2.95	0.00	521.59	172.12	437.21	47.1	750	0.316	625.82	0.70	1.42	1.53
	65	66	0.32			512.81	31040	2.2	218.30	0.22	8.51		0.81		0.00	3.02	0.54	522.13	172.30	437.46	76.8	750	0.312	621.84	0.70	1.41	1.52
	66	67				512.81	31040	2.2	218.30		8.51		0.81		0.00	3.02	0.00	522.13	172.30	437.46	81.2	750	0.366	673.51	0.65	1.52	1.62
	67	68				512.81	31040	2.2	218.30		8.51		0.81		0.00	3.02	0.00	522.13	172.30	437.46	17.2	750	0.349	657.68	0.67	1.49	1.59
	68	69				512.81	31040	2.2	218.30		8.51		0.81		0.00	3.02	0.00	522.13	172.30	437.46	81.8	750	0.286	595.37	0.73	1.35	1.47
To MARCH ROAD PUMP STATION						512.81	31040				8.51		0.81		0.00			522.13		437.46							

DESIGN PARAMETERS

Park Flow = 9300 L/ha/da 0.10764 l/s/Ha
Average Daily Flow = 280 l/p/day
Comm/Inst Flow = 28000 L/ha/da 0.3241 l/s/Ha
Industrial Flow = 35000 L/ha/da 0.40509 l/s/Ha
Max Res. Peak Factor = 4.00
Commercial/Inst./Park Peak Factor = 1.00
Institutional = 0.32 l/s/Ha

Industrial Peak Factor = as per MOE Graph
Extraneous Flow = 0.330 L/s/ha
Minimum Velocity = 0.600 m/s
Manning's n = (Conc) 0.013 (Pvc) 0.013
Townhouse coeff= 2.7
Single house coeff= 3.4

Designed: SLM
Checked: ADF
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 2

PROJECT: **7000 Campeau Drive**
LOCATION: **City of Ottawa**
File Ref: 18-1061
Date: **22 May 2020**
Sheet No. 9 of 9

1061_SAN.xlsx

NORTH KANATA
TRUNK SEWER - PHASE 2

CIVIL
OVERALL SITE PLAN

CARINA DUCLOS, P.Eng MANAGER, DESIGN & CONSTRUCTION BRANCH 2	Justin Kurosky, P.Eng Project Manager

ch2m:

Ottawa

Contract No. ISD12-2011	Dwg. No. C-003
Sheet 4 of 39	
Asset No. --------	
Asset Group ISD	
Des. M.H.	Chk'd. P.P.
Dwn. D.L.	Chk'd. P.P.
Utility Circ. No.	Index No.
Const. Inspector	
Scale: 1:2000 HORIZONTAL 0m 25 50 100	

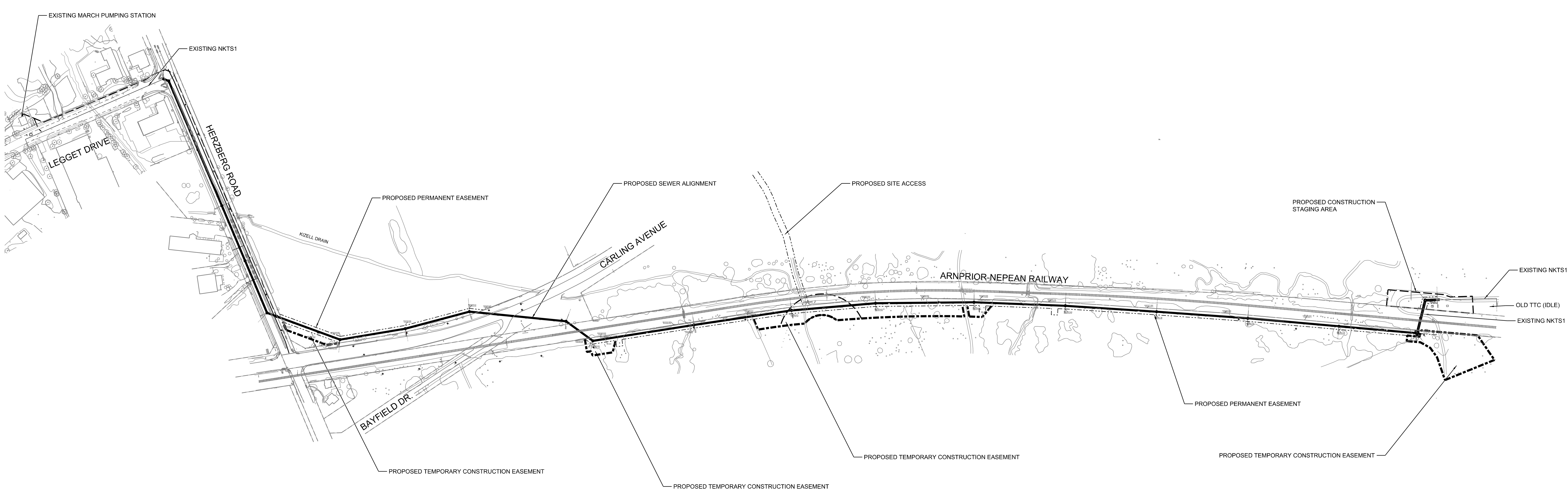
N

NOTE: The location of utilities is approximate only, the exact location should be determined by consulting the municipal authorities and utility companies concerned. The contractor shall prove the location of utilities and shall be responsible for adequate protection from damage.

REVISIONS

No.	Description	By	Date (yyyy/mm/dd)
1	ISSUED FOR APPROVALS	M.H.	2017/06/23
2	ISSUED FOR UTILITY CIRCULATION	M.H.	2017/06/28

NOT FOR CONSTRUCTION



PLOT TIME: 8:42:03 AM
PLOT DATE: 2017\08\16
FILENAME:ISD12-2011-001-OSP.dgn

Utility Circ

462754

SIGNATURE RIDGE
TRUNK SEWER
① PLAN & PROFILE DWG. NO.
FORCE MAIN
GRAVITY SEWER
TRUNK SEWER LOCATION THROUGH SOUTHERN PORTION OF 7000 CAMPEAU DRIVE PROPERTY.
SEE PROFILE DRAWINGS IN APPENDIX B.
S-2414
RICHARDSON SIDE ROAD
CAMPEAU DRIVE
QUEENSWAY - HIGHWAY No 417
TERRY FOX DRIVE
CASTLEFRANK ROAD
GOLDRIDGE DRIVE
WINDARRA CRESCENT
CHELTONIA WAY
MARICONA WAY
STIKINE DRIVE
LANGFORD CRESCENT
BEAVERBROOK ROAD
TERON ROAD
STATION ROAD
LEGGETT DRIVE
MARCH ROAD
CITY OF KANATA
CITY OF NEPEAN
OHEPC
CYCLONE TAYLOR BOULEVARD
LOT 8, CONC 2
LOT 7, CONC 2
LOT 6, CONC 2
LOT 5, CONC 1
LOT 4, CONC 1
LOT 3, CONC 2
LOT 2, CONC 2
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

SANITARY TRUNK SEWER THROUGH SOUTHERN PORTION OF 7000 CAMPEAU DRIVE PROPERTY.
FROM CAMPEAU DRIVE TO ROSENFIELD CRESCENT. SEE OVERALL TRUNK SEWER DRAWING FOR LOCATION DETAILS.
CAMPEAU
DRIVE
MATCHLINE SEE DWG S1
MATCHLINE SEE DWG S3
LIMIT OF PROPOSED GOLF PRACTICE FACILITY
MH 105
MH 107
MH 109
SA 525mm
LINE B - B
EDGE OF ROAD
℄ ROW CAMPEAU DRIVE
PROPOSED WM LOCATION
TEMPORARY CONSTRUCTION FENCE
EX 100 Ø GOLF COURSE IRRIGATION PIPE
6.0m PERMANENT EASEMENT
14.0m WORKING EASEMENT
7.0m PERMANENT EASEMENT
13.0m WORKING EASEMENT
GENERAL NOTES
1. FOR LEGAL BOUNDARY INFORMATION OF SEWER EASEMENT REFER TO REGISTERED PLAN 4R-6558 BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD., ONTARIO LAND SURVEYORS.
2. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. THE LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND / UTILITY COMPANIES CONCERNED.
THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.
ELEVATIONS
102
100
98
96
PROPOSED ROAD SECTION (BY OTHERS)
℄ CAMPEAU DR ROW
PROPOSED ROAD GRADE ALONG SANITARY SEWER
EXISTING GROUND ALONG LINE B-B
EXISTING GROUND OVER SANITARY SEWER
ASSUMED ROCK PROFILE
EXISTING ROCK PROFILE
EX PLUG
SANITARY - 150.0m @ 0.25%, 525mm CONC CL. V
SANITARY - 99.5m @ 0.25%, 525mm CONC CL. V
CENTRE LINE ROAD ELEVATION
WATERMAIN TOP ELEVATION
STORM INVERT
SANITARY INVERT
CENTRE LINE SEWER CHAINAGE
96.09 96.07 96.10 96.11
EX PLUG 96.39
96.48 96.51
96.76 96.79
0+250
0+275
0+300
0+350
0+379
0+400
0+425
0+450
0+500
0+524.5
No. DATE REVISIONS BY
2 1/09/89 REV LOCATION MH 107 TO 115 RGV
1 9/02/89 ADDED TEMPORARY CONSTRUCTION FENCE & IRRIGATION PIPE RGV
0 11/01/89 ISSUED FOR APPROVAL RGV
SCALES
HORIZONTAL 1:500
VERTICAL 1:50
uma
UMA Engineering Ltd
Engineers & Planners
CAMPEAU CORPORATION
KANATA LAKES
TRUNK SANITARY SEWER CONNECTION TO ASHFORD MARTIN LANDS
DESIGN LME
DRAWN RGV
APPROVED BNC
S-2414-6
CITY OF KANATA
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS
SANITARY SEWER EASEMENT
STA 0+275 TO STA 0+524.5
PROJ No 4994-012
DATED DECEMBER 1988
DWG No S2


SANITARY TRUNK SEWER THROUGH SOUTHERN PORTION OF 7000 CAMPEAU DRIVE PROPERTY.
FROM CAMPEAU DRIVE TO ROSENFIELD CRESCENT. SEE OVERALL TRUNK SEWER DRAWING FOR LOCATION DETAILS.
ROSENFIELD
CRESCENT
BLOCK 113
REMOVE PLUG AND CONNECT TO EXISTING
EX 100.0 GOLF COURSE IRRIGATION PIPE
TEMPORARY CONSTRUCTION FENCE
LIMIT OF PROPOSED GOLF FAIRWAY
LIMIT OF EXISTING GOLF FAIRWAY
NOTE: FOR LEGAL BOUNDARY INFORMATION ON LOTS AND BLOCKS, REFER TO REGISTERED PLAN 4M-651 AND 4M- BY ANNIS, O'SULLIVAN, VOLLEBEKK LIMITED, ONTARIO LAND SURVEYORS.
GENERAL NOTES
1. FOR LEGAL BOUNDARY INFORMATION OF SEWER EASEMENT REFER TO REGISTERED PLAN 4R-6558 BY ANNIS, O'SULLIVAN, VOLLEBEKK LTD., ONTARIO LAND SURVEYORS.
2. THE LOCATION OF UTILITIES IS APPROXIMATE ONLY. THE LOCATION SHOULD BE DETERMINED BY CONSULTING THE MUNICIPAL AUTHORITIES AND UTILITY COMPANIES CONCERNED.
THE CONTRACTOR SHALL PROVE THE LOCATION OF UTILITIES AND SHALL BE RESPONSIBLE FOR ADEQUATE PROTECTION FROM DAMAGE.
ELEVATIONS
PROPOSED GRADE
EXISTING GROUND
EXISTING GROUND OVER SANITARY SEWER
LIMIT OF SUBDIVISION
MATCHLINE SEE DWG S2
EX 525mm SA
EX PLUG - REMOVE AND CONNECT TO EXISTING
EXISTING ROCK PROFILE
RECORD DRAWING
CENTRE LINE ROAD ELEVATION
WATERMAIN TOP ELEVATION
STORM INVERT
SANITARY INVERT
CENTRE LINE SEWER CHAINAGE
No. DATE REVISIONS BY
3 5/04/89 RECORD DRAWING RGV
2 6/03/89 ELIMINATED MH 101 AND MOVED MH 103 RGV
1 9/02/89 ADDED TEMPORARY CONSTRUCTION FENCE & IRRIGATION PIPE RGV
0 11/01/89 ISSUED FOR APPROVAL RGV
SCALES
HORIZONTAL 1:500
VERTICAL 1:50
UMA Engineering Ltd
CAMPEAU CORPORATION
KANATA LAKES TRUNK SANITARY SEWER CONNECTION TO
S-2414-7
CITY OF KANATA
DEPARTMENT OF ENGINEERING AND PUBLIC WORKS
SANITARY SEWER EASEMENT
STA. 0+000 TO STA. 0+275
4994-012
DECEMBER 1988
S1

6.0 WASTEWATER SERVICING

6.1 Introduction

As indicated previously, the subject development is within the City of Ottawa West Urban Community (former City of Kanata). This area is serviced by local gravity sewers and pump stations that discharge to a regional trunk system that carries flows to the Robert O. Pickard Environmental Centre for treatment of wastewater.

There are several trunk sanitary sewers and pump stations servicing the West Urban Community including the East March Trunk, Marchwood Trunk, Kanata Lakes Trunk, North Kanata Trunk, March Pump Station, and the Briar Ridge Pump Station. These all drain into the Wattœs Creek Relief Sewer that provides service to the entire West Urban Community and flows into the Acres Road Pump Station. An Existing Wastewater Collection System Schematic (Figure 2) from the 2013 Infrastructure Master Plan is included in **Appendix C-1** for reference.

The outlet for the Kanata North Urban Expansion Area is the existing March Pump Station. The City has indicated that the inlet to the March Pump Station is a reasonable limit for wastewater analysis.

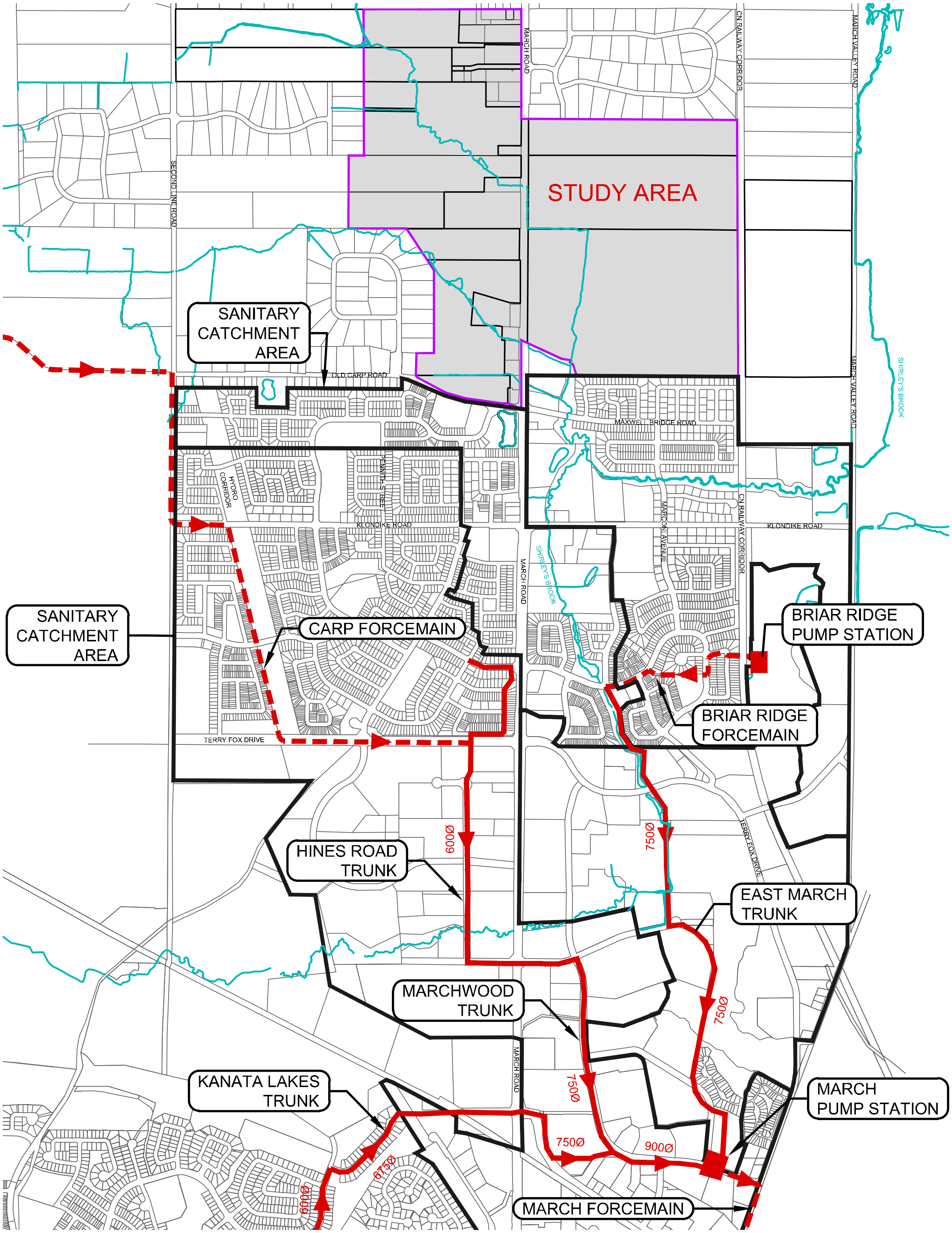
Based on the proposed land use, a probable wastewater flow was calculated to be 182.2L/s. Further details on the calculations of this flow rate are discussed in Section 6.6.1.2.

6.2 Existing Wastewater Infrastructure

There are three trunk sewers that drain to the March Pump Station. These are the East March Trunk, Marchwood Trunk and the Kanata Lakes Trunk. These trunk sewers and their drainage boundaries are shown on **Figure 6.2.** The East March Trunk and Marchwood Trunk sewers are the two most viable options to service development of the KNUEA. The Kanata Lakes Trunk Sewer is located farther from the development area and is not a viable option for servicing the Kanata North Urban Expansion Area.

The following is a brief description of each trunk sewer along with capacity and probable flow rates. The flow generation and wastewater modelling, completed in 2013 on behalf of the City, is provided in the *2013 Infrastructure Master Plan Wastewater Collection System Assessment* (2013 IMP) prepared by Stantec, dated Sept 2013. This document provides the most current sanitary analysis of the entire City and establishes a basis upon which the KNUEA can be evaluated. Where information was not available in the 2013 IMP, namely for trunk sewers, information was obtained from the *West Urban Community – Wastewater Collection System Master Servicing Plan Study* (2012 WUC, RVA, July 2012).

The data obtained from the above noted Master Plans provides flow data for existing flows monitored as of 2010, and projected flows for 2031. The projected flow data in the 2031 IMP has accounted for the full development/buildout of the KNUEA. Therefore during the analysis of KNUEA on existing infrastructure, design KNUEA flows have only been added where 2013 IMP data was not available.



KANATA NORTH
COMMUNITY DESIGN PLAN

NOVATECH
Engineers, Planners & Landscape Architects

FIGURE NO. 6.2

NORTH KANATA WASTEWATER TRUNK INFRASTRUCTURE

DATE FEB 2016

JOB 112117

SCALE N.T.S.

M:\2012\112117\CAD\Design_MSS\FIGURES\FIGURE 7.1 - WASTEWATER COLLECTION INFRASTRUCTURE.dwg, WW COLL, Feb 23, 2016 - 1:40pm, lseely

SHT8x11.DWG - 216mmx279mm

The **East March Trunk** (EMT) is a 750mm diameter pipe that extends north from the March Pump Station through the Kanata Research Park to Shirleyøs Brook Drive, with the upper reach generally follows the creek corridor. The pipe has a free-flow capacity of 550 L/s and an obvert elevation of 72.1m at Shirleyøs Brook Drive. Flow generation and modelling for the City indicates peak flow rates in the EMT of 96 L/s in 2010, and projects a flow of 255 L/s in 2031. Therefore, the EMT is currently flowing at approximately 17% of the free-flow capacity, and will reach 46% at build-out. These values account for the full buildout of the KNUEA.

The **Marchwood Trunk** (MWT) is 750mm to 900mm in diameter, and generally follows Legget Drive. Flow from the Kanata Lakes Trunk combines with the Marchwood Trunk, west of Schneider Road, in a 900mm diameter sewer which conveys all flows to the March Pump Station. Upstream, the MWT decreases in size to a 750mm pipe south of Farrar Road; the trunk continues north on Legget Drive, turning west at Solandt Drive and generally services land on the west side of March Road. The upper reach of the MWT is located at the intersection of Solandt Drive and Hines Road with an obvert elevation of 77.3m. The lower-reach of the MWT has a free-flow capacity of 1,100 L/s. Flow generation by the City has an estimated peak flow of 230 L/s in 2010, and 592 L/s in 2031. This puts the free-flow capacity at approximately 21% (2010) and 54% (2031), including full development of the KNUEA.

The **Hines Road Trunk** (HRT) is essentially a northward continuation of the Marchwood Trunk. The HRT is a 600mm gravity pipe that services lands in North Kanata, and conveys flow from the Carp Forcemain to the Marchwood Trunk and March Pump Station. The upper reach of the HRT is located at the intersection of Morganøs Grant Way and March Road with an obvert elevation of 79.7m. The upper-reach of the MWT has a free-flow capacity of 205 L/s, based on as-built information. The free flow capacity of the HRT is unknown.

The **March Pump Station** (MPS) is located at the downstream end of these trunk sewers with a firm capacity of 490 L/s. City modelling has peak flows of 326 L/s (2010) and 771 L/s (2031). This represents 67% and 157% of the firm capacity. Pumps currently discharge through the March Forcemain, routing flow south along Herzberg Road to the March Road Trunk. There are significant planned changes that will affect how this facility operates, and the reader is directed to the next section on planned infrastructure for details.

The **Briar Ridge Pump Station** (BRPS) is located south of Klondike Road and east of the railway corridor. This facility discharges into the East March Trunk and has a firm design capacity of 183 L/s with three pumps installed. Due to low initial flows, only two of the three pumps are currently installed; as such the station has a temporary firm capacity of 53 L/s. Flow monitoring by City staff will determine when the third pump is required.

Capacities of the various systems are summarized in in **Table 6.2**. This information is taken from the 2013 IMP, 2012 WUC, and supplementary 2013 IMP data provided by the City. Relevant excerpts and supplementary information are included in **Appendix C-2** for reference.

Table 6.2: Existing Capacity and 2031 Wastewater Flow

Infrastructure	**Obvert Elevation**	**Flow**	**Ex. Capacity**	**Design Flow**	**Q/Q_{full} Capacity (%)**	**Available Flow**
		2010 (L/s)	**(L/s)**	**2031 (L/s)**	**2031**	**2031 (L/s)**
March Pump Station	-	**371(2008)**	**416 (IMP)** **586 (upgrade)***	**256**	**44%**	**330**
Briar Ridge Pump Station	61.15	21**	53 (Ex) 183 (Ult) **175 (IMP)**	**124**	**71%**	**51**
East March Trunk	72.1	*96*	*550 (WUC)* *259 (Asbuilt)* ****	**255**	98%	5***
MarchWood Trunk	77.3	*230*	*1,100*	**592**	54%	508
Hines Road Trunk	79.7		205	**135**	66%	70

Note values in bold are from the 2013 IMP (and supplementary data), italics are from the 2012 WUC report.

*March Pump Station is scheduled to be upgraded to an ultimate firm capacity of +/-586L/s per March PS Class EA report.

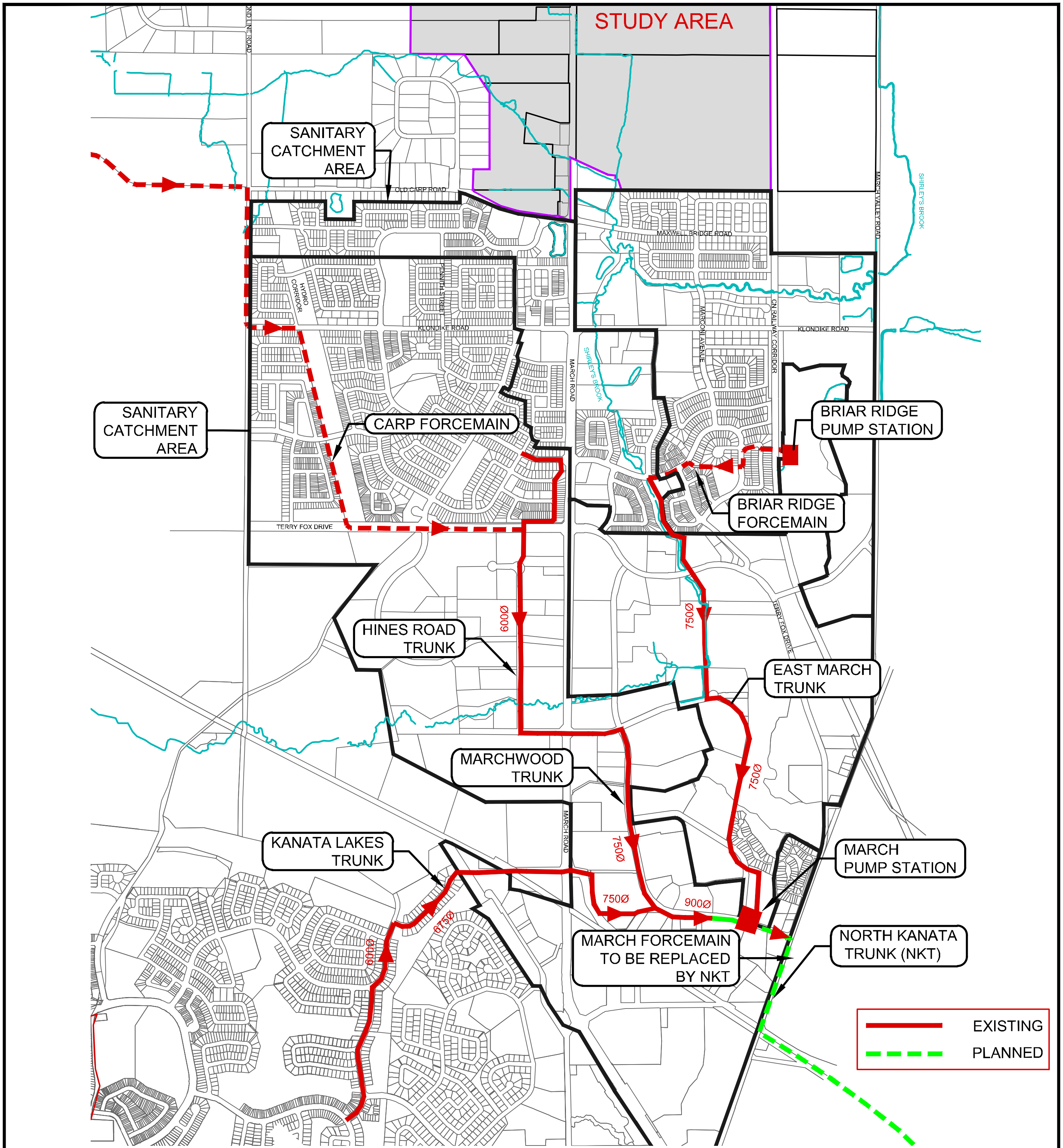
** Based on monitored SCADA data provided by the City included in **Appendix C**.

*** Available Flow based on Novatech analysis of as-built capacity of the existing EMT. Supporting calculations are included in Table C-6e: Sanitary Sewer Capacity Analysis ï East March Trunk, included in **Appendix C**.

6.3 Planned Wastewater Infrastructure

There are two major planned wastewater infrastructure works planned as noted in the Cityós 2013 Infrastructure Master Plan which will have an impact on the future servicing of the proposed development. The planned wastewater infrastructure works are shown on **Figure 6.3**.

Phase 2 of the **North Kanata Trunk** (NKT) will extend a 1200mm pipe with a design capacity of 1,290 L/s from the March Pump Station (MPS) to the temporary cap where Phase 1 construction ended. A gravity connection will be made from the Marchwood Trunk to the NKT, allowing wastewater to bypass the MPS. This measure will significantly reduce flow to the station, thereby increasing residual capacity at the MPS. Construction of the NKT is expected to be complete by 2018 as per the 2013 IMP.



M:\2012\112117\CAD\Design_MSS\FIGURES\FIGURE 7.3 - PLANNED WASTEWATER INFRASTRUCTURE.dwg, PWW COLL, Feb 11, 2016 - 9:37am, lseely

KANATA NORTH
COMMUNITY DESIGN PLAN

NOVATECH
Engineers, Planners & Landscape Architects

FIGURE NO. 6.3
NORTH KANATA PLANNED WASTEWATER TRUNK INFRASTRUCTURE

DATE
FEB 2016

JOB
112117

SCALE
N.T.S.

SHT8x11.DWG - 216mmx279mm

The **March Pump Station** (MPS) will be converted to a low-lift facility that connects to the North Kanata Trunk. The March Forcemain will be decommissioned as part of these works. The 2013 IMP indicates that construction would occur sometime between 2013 and 2018. With diversion of the Marchwood Trunk, there will be no urgency to complete this project. The projected 2031 flow from the 2013 IMP in this configuration is 256 L/s, or 44% of the station firm capacity.

Supporting information on the Planned Wastewater Infrastructure work from the 2013 IMP is included in **Appendix C-1** for reference.

6.4 Viable Off-site Trunk Servicing Evaluation

As indicated previously, the Kanata Lakes Trunk Sewer is located farther from the development area and is not a viable option for servicing the proposed development. Therefore, the Hines Road, Marchwood and East March Trunk Sewers and the Briar Ridge Pump Station were evaluated to determine the preferred servicing option for the Kanata North Urban Expansion Area.

6.4.1 Trunk Sewers

There are two initial constraints to review when evaluating these trunk sewers which are elevation and capacity. The elevations were obtained from record drawings provided by the City and the capacities of each trunk sewer was obtained from the *WUC Master Servicing Plan by RVA*.

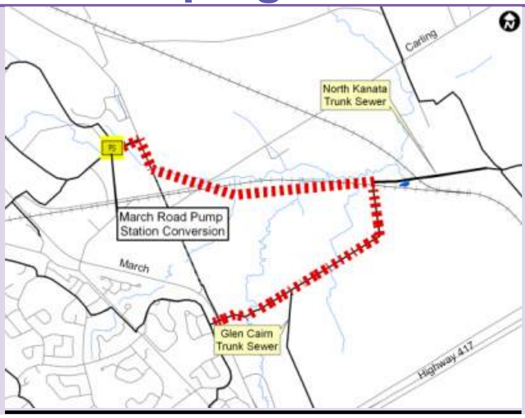
Elevation
Hines Road Trunk (by Morgan's Grant and March) = 79.7m
Marchwood Trunk (by Solandt and Hines) obvert = 77.3m
East March Trunk (by Shirley's Brook Dr.) obvert = 72.1m

Capacity
Hines Road Trunk = 205L/s (upper reach of MWT)
Marchwood Trunk = 1,100L/s, reaching 52% capacity by 2031 with a remaining capacity of 526 L/s.
East March Trunk = 550 L/s, reaching 31% capacity by 2031 with a remaining capacity is 378 L/s.

The capacities are based on the projected 2031 buildout of the existing drainage areas tributary to each trunk sewer and do not include the subject development. There are no indications that there are HGL issues in any of these trunk sewers, therefore HGL was not part of the initial evaluation.

Based on these two constraints the most viable option to provide a wastewater outlet for the subject lands is the East March Trunk Sewer. The connection point to the East March Trunk Sewer is proposed at the intersection of Shirley's Brook Drive and Sandhill Road just east of March Road. The East March Trunk Sewer and its catchment area are shown on **Figure 6.4.1**. There are two possible routes for a sewer to this connection point from the KNUEA. One is southward along March Road and along Shirley's Brook Drive. The second option is to service the development using the Briar Ridge Pump Station. A connection can be made to the existing sanitary sewer that runs along the Ottawa Central Railway corridor to the Briar Ridge Pump Station. The Briar Ridge Forcemain then connects to the East March

March Road Pumping Station Conversion



Scope and Justification

The March Pump Station was built in 1972. Currently the firm capacity of the station with one pump being out of services is rated at 490 L/s. The station pumps wastewater to the 600 mm dia. 1300 m long forcemain discharging to the March Road Trunk Sewer. A Class EA was completed in 2001 for the North Kanata Sanitary Sewage Infrastructure Upgrade Study. It recommended building the Kanata North Gravity Collector Sewer including gravity connection of the March Collector Sewer bypassing the March PS and conversion of the March PS to a low lift station.

The existing March PS can be retrofit to a low lift station or a new wet well can be added and existing structure to be used to house a valve chamber, stand-by power, controls, etc… or alternatively new PS can be built and existing structure be decommissioned and removed. Since the constructing new PS is an alternative option there is a requirement to conduct the Schedule B of the Class Environmental Assessment (EA) planning process. The Class EA for the station is currently under way.

Timing

2013 - 2018: Complete EA, detailed design and build the station.

Action Item Funding

Construction Cost Estimate = $3.4 M
Capital Cost Estimate* = $6.0 M (100% Development Charges, 0% Rate)
**Including construction cost, engineering, city internal costs and contingency allowance. Funding split subject to review as part of 2014 Development Charges By-Law.*

EA Requirements and Consultation

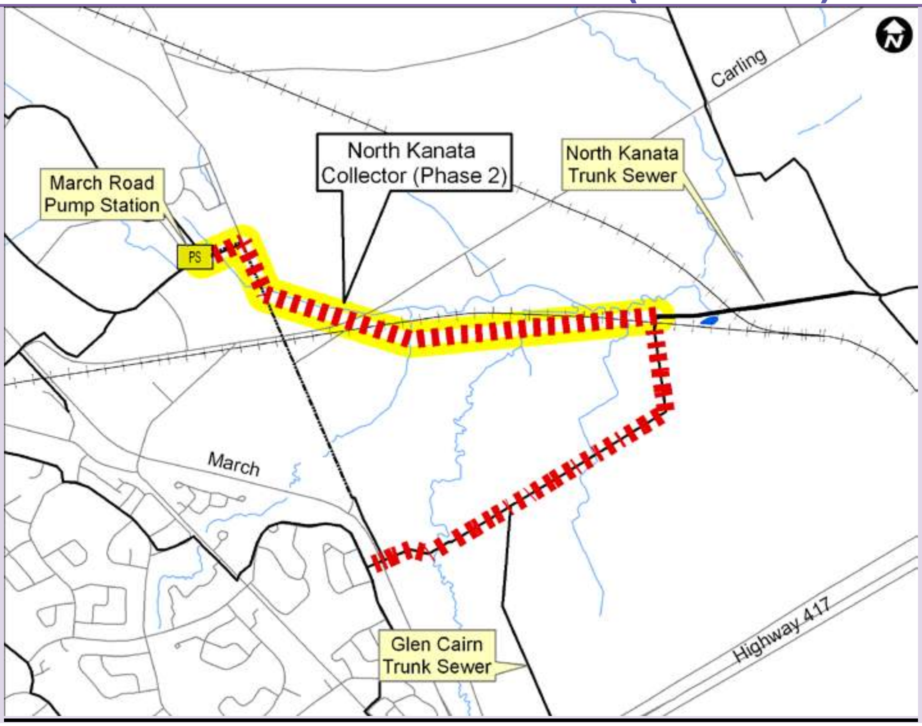
Class EA Schedule B project study is currently underway.

The EA recommendations will be presented to City Council for approval. Once approved by Council the 'Notice of Study Completion' will be posted for the 30 day review period.

Follow Up Actions

Coordinate with Kanata North Collector Sewer Phase 2 project.

North Kanata Collector (Phase 2)



Scope and Justification

Construct the North Kanata Phase 2 Sewer to provide capacity for the North Kanata growth area. This project was identified in the 1997 Wastewater Master Plan to provide infrastructure to convey the projected flows for the planning period. Follow up studies such as the Environmental Assessment (EA), Functional Design and Preliminary Design of sewers in the study area refined and confirmed the infrastructure, phasing, schedule and costing. The Phase 2 sewer will be 1200 mm dia. pipe and approximately 2100 m long.

Timing

2013-2018: Complete detailed design and construct the sewer.

Action Item Funding

Construction Cost Estimate = $5.5 M
Capital Cost Estimate* = $8.7 M (90% Development Charges, 10% Rate)
**Including construction cost, engineering, city internal costs and contingency allowance.*

EA Requirements and Consultation

Schedule B Class EA has been completed and the project is approved.

Follow Up Actions

Tender and Construction

Kevin Murphy

Subject: FW: 1061 7000 Campeau Drive - Pre consultation Follow-up

From: Candow, Julie
Sent: April 12, 2019 12:19 PM
To: 'Adam Fobert' <AFobert@dsel.ca>; Warnock, Charles <Charles.Warnock@ottawa.ca>; Moodie, Derrick <Derrick.Moodie@ottawa.ca>
Cc: Susan Murphy <SMurphy@minto.com>; Beth Henderson <BHenderson@minto.com>; mdror@bousfields.ca; Steve Pichette <SPichette@dsel.ca>
Subject: RE: 1061 7000 Campeau Drive - Pre consultation Follow-up

Hi Adam,

Please see outstanding responses in red below. You will receive a second email with a link to an FTP site which will provide the files noted below.

Should you have any questions please do not hesitate to call.

Julie Candow, P.Eng.
Project Manager - Infrastructure Approvals

City of Ottawa
Development Review - West Branch
Planning, Infrastructure and Economic Development Department
110 Laurier Ave., 4th Floor East;
Ottawa ON K1P 1J1
Tel: 613-580-2424 x 13850

From: Adam Fobert <AFobert@dsel.ca>
Sent: March 22, 2019 2:19 PM
To: Warnock, Charles <Charles.Warnock@ottawa.ca>; Moodie, Derrick <Derrick.Moodie@ottawa.ca>; Candow, Julie <julie.candow@ottawa.ca>
Cc: Susan Murphy <SMurphy@minto.com>; Beth Henderson <BHenderson@minto.com>; mdror@bousfields.ca; Steve Pichette <SPichette@dsel.ca>
Subject: 1061 7000 Campeau Drive - Pre consultation Follow-up

Hello City Staff,

As discussed during our pre-consultation regarding 7000 Campeau Drive, please see the below summary of information requests.

Let me know if you have any questions or comments

Water:
Please see the attached figure illustrating potential connection points.

Connection points 1 and 2 would have the following demands:
Average Daily: 282.9L/min

Max Day: 707.3 L/min
Peak Hour: 1556.0 L/min
Fire Flow: 10,000L/min

Connection points 3, 4, 5, and 6 would have the following demands:

Average Daily: 811.6L/min
Max Day: 2029.0L/min
Peak Hour: 4463.9L/min
Fire Flow: 15,000L/min

Wastewater:

- Please provide available calculation sheets for the existing trunk from Campeau Drive to the March Road PS. Design sheets for the Kanata Lakes trunk are shown in the 2007 Serviceability Study (FTP site). Design sheets are not available for the Marchwood Trunk. As-built drawings have been provided for the Kanata Lakes and Marchwood Trunk sewers (FTP site).
- Please provide available models of the existing trunk from Campeau to March Road PS. Existing and future flows and HGLs along the Kanata Lakes/Marchwood Trunk sewers from the golf course to Legget/Schneider are provided in an excel table (FTP site). Modelling of the trunk sewer system is not required. In the future, flows from the Signature Ridge Pump Station will be diverted from the Kanata Lakes sewer to the Penfield Trunk.
- The Infrastructure Master Plan outlined a number of upgrades to the March Road PS. What has taken place? The March PS will be converted to a lift station. The March PS project is on-going and Jacobs presented the 90% design review to City staff in Feb 2019. What is the current capacity of the facility? The rated capacity of the facility is 416 l/s. However, capacity at the station is not relevant to this application since the Marchwood Trunk sewer on Legget will no longer outlet to the March PS (refer to outdated drawings on FTP site that shows the conceptual plan). The North Kanata Trunk Phase 2, which is currently under construction, will convey flows from the Marchwood Trunk to the Watts Creek Relief Sewer. The City will provide an update on the expected completion date of the North Kanata Trunk Phase 2.
- Does the City have flow monitoring data at the March Road PS? If so, please provide. Dry weather flows range from 80 l/s (average) to 140 l/s (peak). Wet weather flows can reach +/- 325 l/s. Additional analysis of the March Pump Station is not required.

Stormwater:

- Please provide available calculation sheet for the existing trunk storm sewer from Campeau to the Beaver Pond. Design sheets are not available.
- Please provide the current model of the storm sewer system to the Beaver Pond. An existing conditions SWMHYMO model (JFSA, Sept 2015) of Kanata Lakes south of Beaver Pond and XP-SWMM/HEC-RAS models of Beaver Pond and Watts Creek (AECOM, 2014) are located on the FTP site. IBI recently updated the XP-SWMM/HEC-RAS models to support KNL Phase 9 (DSEL should obtain the latest models from IBI).
- Has there been a history of flooding / complaints of standing water in the surrounding subdivision?
- Has the City implemented ICD in the surrounding neighborhood?
- Does the City have any monitoring data within the storm sewer system or pond? If so, please provide.
- DSEL would like to request complete monitoring of the existing storm infrastructure at five locations. Please see plan attached.

Adam Fobert, P.Eng.

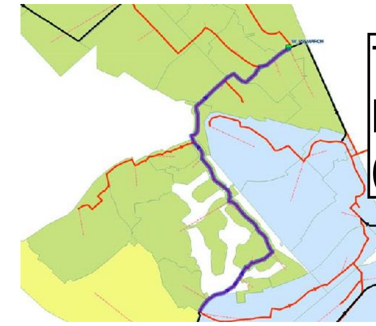
DSEL

david schaeffer engineering ltd.

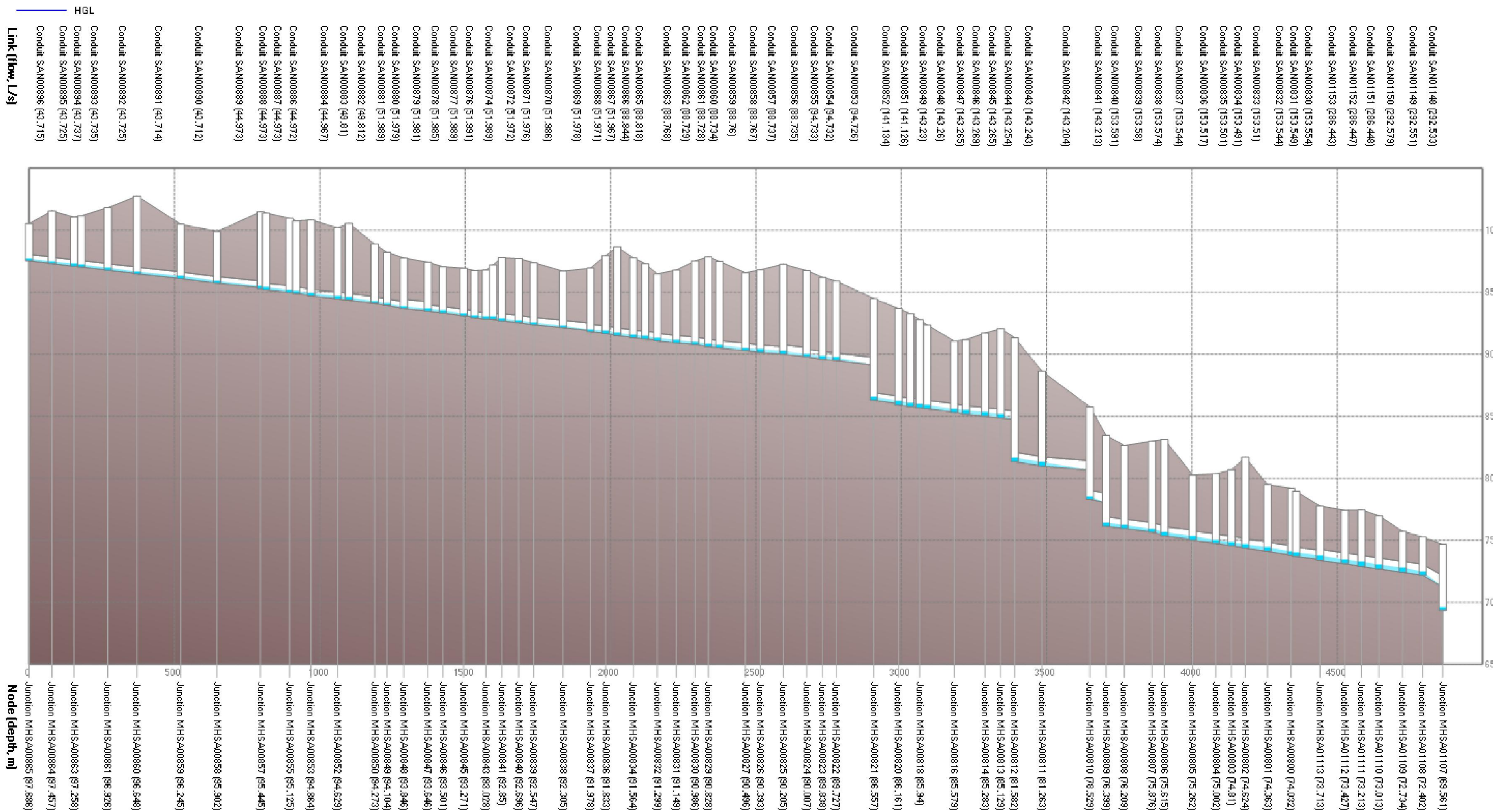
120 Iber Road, Unit 103
Stittsville, ON K2S 1E9

office: (613) 836-0856
direct: (613) 836-0626
cell: (613) 222-9493
email: afobert@DSEL.ca

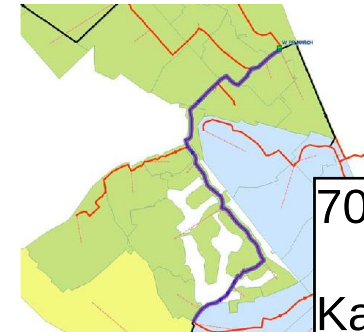
Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)
MHSA00865	97.52	100.53	3.01	0.17	97.69	43.83
MHSA00858	95.73	99.89	4.16	0.17	95.9	44.99
MHSA00852	94.45	100.19	5.74	0.18	94.63	49.82
MHSA00850	94.11	98.89	4.78	0.16	94.27	52
MHSA00835	91.50	98.66	7.16	0.22	91.72	88.87
MHSA00824	89.80	96.75	6.95	0.21	90.01	94.77
MHSA00811	80.97	88.66	7.69	0.29	81.26	143.26
MHSA00818	85.68	92.80	7.12	0.26	85.94	143.28
MHSA00809	76.14	83.47	7.33	0.26	76.4	153.59
MHSA01110	72.68	76.97	4.29	0.33	73.01	292.58
MHSA01107	69.35	74.70	5.35	0.21	69.56	295.67



7000CampeauDr_Wastewater_2013Existing
Kanata Lakes & Marchwood Trunk Sewers - HGL
(From Campeau To Legget/Schneider Rd)



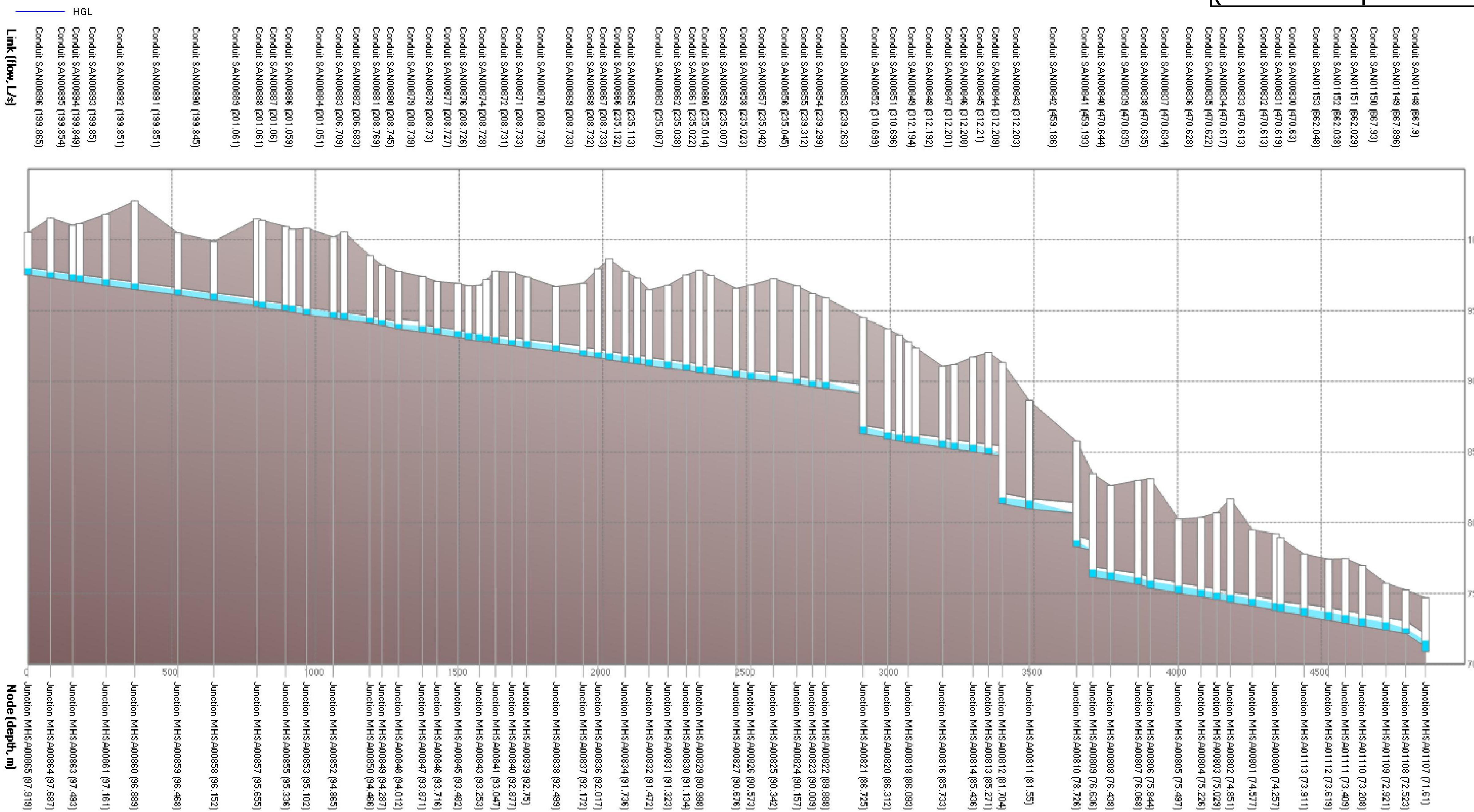
Name	Invert Elev. (m)	Rim Elev. (m)	Depth (m)	Max. Depth (m)	Max. HGL (m)	Max. Total Inflow (L/s)
MHSA00865	97.52	100.53	3.01	0.40	97.92	199.87
MHSA00858	95.73	99.89	4.16	0.42	96.15	201.07
MHSA00852	94.45	100.19	5.74	0.42	94.87	206.72
MHSA00850	94.11	98.89	4.78	0.36	94.47	208.79
MHSA00835	91.50	98.66	7.16	0.39	91.89	235.19
MHSA00824	89.80	96.75	6.95	0.36	90.16	239.32
MHSA00818	85.68	92.80	7.12	0.41	86.09	312.22
MHSA00809	76.14	83.47	7.33	0.50	76.64	470.66
MHSA01110	72.68	76.97	4.29	0.52	73.21	667.96
MHSA01107	70.90	74.70	3.80	0.71	71.61	675.99



Note: MHSA00865 includes flow from Signature Ridge PS
In the future, flows from SRPS will be diverted to the Penfield Trui

7000CampeauDr_Wastewater_2060Future

Kanata Lakes & Marchwood Trunk Sewers - HGL
(From Campeau To Legget/Schneider Rd)



APPENDIX D

STORM

Ministry of the Environment
Ministère de l'Environnement

CERTIFICATE OF APPROVAL
MUNICIPAL AND PRIVATE SEWAGE WORKS
NUMBER 5190-7L6RRY
Issue Date: November 26, 2008

City of Ottawa
110 Laurier Avenue West
Ottawa, Ontario
K1P 1J1

Site Location: Kanata Lakes Stormwater Management Facility
Lot 6 and 7, Concession 2 and 3, March
City of Ottawa, Ontario

You have applied in accordance with Section 53 of the Ontario Water Resources Act for approval of:

stormwater management *Works* for the treatment and disposal of stormwater runoff from a catchment area of 397 hectares, servicing Kanata Lakes Subdivision, to provide Enhanced (Level 1) water quality protection and to attenuate post-development peak flows in two cells in series, upstream Kizell Cell and downstream Beaver Cell, to a maximum flow rate of 0.96 cubic metres per second for the 100 year storm event, discharging to Kizell Drain, consisting of the following:

Stormwater Management System

Kizell Cell
a stormwater management wet pond, located west of Goulbourn Forced Road, having a minimum liquid retention volume of approximately 10,271 cubic metres at an elevation of 93.30 metres, and a maximum active retention volume of approximately 89,825 cubic metres at an elevation of 94.28 metres for the 100 year storm event, complete with two (2) energy dissipaters at the storm inlets to the cell, and one (1) outlet berm, discharging at a controlled flow rate of 1.16 cubic metres per second for the 100 year storm event to the downstream Beaver Cell;

Beaver Cell
a stormwater management wet pond, located east of Goulbourn Forced Road, having a minimum liquid retention volume of approximately 41,042 cubic metres at an elevation of 90.47 metres, and a maximum active volume of approximately 236,696 cubic metres at an elevation of 92.60 metres for the 100 year storm event, complete with three (3) storm inlets to the cell, two (2) with energy dissipaters, and one (1) outlet structure consists of a 600 millimetre diameter orifice at an invert elevation of 90.47 metres and an overflow weir set at an invert elevation of 92.60 metres, discharging at a controlled flow rate of 0.96 cubic metre per second for the 100 year storm event via an 80 metre long 1200 millimetre diameter culvert to Kizell Drain;

including erosion/sedimentation control measures during construction and all other controls and appurtenances essential for the proper operation of the aforementioned Works;

all in accordance with the following submitted supporting documents:

1. Application for Approval of Municipal and Private Sewage Works submitted by Guy Bourgon, Program manager, Infrastructure Approvals West of City of Ottawa dated October 21, 2008;

2. a letter dated October 9, 2008 and a letter date November 24, 2008 from Peter Spal, P.Eng., Manager - Water Resources of IBI Group, to the Ministry of the Environment;

3. *Kanata Lakes North Serviceability Study* dated June 2006 and prepared by IBI Group, including enclosed drawings

dated June 15, 2006 by IBI Group and Cumming Cockburn Ltd.;

4. *Kanata Lakes, Beaver Pond, Urban Stormwater quality Control,* dated November 1994, prepared by Cumming Cockburn Ltd;

5. *Kanata Lakes Dam & Outlet Structure Operation & Maintenance Manual* dated April 1990, prepared by Oliver, Mangione, McCalla & Associates Limited, Consulting Engineers; and

6. *Kanata Lakes Storm Drainage Report - Campeau Corporation* dated March 1985, prepared by Oliver, Mangione, McCalla & Associates Limited, Consulting Engineers.

For the purpose of this Certificate of Approval and the terms and conditions specified below, the following definitions apply:

1. "*Certificate*" means this entire certificate of approval document, issued in accordance with Section 53 of the Ontario Water Resources Act, and includes any schedules;

2. "*Director*" means any *Ministry* employee appointed by the Minister pursuant to section 5 of the Ontario Water Resources Act;

3. "*District Manager*" means the District Manager of the Ottawa District Office of the *Ministry*;

4. "*Ministry*" means the Ontario Ministry of the Environment;

5. "*Owner*" means City of Ottawa and includes its successors and assignees;

6. "*Works*" means the sewage works described in the *Owner*'s application, this *Certificate* and in the supporting documentation referred to herein, to the extent approved by this *Certificate*.

You are hereby notified that this approval is issued to you subject to the terms and conditions outlined below:

TERMS AND CONDITIONS

1. GENERAL PROVISIONS

(1) Except as otherwise provided by these Conditions, the *Owner* shall design, build, install, operate and maintain the *Works* in accordance with the description given in this *Certificate*, the application for approval of the works and the submitted supporting documents and plans and specifications as listed in this *Certificate*.

(2) Where there is a conflict between a provision of any submitted document referred to in this *Certificate* and the Conditions of this *Certificate*, the Conditions in this *Certificate* shall take precedence, and where there is a conflict between the listed submitted documents, the document bearing the most recent date shall prevail.

(3) Where there is a conflict between the listed submitted documents, and the application, the application shall take precedence unless it is clear that the purpose of the document was to amend the application.

2. EXPIRY OF APPROVAL

The approval issued by this *Certificate* will cease to apply to those parts of the *Works* which have not been constructed within five (5) years of the date of this *Certificate*.

3. CHANGE OF OWNER

The *Owner* shall notify the *District Manager* and the *Director*, in writing, of any of the following changes within thirty (30) days of the change occurring:

(a) change of *Owner*;

(b) change of address of the *Owner*;

(c) change of partners where the *Owner* is or at any time becomes a partnership, and a copy of the most recent declaration filed under the Business Names Act, R.S.O. 1990, c.B17 shall be included in the notification to the *District Manager*; and

(d) change of name of the corporation where the *Owner* is or at any time becomes a corporation, and a copy of the most current information filed under the Corporations Information Act, R.S.O. 1990, c. C39 shall be included in the notification to the *District Manager*.

4. OPERATION AND MAINTENANCE.

(1) The *Owner* shall ensure that the design minimum liquid retention volume(s) is maintained at all times.

(2) The *Owner* shall inspect the *Works* at least once a year and, if necessary, clean and maintain the *Works* to prevent the excessive buildup of sediments and/or vegetation.

(3) The *Owner* shall maintain a logbook to record the results of these inspections and any cleaning and maintenance operations undertaken, and shall keep the logbook available for inspection by the *Ministry*. The logbook shall include the following:

(a) the name of the *Works*; and

(b) the date and results of each inspection, maintenance and cleaning, including an estimate of the quantity of any materials removed.

5. RECORD KEEPING

The *Owner* shall retain for a minimum of five (5) years from the date of their creation, all records and information related to or resulting from the operation and maintenance activities required by this *Certificate*.

The reasons for the imposition of these terms and conditions are as follows:

1. Condition 1 is imposed to ensure that the *Works* are built and operated in the manner in which they were described for review and upon which approval was granted. This condition is also included to emphasize the precedence of Conditions in the *Certificate* and the practice that the Approval is based on the most current document, if several conflicting documents are submitted for review.

2. Condition 2 is included to ensure that, when the *Works* are constructed, the *Works* will meet the standards that apply at the time of construction to ensure the ongoing protection of the environment..

3. Condition 3 is included to ensure that the Ministry records are kept accurate and current with respect to approved works and to ensure that subsequent owners of the works are made aware of the certificate and continue to operate the works in compliance with it.

4. Condition 4 is included to require that the *Works* be properly operated and maintained such that the environment is protected .

5. Condition 5 is included to require that all records are retained for a sufficient time period to adequately evaluate the long-term operation and maintenance of the *Works*.

In accordance with Section 100 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, as amended, you may by written notice served upon me and the Environmental Review Tribunal within 15 days after receipt of this Notice, require a hearing by the Tribunal. Section 101 of the Ontario Water Resources Act, R.S.O. 1990, Chapter 0.40, provides that the Notice requiring the hearing shall state:

1. The portions of the approval or each term or condition in the approval in respect of which the hearing is required, and;
2. The grounds on which you intend to rely at the hearing in relation to each portion appealed.

The Notice should also include:

3. The name of the appellant;
4. The address of the appellant;
5. The Certificate of Approval number;
6. The date of the Certificate of Approval;
7. The name of the Director;
8. The municipality within which the works are located;

And the Notice should be signed and dated by the appellant.

This Notice must be served upon:

The Secretary*
Environmental Review Tribunal
655 Bay Street, 15th Floor
Toronto, Ontario
M5G 1E5

AND

The Director
Section 53, *Ontario Water Resources Act*
Ministry of the Environment
2 St. Clair Avenue West, Floor 12A
Toronto, Ontario
M4V 1L5

*** Further information on the Environmental Review Tribunal's requirements for an appeal can be obtained directly from the Tribunal at: Tel: (416) 314-4600, Fax: (416) 314-4506 or www.ert.gov.on.ca**

The above noted sewage works are approved under Section 53 of the Ontario Water Resources Act.

DATED AT TORONTO this 26th day of November, 2008

Mansoor Mahmood, P.Eng.
Director
Section 53, *Ontario Water Resources Act*

NH/
c: District Manager, MOE Ottawa District Office
Lance Erion, P.Eng., IBI Group

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha)																FLOW						SEWER DATA									
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	FLOW (min)	Q/Q full
BLOCK 17																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						104									
	5018	5019			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	104	675	675	CONC	1.00	19.0	840.6	2.35	0.13	0.12
To STREET 16, Pipe 5019 - 5020						0.00				0.00				0.00				0.00	10.13					104									
BLOCK 4																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						264									
	4053	4054			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	264	825	825	CONC	1.00	69.5	1435.4	2.69	0.43	0.18
To WESLOCK WAY, Pipe 4054 - 5020						0.00				0.00				0.00				0.00	10.43					264									
BLOCK 6																																	
Contribution From STREET 17, Pipe 6011 - 6014						11.29				1.97				0.00				0.00	21.27														
Contribution From STREET 17, Pipe 6013 - 6014						0.61				0.42				0.00				0.00	12.05														
	6014	6015			0.00	11.91			0.00	2.39			0.00	0.00			0.00	0.00	21.27	50.08	67.59	79.08	115.36	758	975	975	CONC	0.20	14.0	1002.2	1.34	0.17	0.76
	6015	6016			0.00	11.91			0.00	2.39			0.00	0.00			0.00	0.00	21.44	49.82	67.24	78.67	114.76	754	975	975	CONC	0.20	77.0	1002.2	1.34	0.96	0.75
	6016	6017			0.00	11.91	0.39	0.25	0.27	2.66			0.00	0.00			0.00	0.00	22.40	48.47	65.39	76.50	111.58	751	975	975	CONC	0.20	48.5	1002.2	1.34	0.60	0.75
To WESLOCK WAY, Pipe 6017 - 212						11.91				2.66				0.00				0.00	23.00														
BLOCK 8																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						275									
	2022	2023			0.00	0.00	0.15	0.65	0.27	0.27			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	303	675	675	CONC	1.60	61.0	1063.3	2.97	0.34	0.29
	2023	6019			0.00	0.00			0.00	0.27			0.00	0.00			0.00	0.00	10.34	75.52	102.42	120.05	175.49	303	825	825	CONC	0.35	42.0	849.2	1.59	0.44	0.36
To KNUDSON DRIVE, Pipe 6019 - 154						0.00				0.27				0.00				0.00	10.78					275									
Contribution From KNUDSON DRIVE, Pipe 146 - 148						0.00				38.08				0.00				0.00	27.81					186									
	148	6019			0.00	0.00			0.00	38.08			0.00	0.00			0.00	0.00	27.81	42.11	56.74	66.35	96.71	2347	2100	2100	CONC	0.15	5.2	6804.3	1.96	0.04	0.34
To KNUDSON DRIVE, Pipe 6019 - 154						0.00				38.08				0.00				0.00	27.86					186									
STREET 17																																	
			0.34	0.65	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00															
	6012	6013			0.00	0.61	0.60	0.25	0.42	0.42			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	91	600	600	CONC	0.15	85.5	237.8	0.84	1.69	0.38
	6013	6014			0.00	0.61			0.00	0.42			0.00	0.00			0.00	0.00	11.69	70.86	96.02	112.52	164.42	84	600	600	CONC	0.15	18.0	237.8	0.84	0.36	0.35
To BLOCK 6, Pipe 6014 - 6015						0.61				0.42				0.00				0.00	12.05														
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						186									
	1062	1063			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	186	1050	1050	CONC	0.40	49.5	1727.1	1.99	0.41	0.11
	1063	1064			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.41	75.25	102.06	119.63	174.86	186	1200	1200	CONC	0.15	46.0	1510.0	1.34	0.57	0.12
	1064	1065			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.99	73.21	99.25	116.32	170.01	186	1200	1200	CONC	0.15	61.5	1510.0	1.34	0.77	0.12
	1065	1066			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	11.76	70.66	95.75	112.20	163.96	186	1200	1200	CONC	0.15	73.5	1510.0	1.34	0.92	0.12
	1066	1067			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	12.67	67.87	91.92	107.69	157.33	186	1200	1200	CONC	0.15	57.0	1510.0	1.34	0.71	0.12
To BLOCK 9, Pipe 1067 - 1068						0.00				0.00				0.00				0.00	13.38					186									
					0.00	0.00	0.16	0.25	0.11	0.11			0.00	0.00			0.00	0.00															
			0.44	0.65	0.80	0.80			0.00	0.11			0.00	0.00			0.00	0.00															
	6000	6001			0.00	0.80	1.05	0.25	0.73	0.84			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	149	525	525	CONC	0.20	42.0	192.3	0.89	0.79	0.77
	6001	6002	0.34	0.65	0.61	1.41			0.00	0.84			0.00	0.00			0.00	0.00	10.79	73.91	100.21	117.45	171.66	188	600	600	CONC	0.15	45.5	237.8	0.84	0.90	0.79
					0.00	1.41	0.27	0.25	0.19	1.03			0.00	0.00			0.00	0.00															
	6002	6003	0.43	0.65	0.78	2.19			0.00	1.03			0.00	0.00			0.00	0.00	11.69	70.87	96.04	112.54	164.46	254	675	675	CONC	0.15	62.5	325.6	0.91	1.14	0.78
					0.00	2.19	0.18	0.25	0.13	1.15			0.00	0.00			0.00	0.00															
					0.00	2.19	0.23	0.25	0.16	1.31			0.00	0.00			0.00	0.00															
	6003	6004	0.91	0.65	1.64	3.83			0.00	1.31			0.00	0.00			0.00	0.00	12.83	67.40	91.28	106.93	156.22	378	825	825	CONC	0.15	116.5	555.9	1.04	1.87	0.68
					0.00	3.83	0.14	0.25	0.10	1.41			0.00	0.00			0.00	0.00															
	6004	6005	0.35	0.65	0.63	4.46			0.00	1.41			0.00	0.00			0.00	0.00	14.70	62.48	84.53	99.00	144.58	398	825	825	CONC	0.15	51.0	555.9	1.04	0.82	0.72
	6005	6006	0.35	0.65	0.63	5.10			0.00	1.41			0.00	0.00			0.00	0.00	15.52	60.57	81.92	95.92	140.06	424	825	825	CONC	0.15	53.5	555.9	1.04	0.86	0.76
					0.00	5.10	0.32	0.25	0.22	1.63			0.00	0.00			0.00	0.00															
	6006	6007	0.65	0.65	1.17	6.27			0.00	1.63			0.00	0.00			0.00	0.00	16.38	58.70	79.36	92.92	135.65	498	900	900	CONC	0.15	81.5	701.1	1.10	1.23	0.71
					0.00	6.27	0.22	0.25	0.15	1.79			0.00	0.00			0.00	0.00															
	6007	6008	0.70	0.65	1.26	7.54			0.00	1.79			0.00	0.00			0.00	0.00	17.61	56.23	75.98	88.94	129.82	559	900	900	CONC	0.20	74.0	809.6	1.27	0.97	0.69

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive			
Checked: ADF	LOCATION: City of Ottawa			
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 1 OF 11	

1061_STMv2.xlsx

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	7.54	0.27	0.25	0.19	1.97			0.00	0.00			0.00	0.00															
	6008	6009	0.87	0.65	1.57	9.11			0.00	1.97			0.00	0.00			0.00	0.00	18.58	54.44	73.54	86.07	125.61	641	900	900	CONC	0.20	94.5	809.6	1.27	1.24	0.79
	6009	6010	0.20	0.65	0.36	9.47			0.00	1.97			0.00	0.00			0.00	0.00	19.82	52.33	70.66	82.69	120.65	635	900	900	CONC	0.20	22.0	809.6	1.27	0.29	0.78
	6010	6011	0.21	0.65	0.38	9.85			0.00	1.97			0.00	0.00			0.00	0.00	20.10	51.87	70.02	81.94	119.56	649	900	900	CONC	0.25	21.5	905.2	1.42	0.25	0.72
	6011	6014	0.80	0.65	1.45	11.29			0.00	1.97			0.00	0.00			0.00	0.00	20.36	51.47	69.48	81.31	118.62	718	975	975	CONC	0.20	73.5	1002.2	1.34	0.91	0.72
To BLOCK 6, Pipe 6014 - 6015						11.29				1.97				0.00				0.00	21.27														
BLOCK 9																																	
Contribution From STREET 17, Pipe 1066 - 1067						0.00				0.00				0.00				0.00	13.38					186									
	1067	1068			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	13.38	65.86	89.17	104.45	152.58	186	1200	1200	CONC	0.15	42.5	1510.0	1.34	0.53	0.12
	1068	1069			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	13.92	64.45	87.23	102.18	149.24	186	1200	1200	CONC	0.15	56.0	1510.0	1.34	0.70	0.12
To KNUDSON DRIVE, Pipe 1069 - 146						0.00				0.00				0.00				0.00	14.61					186									
KNUDSON DRIVE																																	
					0.00	0.00	6.71	0.70	13.06	13.06			0.00	0.00			0.00	0.00	14.00														
	112	113			0.00	0.00			0.00	13.06			0.00	0.00			0.00	0.00	14.00	64.23	86.93	101.82	148.72	1135	750	750	CONC	0.35	62.8	658.6	1.49	0.70	1.72
	113	114			0.00	0.00			0.00	13.06			0.00	0.00			0.00	0.00	14.70	62.48	84.53	99.00	144.58	1104	750	750	CONC	0.39	64.9	690.8	1.56	0.69	1.60
	114	115			0.00	0.00			0.00	13.06			0.00	0.00			0.00	0.00	15.39	60.85	82.31	96.38	140.74	1075	750	750	CONC	0.35	103.7	655.8	1.48	1.16	1.64
					0.00	0.00	1.26	0.65	2.28	15.33			0.00	0.00			0.00	0.00	10.00														
	115	116			0.00	0.00			0.00	15.33			0.00	0.00			0.00	0.00	16.56	58.32	78.84	92.31	134.76	1209	750	750	CONC	0.60	112.5	859.5	1.95	0.96	1.41
	116	132			0.00	0.00			0.00	15.33			0.00	0.00			0.00	0.00	17.52	56.39	76.21	89.21	130.22	1169	750	750	CONC	0.68	110.8	916.0	2.07	0.89	1.28
					0.00	0.00	5.41	0.65	9.78	25.11			0.00	0.00			0.00	0.00	15.00														
	132	133			0.00	0.00			0.00	25.11			0.00	0.00			0.00	0.00	18.41	54.73	73.94	86.55	126.31	1857	1050	1050	CONC	0.58	45.2	2070.7	2.39	0.32	0.90
					0.00	0.00	3.25	0.25	2.26	27.37			0.00	0.00			0.00	0.00	25.00														
	133	138			0.00	0.00			0.00	27.37			0.00	0.00			0.00	0.00	25.00	45.17	60.90	71.22	103.85	1667	1050	1050	CONC	0.73	61.8	2329.9	2.69	0.38	0.72
					0.00	0.00	1.21	0.65	2.19	29.56			0.00	0.00			0.00	0.00	12.00														
	138	139			0.00	0.00			0.00	29.56			0.00	0.00			0.00	0.00	25.38	44.72	60.29	70.51	102.81	1782	1050	1050	CONC	0.61	78.8	2131.0	2.46	0.53	0.84
	139	140			0.00	0.00			0.00	29.56			0.00	0.00			0.00	0.00	25.92	44.12	59.47	69.55	101.40	1758	1050	1050	CONC	0.57	51.1	2058.0	2.38	0.36	0.85
					0.00	0.00	3.33	0.65	6.02	35.57			0.00	0.00			0.00	0.00	12.00														
	140	144			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	26.28	43.73	58.93	68.92	100.47	2096	1050	1050	CONC	0.65	72.6	2196.5	2.54	0.48	0.95
	144	145			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	26.75	43.21	58.23	68.10	99.27	2072	1050	1050	CONC	0.43	34.9	1790.7	2.07	0.28	1.16
	145	1069			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	27.03	42.91	57.83	67.63	98.58	2057	2100	2100	CONC	0.17	42.5	7043.1	2.03	0.35	0.29
Contribution From BLOCK 9, Pipe 1068 - 1069						0.00				0.00				0.00				0.00	14.61					186									
	1069	146			0.00	0.00			0.00	35.57			0.00	0.00			0.00	0.00	27.38	42.55	57.34	67.05	97.73	2226	2100	2100	CONC	0.14	21.2	6417.8	1.85	0.19	0.35
					0.00	0.00	1.39	0.65	2.51	38.08			0.00	0.00			0.00	0.00	20.00														
	146	148			0.00	0.00			0.00	38.08			0.00	0.00			0.00	0.00	27.57	42.36	57.08	66.74	97.28	2360	2100	2100	CONC	0.16	29.2	6957.2	2.01	0.24	0.34
To BLOCK 8, Pipe 148 - 6019						0.00				38.08				0.00				0.00	27.81					186									
Contribution From BLOCK 8, Pipe 148 - 6019						0.00				38.08				0.00				0.00	27.86					186									
Contribution From BLOCK 8, Pipe 2023 - 6019						0.00				0.27				0.00				0.00	10.78					275									
	6019	154			0.00	0.00			0.00	38.36			0.00	0.00			0.00	0.00	27.86	42.07	56.68	66.28	96.60	2635	2100	2100	CONC	0.16	52.1	7000.3	2.02	0.43	0.38
					0.00	0.00	1.13	0.65	2.04	40.40			0.00	0.00			0.00	0.00	12.00														
	154	155			0.00	0.00			0.00	40.40			0.00	0.00			0.00	0.00	28.29	41.65	56.11	65.60	95.61	2728	2100	2100	CONC	0.17	53.7	7149.1	2.06	0.43	0.38
	155	156			0.00	0.00			0.00	40.40			0.00	0.00			0.00	0.00	28.72	41.23	55.54	64.93	94.63	2705	2100	2100	CONC	0.18	96.7	7437.6	2.15	0.75	0.36
					0.00	0.00	3.94	0.65	7.12	47.52			0.00	0.00			0.00	0.00	11.00														
	156	158			0.00	0.00			0.00	47.52			0.00	0.00			0.00	0.00	29.47	40.52	54.58	63.81	92.99	3054	2100	2100	CONC	0.18	101.5	7335.9	2.12	0.80	0.42
	158	159			0.00	0.00			0.00	47.52			0.00	0.00			0.00	0.00	30.27	39.80	53.60	62.66	91.31	3008	2100	2100	CONC	0.21	45.6	8002.3	2.31	0.33	0.38
	159	210			0.00	0.00			0.00	47.52			0.00	0.00			0.00	0.00	30.60	39.51	53.21	62.20	90.63	2989	2100	2100	CONC	0.18	46.1	7397.1	2.14	0.36	0.40
To WESLOCK WAY, Pipe 210 - 6017						0.00				47.52				0.00				0.00	30.96					461									
WESLOCK WAY																																	
Contribution From KNUDSON DRIVE, Pipe 159 - 210						0.00				47.52				0.00				0.00	30.96					461									
Contribution From STREET 18, Pipe 209 - 210						0.00				28.91				0.00				0.00	20.47														
	210	6017			0.00	0.00			0.00	76.43			0.00	0.00			0.00	0.00	30.96	39.20	52.79	61.71	89.91	4496	2250	2250	CONC	0.17	55.1	8643.5	2.17	0.42	0.52
Contribution From BLOCK 6, Pipe 6016 - 6017						11.91				2.66				0.00				0.00	23.00														
	6017	212			0.00	11.91			0.00	79.09			0.00	0.00			0.00	0.00	31.38	38.85	52.30	61.14	89.08	5060	2250	2250	CONC	0.16	39.2	8362.6	2.10	0.31	0.61
	212	213			0.00	11.91			0.00	79.09			0.00	0.00			0.00	0.00	31.69	38.59	51.95	60.73	88.47	5029	2250	2250	CONC	0.16	44.9	8336.6	2.10	0.36	0.60

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 2 OF 11

1061_STMv2.xlsx

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	11.91	1.75	0.65	3.16	82.25			0.00	0.00			0.00	0.00	15.00														
	213	220			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	32.05	38.30	51.56	60.26	87.79	5158	2550	2550	CONC	0.36	125.0	17507.9	3.43	0.61	0.29
	220	221			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	32.66	37.81	50.90	59.49	86.66	5098	2550	2550	CONC	0.13	46.4	10451.4	2.05	0.38	0.49
	221	226			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	33.03	37.52	50.49	59.02	85.97	5061	2550	2550	CONC	0.15	42.2	11419.3	2.24	0.31	0.44
	226	4054			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	33.35	37.27	50.17	58.63	85.41	5031	2700	2700	CONC	0.10	70.4	10929.3	1.91	0.61	0.46
Contribution From BLOCK 4, Pipe 4053 - 4054						0.00				0.00				0.00				0.00	10.43					264									
	4054	5020			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	33.96	36.81	49.54	57.90	84.33	5238	2700	2700	CONC	0.07	8.1	9237.9	1.61	0.08	0.57
Contribution From STREET 16, Pipe 5019 - 5020						0.00				0.00				0.00				0.00	10.50					104									
	5020	228			0.00	11.91			0.00	82.25			0.00	0.00			0.00	0.00	34.05	36.75	49.45	57.80	84.19	5334	2700	2700	CONC	0.07	59.5	9244.1	1.61	0.61	0.58
					0.00	11.91	9.43	0.65	17.04	99.29			0.00	0.00			0.00	0.00	14.00														
					0.00	11.91	1.47	0.65	2.66	101.95			0.00	0.00			0.00	0.00	10.00														
					0.00	11.91	0.72	0.65	1.30	103.25			0.00	0.00			0.00	0.00															
	228	242			0.00	11.91	1.84	0.65	3.32	106.58			0.00	0.00			0.00	0.00	34.66	36.30	48.85	57.09	83.14	6467	2700	2700	CONC	0.08	160.6	9465.1	1.65	1.62	0.68
	242	243			0.00	11.91			0.00	106.58			0.00	0.00			0.00	0.00	36.28	35.18	47.32	55.30	80.52	6291	2700	2700	CONC	0.21	55.1	15567.5	2.72	0.34	0.40
	243	244			0.00	11.91			0.00	106.58			0.00	0.00			0.00	0.00	36.62	34.95	47.01	54.94	80.00	6256	2700	2700	CONC	0.10	44.4	10770.5	1.88	0.39	0.58
					0.00	11.91	2.75	0.65	4.97	111.54			0.00	0.00			0.00	0.00	14.00														
					0.00	11.91	1.98	0.65	3.58	115.12			0.00	0.00			0.00	0.00	10.00														
	244	254			0.00	11.91			0.00	115.12			0.00	0.00			0.00	0.00	37.01	34.69	46.66	54.53	79.40	6614	2700	2700	CONC	0.12	132.6	11934.0	2.08	1.06	0.55
	254	255			0.00	11.91			0.00	115.12			0.00	0.00			0.00	0.00	38.07	34.02	45.75	53.46	77.83	6501	2700	2700	CONC	0.05	32.8	7728.2	1.35	0.41	0.84
To BLOCK 1, Pipe 255 - 256						11.91				115.12				0.00				0.00	38.48					829									
STREET 8																																	
	2008	2018	0.27	0.65	0.49	0.49			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	37	600	600	CONC	0.15	67.0	237.8	0.84	1.33	0.16
	2018	2019	0.34	0.65	0.61	1.10			0.00	0.00			0.00	0.00			0.00	0.00	11.33	72.06	97.67	114.46	167.27	79	600	600	CONC	0.15	67.0	237.8	0.84	1.33	0.33
To STREET 7, Pipe 2019 - 2020						1.10				0.00				0.00				0.00	12.66														
BLOCK 7																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						555									
	2011	2012			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	555	900	900	CONC	0.15	76.0	701.1	1.10	1.15	0.79
	2012	2015			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	11.15	72.66	98.49	115.43	168.69	555	900	900	CONC	0.15	43.0	701.1	1.10	0.65	0.79
To STREET 7, Pipe 2015 - 2016						0.00				0.00				0.00				0.00	11.80					555									
STREET 7																																	
	2008	2009	0.63	0.65	1.14	1.14			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	87	600	600	CONC	0.15	68.5	237.8	0.84	1.36	0.37
To STREET 7, Pipe 2009 - 2010						1.14				0.00				0.00				0.00	11.36														
					0.00	0.00	0.36	0.65	0.65	0.65			0.00	0.00			0.00	0.00															
	2008	2013	0.83	0.65	1.50	1.50			0.00	0.65			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	183	600	600	CONC	0.15	67.5	237.8	0.84	1.34	0.77
					0.00	1.50	0.28	0.65	0.51	1.16			0.00	0.00			0.00	0.00															
	2013	2014	0.47	0.65	0.85	2.35			0.00	1.16			0.00	0.00			0.00	0.00	11.34	72.02	97.62	114.40	167.19	282	750	750	CONC	0.15	12.5	431.2	0.98	0.21	0.65
					0.00	2.35	0.17	0.65	0.31	1.46			0.00	0.00			0.00	0.00															
	2014	2015	0.34	0.65	0.61	2.96			0.00	1.46			0.00	0.00			0.00	0.00	11.55	71.32	96.66	113.27	165.52	353	825	825	CONC	0.15	28.0	555.9	1.04	0.45	0.63
Contribution From BLOCK 7, Pipe 2012 - 2015						0.00				0.00				0.00				0.00	11.80					555									
					0.00	2.96	0.21	0.65	0.38	1.84			0.00	0.00			0.00	0.00															
	2015	2016	1.07	0.65	1.93	4.90			0.00	1.84			0.00	0.00			0.00	0.00	12.00	69.89	94.70	110.96	162.13	1072	1200	1200	CONC	0.15	89.0	1510.0	1.34	1.11	0.71
					0.00	4.90	0.57	0.65	1.03	2.87			0.00	0.00			0.00	0.00															
					0.00	4.90	0.77	0.65	1.39	4.26			0.00	0.00			0.00	0.00															
	2016	2017	1.61	0.65	2.91	7.81			0.00	4.26			0.00	0.00			0.00	0.00	13.11	66.62	90.20	105.67	154.37	1460	1200	1200	CONC	0.25	12.5	1949.4	1.72	0.12	0.75
					0.00	7.81	0.25	0.65	0.45	4.72			0.00	0.00			0.00	0.00															
	2017	2019	0.65	0.65	1.17	8.98			0.00	4.72			0.00	0.00			0.00	0.00	13.23	66.28	89.74	105.13	153.57	1574	1350	1350	CONC	0.15	67.5	2067.2	1.44	0.78	0.76
Contribution From STREET 8, Pipe 2018 - 2019						1.10				0.00				0.00				0.00	12.66														
	2019	2020	0.26	0.65	0.47	10.55			0.00	4.72			0.00	0.00			0.00	0.00	14.01	64.21	86.90	101.78	148.66	1642	1350	1350	CONC	0.20	68.0	2387.0	1.67	0.68	0.69
To STREET 7, Pipe 2020 - 2021						10.55				4.72				0.00				0.00	14.69					555									

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 3 OF 11

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STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

LOCATION			AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
BLOCK 12																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						581									
	2003	2004			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	581	600	600	CONC	0.95	32.5	598.5	2.12	0.26	0.97
To STREET 7, Pipe 2004 - 2005						0.00				0.00				0.00				0.00	10.26					581									
BLOCK 15																																	
					0.00	0.00	1.48	0.65	2.67	2.67			0.00	0.00			0.00	0.00	12.00														
	2000	2002			0.00	0.00			0.00	2.67			0.00	0.00			0.00	0.00	12.00	69.89	94.70	110.96	162.13	253	600	600	CONC	0.87	63.5	572.7	2.03	0.52	0.44
To STREET 7, Pipe 2002 - 2004						0.00				2.67				0.00				0.00	12.52														
BLOCK 1																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						223									
	4040	4041			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	223	375	375	CONC	1.25	55.0	196.0	1.77	0.52	1.14
To STREET 1, Pipe 4041 - 4042						0.00				0.00				0.00				0.00	10.52					223									
Contribution From WESLOCK WAY, Pipe 254 - 255						11.91				115.12				0.00				0.00	38.48					829									
	255	256			0.00	11.91			0.00	115.12			0.00	0.00			0.00	0.00	38.48	33.77	45.41	53.06	77.25	6459	2700	2700	CONC	0.13	20.2	12405.9	2.17	0.16	0.52
STREET 19																																	
Contribution From STREET 1, Pipe 4041 - 4042						2.64				0.61				0.00				0.00	11.91					223									
					0.00	2.64	0.12	0.65	0.22	0.83			0.00	0.00			0.00	0.00															
	4042	4043	0.58	0.65	1.05	3.69			0.00	0.83			0.00	0.00			0.00	0.00	11.91	70.18	95.08	111.41	162.80	561	750	750	CONC	0.50	95.0	787.2	1.78	0.89	0.71
					0.00	3.69	0.04	0.65	0.07	0.90			0.00	0.00			0.00	0.00															
	4043	4044	0.17	0.65	0.31	3.99			0.00	0.90			0.00	0.00			0.00	0.00	12.80	67.51	91.42	107.10	156.47	575	750	750	CONC	1.05	17.0	1140.8	2.58	0.11	0.50
	4044	4045	0.24	0.65	0.43	4.43			0.00	0.90			0.00	0.00			0.00	0.00	12.91	67.19	90.99	106.59	155.73	603	750	750	CONC	1.15	35.0	1193.9	2.70	0.22	0.50
To STREET 18, Pipe 4045 - 4046						4.43				0.90				0.00				0.00	13.12					223									
STREET 15																																	
	4034	4035	0.41	0.65	0.74	0.74			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	57	300	300	PVC	1.35	53.0	112.4	1.59	0.56	0.51
	4035	4036	0.06	0.65	0.11	0.85			0.00	0.00			0.00	0.00			0.00	0.00	10.56	74.73	101.35	118.79	173.63	63	300	300	PVC	1.05	11.0	99.1	1.40	0.13	0.64
	4036	4037	0.13	0.65	0.23	1.08			0.00	0.00			0.00	0.00			0.00	0.00	10.69	74.27	100.70	118.03	172.52	81	300	300	PVC	1.25	31.0	108.1	1.53	0.34	0.74
To STREET 18, Pipe 4037 - 4045						1.08				0.00				0.00				0.00	11.02														
BLOCK 3																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						958									
	4013	4014			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	958	900	900	CONC	0.20	81.5	809.6	1.27	1.07	1.18
To STREET 1, Pipe 4014 - 4020						0.00				0.00				0.00				0.00	11.07					958									
STREET 2																																	
	4009	4010	0.26	0.65	0.47	0.47			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	36	300	300	PVC	0.40	67.0	61.2	0.87	1.29	0.59
To STREET 1, Pipe 4010 - 4011						0.47				0.00				0.00				0.00	11.29														
					0.00	0.00	0.09	0.65	0.16	0.16			0.00	0.00			0.00	0.00															
	4009	4015	0.29	0.65	0.52	0.52			0.00	0.16			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	57	300	300	PVC	0.55	10.5	71.7	1.01	0.17	0.80
					0.00	0.52	0.29	0.65	0.52	0.69			0.00	0.00			0.00	0.00															
	4015	4016	1.40	0.65	2.53	3.05			0.00	0.69			0.00	0.00			0.00	0.00	10.17	76.15	103.29	121.08	177.00	303	600	600	CONC	0.50	115.5	434.2	1.54	1.25	0.70
					0.00	3.05	0.20	0.65	0.36	1.05			0.00	0.00			0.00	0.00															
	4016	4017	0.95	0.65	1.72	4.77			0.00	1.05			0.00	0.00			0.00	0.00	11.43	71.73	97.22	113.93	166.50	444	675	675	CONC	0.50	103.0	594.4	1.66	1.03	0.75
					0.00	4.77	0.25	0.65	0.45	1.50			0.00	0.00			0.00	0.00															
	4017	4018	0.85	0.65	1.54	6.31			0.00	1.50			0.00	0.00			0.00	0.00	12.46	68.50	92.78	108.70	158.82	571	750	750	CONC	0.50	103.5	787.2	1.78	0.97	0.73
					0.00	6.31	0.13	0.65	0.23	1.73			0.00	0.00			0.00	0.00															
	4018	4019	0.14	0.65	0.25	6.56			0.00	1.73			0.00	0.00			0.00	0.00	13.43	65.75	89.01	104.26	152.30	586	750	750	CONC	0.45	9.0	746.8	1.69	0.09	0.78
	4019	4020	0.27	0.65	0.49	7.05			0.00	1.73			0.00	0.00			0.00	0.00	13.52	65.51	88.68	103.88	151.74	615	825	825	CONC	0.45	68.5	962.9	1.80	0.63	0.64
To STREET 1, Pipe 4020 - 4021						7.05				1.73				0.00				0.00	14.15														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 4 OF 11

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STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Location	From Node	To Node	2 YEAR AREA (Ha)	2 YEAR R	2 YEAR Indiv. 2.78 AC	2 YEAR Accum. 2.78 AC	5 YEAR AREA (Ha)	5 YEAR R	5 YEAR Indiv. 2.78 AC	5 YEAR Accum. 2.78 AC	10 YEAR AREA (Ha)	10 YEAR R	10 YEAR Indiv. 2.78 AC	10 YEAR Accum. 2.78 AC	100 YEAR AREA (Ha)	100 YEAR R	100 YEAR Indiv. 2.78 AC	100 YEAR Accum. 2.78 AC	Time of Conc. (min)	Intensity 2 Year (mm/h)	Intensity 5 Year (mm/h)	Intensity 10 Year (mm/h)	Intensity 100 Year (mm/h)	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min)	RATIO Q/Q full
BLOCK 16																																	
					0.00	0.00	6.02	0.30	5.02	5.02			0.00	0.00			0.00	0.00	14.00														
	4007	4008			0.00	0.00			0.00	5.02			0.00	0.00			0.00	0.00	14.00	64.23	86.93	101.82	148.72	436	825	825	PVC	0.30	33.5	786.2	1.47	0.38	0.56
To STREET 1, Pipe 4008 - 4010						0.00				5.02				0.00				0.00	14.38														
STREET 18																																	
					0.00	0.00	8.99	0.65	16.24	16.24			0.00	0.00			0.00	0.00	20.00														
					0.00	0.00	1.43	0.65	2.58	18.83			0.00	0.00			0.00	0.00	17.00														
					0.00	0.00	0.82	0.65	1.48	20.31			0.00	0.00			0.00	0.00	15.00														
					0.00	0.00	4.76	0.65	8.60	28.91			0.00	0.00			0.00	0.00	13.00														
	209	210			0.00	0.00			0.00	28.91			0.00	0.00			0.00	0.00	20.00	52.03	70.25	82.21	119.95	2031	1200	1200	CONC	0.15	38.0	1510.0	1.34	0.47	1.35
To WESLOCK WAY, Pipe 210 - 6017						0.00				28.91				0.00				0.00	20.47														
Contribution From STREET 1, Pipe 4023 - 4028						20.74				11.07				0.00				0.00	19.66					958									
Contribution From STREET 1, Pipe 4027 - 4028						1.21				0.29				0.00				0.00	12.44														
	4028	4029			0.00	21.96			0.00	11.36			0.00	0.00			0.00	0.00	19.66	52.59	71.01	83.11	121.27	2920	1650	1650	CONC	0.20	12.5	4076.1	1.91	0.11	0.72
	4029	4030	0.21	0.65	0.38	22.33			0.00	11.36			0.00	0.00			0.00	0.00	19.77	52.41	70.77	82.82	120.84	2933	1650	1650	CONC	0.20	21.5	4076.1	1.91	0.19	0.72
					0.00	22.33	0.15	0.65	0.27	11.63			0.00	0.00			0.00	0.00															
	4030	4031	0.22	0.65	0.40	22.73			0.00	11.63			0.00	0.00			0.00	0.00	19.95	52.11	70.35	82.33	120.13	2961	1650	1650	CONC	0.20	25.5	4076.1	1.91	0.22	0.73
					0.00	22.73	0.06	0.65	0.11	11.74			0.00	0.00			0.00	0.00															
	4031	4032	0.29	0.65	0.52	23.26			0.00	11.74			0.00	0.00			0.00	0.00	20.18	51.75	69.87	81.76	119.29	2982	1650	1650	CONC	0.45	30.5	6114.2	2.86	0.18	0.49
					0.00	23.26	0.10	0.65	0.18	11.92			0.00	0.00			0.00	0.00															
	4032	4033	0.30	0.65	0.54	23.80			0.00	11.92			0.00	0.00			0.00	0.00	20.35	51.47	69.48	81.31	118.63	3011	1650	1650	CONC	0.45	34.5	6114.2	2.86	0.20	0.49
					0.00	23.80	0.12	0.65	0.22	12.14			0.00	0.00			0.00	0.00															
	4033	4037	0.35	0.65	0.63	24.43			0.00	12.14			0.00	0.00			0.00	0.00	20.56	51.15	69.06	80.81	117.89	3046	1650	1650	CONC	0.45	51.0	6114.2	2.86	0.30	0.50
Contribution From STREET 15, Pipe 4036 - 4037						1.08				0.00				0.00				0.00	11.02														
					0.00	25.51	0.17	0.65	0.31	12.45			0.00	0.00			0.00	0.00															
	4037	4045	0.38	0.65	0.69	26.20			0.00	12.45			0.00	0.00			0.00	0.00	20.85	50.70	68.43	80.08	116.82	3138	1800	1800	CONC	0.20	70.5	5140.6	2.02	0.58	0.61
Contribution From STREET 19, Pipe 4044 - 4045						4.43				0.90				0.00				0.00	13.12					223									
					0.00	30.63	0.07	0.65	0.13	13.48			0.00	0.00			0.00	0.00															
	4045	4046	0.15	0.65	0.27	30.90			0.00	13.48			0.00	0.00			0.00	0.00	21.43	49.83	67.25	78.69	114.79	3627	1800	1800	CONC	0.25	34.5	5747.4	2.26	0.25	0.63
					0.00	30.90	0.08	0.65	0.14	13.62			0.00	0.00			0.00	0.00															
					0.00	30.90	0.08	0.65	0.14	13.77			0.00	0.00			0.00	0.00															
	4046	4047	0.40	0.65	0.72	31.62			0.00	13.77			0.00	0.00			0.00	0.00	21.69	49.46	66.75	78.10	113.92	3664	1800	1800	CONC	0.25	42.5	5747.4	2.26	0.31	0.64
					0.00	31.62	0.09	0.65	0.16	13.93			0.00	0.00			0.00	0.00															
					0.00	31.62	0.10	0.65	0.18	14.11			0.00	0.00			0.00	0.00															
	4047	4048	0.40	0.65	0.72	32.35			0.00	14.11			0.00	0.00			0.00	0.00	22.00	49.02	66.14	77.38	112.87	3700	1800	1800	CONC	0.25	39.0	5747.4	2.26	0.29	0.64
					0.00	32.35	0.07	0.65	0.13	14.24			0.00	0.00			0.00	0.00															
					0.00	32.35	0.09	0.65	0.16	14.40			0.00	0.00			0.00	0.00															
	4048	4049	0.36	0.65	0.65	33.00			0.00	14.40			0.00	0.00			0.00	0.00	22.29	48.62	65.59	76.74	111.93	3730	1800	1800	CONC	0.25	48.5	5747.4	2.26	0.36	0.65
					0.00	33.00	0.14	0.65	0.25	14.65			0.00	0.00			0.00	0.00															
					0.00	33.00	0.14	0.65	0.25	14.90			0.00	0.00			0.00	0.00															
	4049	4050	0.65	0.65	1.17	34.17			0.00	14.90			0.00	0.00			0.00	0.00	22.65	48.13	64.93	75.96	110.78	3793	1800	1800	CONC	0.25	71.0	5747.4	2.26	0.52	0.66
To BLOCK 5, Pipe 4050 - 4051						34.17				14.90				0.00				0.00	23.17					1181									
BLOCK 5																																	
Contribution From STREET 18, Pipe 4049 - 4050						34.17				14.90				0.00				0.00	23.17					1181									
					0.00	34.17	0.19	0.65	0.34	15.25			0.00	0.00			0.00	0.00															
					0.00	34.17	0.38	0.65	0.69	15.93			0.00	0.00			0.00	0.00															
	4050	4051	0.64	0.65	1.16	35.33			0.00	15.93			0.00	0.00			0.00	0.00	23.17	47.43	63.98	74.84	109.15	3876	1800	1800	CONC	0.25	96.5	5747.4	2.26	0.71	0.67
	4051	4052			0.00	35.33			0.00	15.93			0.00	0.00			0.00	0.00	23.88	46.52	62.74	73.39	107.01	3824	1800	1800	CONC	0.25	65.0	5747.4	2.26	0.48	0.67
BLOCK 13																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						219									
	1053	1054			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	219	525	525	CONC	2.25	43.5	645.1	2.98	0.24	0.34
To STREET 9, Pipe 1054 - 1055						0.00				0.00				0.00				0.00	10.24					219									

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive			
Checked: ADF	LOCATION: City of Ottawa			
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 5 OF 11	

1061_STMv2.xlsx

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
STREET 6																																	
Contribution From STREET 1, Pipe 1010 - 1012						2.39				0.00				0.00				0.00	11.27														
Contribution From STREET 1, Pipe 1011 - 1012						1.73				0.38				0.00				0.00	11.22														
	1012	1013	0.26	0.65	0.47	4.59			0.00	0.38			0.00	0.00			0.00	0.00	11.27	72.24	97.91	114.75	167.69	369	675	675	CONC	0.30	66.0	460.4	1.29	0.85	0.80
	1013	1014	0.10	0.65	0.18	4.77			0.00	0.38			0.00	0.00			0.00	0.00	12.13	69.49	94.15	110.31	161.19	367	675	675	CONC	0.30	19.5	460.4	1.29	0.25	0.80
	1014	1023	1.33	0.65	2.40	7.17			0.00	0.38			0.00	0.00			0.00	0.00	12.38	68.73	93.10	109.08	159.37	528	900	900	CONC	0.15	106.0	701.1	1.10	1.60	0.75
Contribution From STREET 7, Pipe 1022 - 1023						1.32				38.56				0.00				0.00	21.76														
	1023	1019	0.50	0.65	0.90	9.40			0.00	38.94			0.00	0.00			0.00	0.00	21.76	49.36	66.60	77.93	113.67	3057	1650	1650	CONC	0.20	64.5	4076.1	1.91	0.56	0.75
	1019	1018	0.50	0.65	0.90	10.30			0.00	38.94			0.00	0.00			0.00	0.00	22.33	48.57	65.52	76.66	111.81	3052	1650	1650	CONC	0.20	45.5	4076.1	1.91	0.40	0.75
	1018	1017			0.00	10.30			0.00	38.94			0.00	0.00			0.00	0.00	22.73	48.02	64.79	75.79	110.54	3017	1650	1650	CONC	0.20	50.0	4076.1	1.91	0.44	0.74
	1017	1016	0.16	0.65	0.29	10.59			0.00	38.94			0.00	0.00			0.00	0.00	23.16	47.44	64.00	74.86	109.18	2994	1650	1650	CONC	0.20	44.0	4076.1	1.91	0.38	0.73
	1016	1047	0.11	0.65	0.20	10.79			0.00	38.94			0.00	0.00			0.00	0.00	23.55	46.95	63.32	74.07	108.01	2972	1650	1650	CONC	0.20	24.0	4076.1	1.91	0.21	0.73
To STREET 11, Pipe 1047 - 1048						10.79				38.94				0.00				0.00	23.76														
STREET 11																																	
					0.00	0.00	3.11	0.50	4.32	4.32			0.00	0.00			0.00	0.00	13.00														
	1044	1045			0.00	0.00			0.00	4.32			0.00	0.00			0.00	0.00	13.00	66.93	90.63	106.17	155.11	392	525	525	CONC	2.25	28.0	645.1	2.98	0.16	0.61
					0.00	0.00	3.32	0.20	1.85	6.17			0.00	0.00			0.00	0.00	25.00														
					0.00	0.00	0.04	0.65	0.07	6.24			0.00	0.00			0.00	0.00															
					0.00	0.00	0.11	0.65	0.20	6.44			0.00	0.00			0.00	0.00															
	1045	1046	0.59	0.65	1.07	1.07			0.00	6.44			0.00	0.00			0.00	0.00	25.00	45.17	60.90	71.22	103.85	440	750	750	CONC	0.25	64.5	556.6	1.26	0.85	0.79
	1046	1047	0.23	0.65	0.42	1.48			0.00	6.44			0.00	0.00			0.00	0.00	25.85	44.19	59.57	69.66	101.56	449	750	750	CONC	0.30	32.0	609.8	1.38	0.39	0.74
Contribution From STREET 6, Pipe 1016 - 1047						10.79				38.94				0.00				0.00	23.76														
					0.00	12.27	0.10	0.65	0.18	45.56			0.00	0.00			0.00	0.00															
	1047	1048	0.76	0.65	1.37	13.64			0.00	45.56			0.00	0.00			0.00	0.00	26.24	43.76	58.99	68.98	100.56	3285	1950	1950	CONC	0.15	84.5	5511.2	1.85	0.76	0.60
	1048	1049			0.00	13.64			0.00	45.56			0.00	0.00			0.00	0.00	27.00	42.95	57.88	67.68	98.65	3223	2100	2100	CONC	0.15	12.0	6715.4	1.94	0.10	0.48
To STREET 9, Pipe 1049 - 1050						13.64				45.56				0.00				0.00	27.11														
STREET 12																																	
	1039	1040	0.21	0.65	0.38	0.38			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	29	300	300	PVC	0.70	49.0	80.9	1.14	0.71	0.36
	1040	1041	0.36	0.65	0.65	1.03			0.00	0.00			0.00	0.00			0.00	0.00	10.71	74.17	100.57	117.87	172.29	76	375	375	PVC	0.70	60.0	146.7	1.33	0.75	0.52
	1041	1042			0.00	1.03			0.00	0.00			0.00	0.00			0.00	0.00	11.47	71.60	97.04	113.71	166.18	74	375	375	PVC	0.40	10.5	110.9	1.00	0.17	0.67
To STREET 9, Pipe 1042 - 1043						1.03				0.00				0.00				0.00	11.64														
STREET 13																																	
	1035	1036	0.30	0.65	0.54	0.54			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	42	300	300	PVC	0.35	67.0	57.2	0.81	1.38	0.73
	1036	1037	0.34	0.65	0.61	1.16			0.00	0.00			0.00	0.00			0.00	0.00	11.38	71.88	97.43	114.18	166.86	83	450	450	CONC	0.20	75.5	127.5	0.80	1.57	0.65
	1037	1038			0.00	1.16			0.00	0.00			0.00	0.00			0.00	0.00	12.95	67.07	90.83	106.40	155.45	78	450	450	CONC	0.20	11.5	127.5	0.80	0.24	0.61
To STREET 9, Pipe 1038 - 1042						1.16				0.00				0.00				0.00	13.19														
STREET 14																																	
	1030	1031	0.33	0.65	0.60	0.60			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	300	300	PVC	0.35	85.0	57.2	0.81	1.75	0.80
	1031	1032	0.50	0.65	0.90	1.50			0.00	0.00			0.00	0.00			0.00	0.00	11.75	70.68	95.77	112.23	164.00	106	450	450	CONC	0.25	79.5	142.6	0.90	1.48	0.74
	1032	1033			0.00	1.50			0.00	0.00			0.00	0.00			0.00	0.00	13.23	66.29	89.75	105.14	153.59	99	450	450	CONC	0.20	3.0	127.5	0.80	0.06	0.78
	1033	1034			0.00	1.50			0.00	0.00			0.00	0.00			0.00	0.00	13.29	66.12	89.52	104.86	153.19	99	450	450	CONC	0.20	13.0	127.5	0.80	0.27	0.78
To STREET 9, Pipe 1034 - 1038						1.50				0.00				0.00				0.00	13.56														
STREET 2																																	
					0.00	0.00	0.03	0.65	0.05	0.05			0.00	0.00			0.00	0.00															
	1003	1004	0.20	0.65	0.36	0.36			0.00	0.05			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	33	300	300	PVC	2.50	17.5	152.9	2.16	0.13	0.22
					0.00	0.36	0.02	0.65	0.04	0.09			0.00	0.00			0.00	0.00															
	1004	1005	0.18	0.65	0.33	0.69			0.00	0.09			0.00	0.00			0.00	0.00	10.13	76.29	103.49	121.31	177.34	62	300	300	PVC	2.40	22.5	149.8	2.12	0.18	0.41
					0.00	0.69	0.04	0.65	0.07	0.16			0.00	0.00			0.00	0.00															
	1005	1006	0.29	0.65	0.52	1.21			0.00	0.16			0.00	0.00			0.00	0.00	10.31	75.63	102.57	120.24	175.76	108	300	300	PVC	2.55	49.5	154.4	2.18	0.38	0.70
To STREET 5, Pipe 1006 - 1007						1.21				0.16				0.00				0.00	10.69														

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT:	7000 Campeau Drive		
Checked: ADF	LOCATION:	City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref:	18-1061	Date: 28 May 2020	Sheet No. SHEET 6 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

LOCATION			AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	0.00	0.11	0.65	0.20	0.20			0.00	0.00			0.00	0.00															
	4000	4001	0.48	0.65	0.87	0.87			0.00	0.20			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	87	375	375	PVC	0.40	54.5	110.9	1.00	0.90	0.79
					0.00	0.87	0.07	0.65	0.13	0.33			0.00	0.00			0.00	0.00															
	4001	4002	0.28	0.65	0.51	1.37			0.00	0.33			0.00	0.00			0.00	0.00	10.90	73.50	99.65	116.79	170.69	133	450	450	CONC	0.35	35.0	168.7	1.06	0.55	0.79
					0.00	1.37	0.09	0.65	0.16	0.49			0.00	0.00			0.00	0.00															
	4002	4003	0.23	0.65	0.42	1.79			0.00	0.49			0.00	0.00			0.00	0.00	11.45	71.64	97.09	113.78	166.27	176	525	525	CONC	0.30	10.0	235.6	1.09	0.15	0.75
	4003	4006	0.26	0.65	0.47	2.26			0.00	0.49			0.00	0.00			0.00	0.00	11.61	71.14	96.40	112.97	165.09	208	600	600	CONC	0.20	66.5	274.6	0.97	1.14	0.76
To STREET 1, Pipe 4006 - 4008						2.26				0.49				0.00				0.00	12.75														
STREET 5																																	
Contribution From STREET 1, Pipe 1001 - 1002						2.19				0.76				0.00				0.00	11.00														
	1002	1006	0.28	0.65	0.51	2.69			0.00	0.76			0.00	0.00			0.00	0.00	11.00	73.17	99.20	116.26	169.92	272	600	600	CONC	0.35	74.5	363.3	1.28	0.97	0.75
Contribution From STREET 2, Pipe 1005 - 1006						1.21				0.16				0.00				0.00	10.69														
	1006	1007	0.06	0.65	0.11	4.01			0.00	0.92			0.00	0.00			0.00	0.00	11.96	70.00	94.85	111.14	162.40	368	600	600	CONC	0.60	15.0	475.6	1.68	0.15	0.77
	1007	1008	0.24	0.65	0.43	4.45			0.00	0.92			0.00	0.00			0.00	0.00	12.11	69.54	94.22	110.39	161.30	396	675	675	CONC	0.35	30.5	497.3	1.39	0.37	0.80
					0.00	4.45	0.15	0.65	0.27	1.19			0.00	0.00			0.00	0.00															
	1008	1025	0.93	0.65	1.68	6.13			0.00	1.19			0.00	0.00			0.00	0.00	12.48	68.44	92.70	108.61	158.68	530	825	825	CONC	0.30	121.5	786.2	1.47	1.38	0.67
To STREET 7, Pipe 1025 - 1026						6.13				1.19				0.00				0.00	13.86														
STREET 7																																	
					0.00	0.00	21.34	0.65	38.56	38.56			0.00	0.00			0.00	0.00	20.00														
	1020	1021			0.00	0.00			0.00	38.56			0.00	0.00			0.00	0.00	20.00	52.03	70.25	82.21	119.95	2709	1350	1350	CONC	0.25	68.5	2668.7	1.86	0.61	1.02
	1021	1022			0.00	0.00			0.00	38.56			0.00	0.00			0.00	0.00	20.61	51.07	68.94	80.66	117.68	2658	1500	1500	CONC	0.25	17.0	3534.4	2.00	0.14	0.75
	1022	1023	0.73	0.65	1.32	1.32			0.00	38.56			0.00	0.00			0.00	0.00	20.75	50.85	68.64	80.32	117.17	2714	1650	1650	CONC	0.15	100.0	3530.0	1.65	1.01	0.77
To STREET 6, Pipe 1023 - 1019						1.32				38.56				0.00				0.00	21.76														
	6020	1024	0.12	0.65	0.22	0.22			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	17	300	300	PVC	2.50	25.5	152.9	2.16	0.20	0.11
	1024	1025	0.18	0.65	0.33	0.54			0.00	0.00			0.00	0.00			0.00	0.00	10.20	76.06	103.17	120.93	176.78	41	600	600	CONC	0.15	44.5	237.8	0.84	0.88	0.17
Contribution From STREET 5, Pipe 1008 - 1025						6.13				1.19				0.00				0.00	13.86														
	1025	1026	0.16	0.65	0.29	6.96			0.00	1.19			0.00	0.00			0.00	0.00	13.86	64.61	87.45	102.43	149.61	554	825	825	CONC	0.25	40.5	717.7	1.34	0.50	0.77
					0.00	6.96	0.15	0.65	0.27	1.46			0.00	0.00			0.00	0.00															
	1026	1027	0.68	0.65	1.23	8.19			0.00	1.46			0.00	0.00			0.00	0.00	14.36	63.32	85.69	100.36	146.57	644	900	900	CONC	0.20	93.5	809.6	1.27	1.22	0.80
To STREET 9, Pipe 1027 - 1028						8.19				1.46				0.00				0.00	15.58														
					0.00	0.00	0.09	0.65	0.16	0.16			0.00	0.00			0.00	0.00															
	2001	2002	0.21	0.65	0.38	0.38			0.00	0.16			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	46	600	600	CONC	0.15	30.0	237.8	0.84	0.59	0.19
Contribution From BLOCK 15, Pipe 2000 - 2002						0.00				2.67				0.00				0.00	12.52														
					0.00	0.38	0.11	0.65	0.20	3.04			0.00	0.00			0.00	0.00															
					0.00	0.38	0.13	0.65	0.23	3.27			0.00	0.00			0.00	0.00															
	2002	2004	0.56	0.65	1.01	1.39			0.00	3.27			0.00	0.00			0.00	0.00	12.52	68.31	92.52	108.40	158.38	398	825	825	CONC	0.15	59.0	555.9	1.04	0.95	0.72
Contribution From BLOCK 12, Pipe 2003 - 2004						0.00				0.00				0.00				0.00	10.26					581									
					0.00	1.39	0.16	0.65	0.29	3.56			0.00	0.00			0.00	0.00															
					0.00	1.39	0.20	0.65	0.36	3.92			0.00	0.00			0.00	0.00															
	2004	2005	0.85	0.65	1.54	2.93			0.00	3.92			0.00	0.00			0.00	0.00	13.47	65.64	88.86	104.09	152.04	1122	1200	1200	CONC	0.15	82.5	1510.0	1.34	1.03	0.74
					0.00	2.93	0.14	0.65	0.25	4.17			0.00	0.00			0.00	0.00															
					0.00	2.93	0.15	0.65	0.27	4.45			0.00	0.00			0.00	0.00															
	2005	2006	0.70	0.65	1.26	4.19			0.00	4.45			0.00	0.00			0.00	0.00	14.50	62.98	85.22	99.80	145.76	1224	1200	1200	CONC	0.20	63.0	1743.6	1.54	0.68	0.70
					0.00	4.19	0.15	0.65	0.27	4.72			0.00	0.00			0.00	0.00															
	2006	2007	0.65	0.65	1.17	5.37			0.00	4.72			0.00	0.00			0.00	0.00	15.18	61.35	82.98	97.18	141.90	1302	1200	1200	CONC	0.20	48.5	1743.6	1.54	0.52	0.75
	2007	2009			0.00	5.37			0.00	4.72			0.00	0.00			0.00	0.00	15.70	60.16	81.35	95.26	139.09	1288	1200	1200	CONC	0.20	22.5	1743.6	1.54	0.24	0.74
Contribution From STREET 7, Pipe 2008 - 2009						1.14				0.00				0.00				0.00	11.36														
					0.00	6.51	0.14	0.65	0.25	4.97			0.00	0.00			0.00	0.00															
	2009	2010	0.58	0.65	1.05	7.55			0.00	4.97			0.00	0.00			0.00	0.00	15.95	59.62	80.62	94.40	137.82	1432	1200	1200	CONC	0.25	68.5	1949.4	1.72	0.66	0.73
					0.00	7.55	0.24	0.65	0.43	5.40			0.00	0.00			0.00	0.00															
	2010	2020	1.01	0.65	1.83	9.38			0.00	5.40			0.00	0.00			0.00	0.00	16.61	58.21	78.70	92.13	134.51	1552	1350	1350	CONC	0.50	65.5	3774.1	2.64	0.41	0.41

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive			
Checked: ADF	LOCATION: City of Ottawa			
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061		Date: 28 May 2020	Sheet No. SHEET 7 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

Location	From Node	To Node	2 YEAR AREA (Ha)	2 YEAR R	2 YEAR Indiv. 2.78 AC	2 YEAR Accum. 2.78 AC	5 YEAR AREA (Ha)	5 YEAR R	5 YEAR Indiv. 2.78 AC	5 YEAR Accum. 2.78 AC	10 YEAR AREA (Ha)	10 YEAR R	10 YEAR Indiv. 2.78 AC	10 YEAR Accum. 2.78 AC	100 YEAR AREA (Ha)	100 YEAR R	100 YEAR Indiv. 2.78 AC	100 YEAR Accum. 2.78 AC	Time of Conc. (min)	Intensity 2 Year (mm/h)	Intensity 5 Year (mm/h)	Intensity 10 Year (mm/h)	Intensity 100 Year (mm/h)	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF FLOW (min)	RATIO Q/Q full
Contribution From STREET 7, Pipe 2019 - 2020						10.55				4.72				0.00				0.00	14.69					555									
	2020	2021			0.00	19.93			0.00	10.12			0.00	0.00			0.00	0.00	17.02	57.37	77.54	90.78	132.52	3064	1350	1350	CONC	0.55	20.0	3958.3	2.77	0.12	0.77
STREET 9																																	
Contribution From STREET 7, Pipe 1026 - 1027						8.19				1.46				0.00				0.00	15.58														
	1027	1028	0.16	0.65	0.29	8.47			0.00	1.46			0.00	0.00			0.00	0.00	15.58	60.43	81.72	95.69	139.72	632	975	975	CONC	0.15	34.0	868.0	1.16	0.49	0.73
					0.00	8.47	0.06	0.65	0.11	1.57			0.00	0.00			0.00	0.00															
	1028	1029	1.05	0.65	1.90	10.37			0.00	1.57			0.00	0.00			0.00	0.00	16.07	59.35	80.25	93.96	137.19	742	975	975	CONC	0.20	38.0	1002.2	1.34	0.47	0.74
	1029	1034			0.00	10.37			0.00	1.57			0.00	0.00			0.00	0.00	16.54	58.35	78.88	92.36	134.83	729	975	975	CONC	0.20	5.5	1002.2	1.34	0.07	0.73
Contribution From STREET 14, Pipe 1033 - 1034						1.50				0.00				0.00				0.00	13.56														
					0.00	11.87	0.10	0.65	0.18	1.75			0.00	0.00			0.00	0.00															
	1034	1038	0.22	0.65	0.40	12.27			0.00	1.75			0.00	0.00			0.00	0.00	16.61	58.21	78.69	92.13	134.50	852	975	975	CONC	0.25	47.0	1120.5	1.50	0.52	0.76
Contribution From STREET 13, Pipe 1037 - 1038						1.16				0.00				0.00				0.00	13.19														
					0.00	13.43	0.12	0.65	0.22	1.97			0.00	0.00			0.00	0.00															
	1038	1042	0.25	0.65	0.45	13.88			0.00	1.97			0.00	0.00			0.00	0.00	17.13	57.15	77.25	90.43	132.01	945	975	975	CONC	0.30	52.0	1227.5	1.64	0.53	0.77
Contribution From STREET 12, Pipe 1041 - 1042						1.03				0.00				0.00				0.00	11.64														
					0.00	14.91	0.09	0.65	0.16	2.13			0.00	0.00			0.00	0.00															
	1042	1043	0.27	0.65	0.49	15.40			0.00	2.13			0.00	0.00			0.00	0.00	17.66	56.13	75.85	88.78	129.59	1026	1050	1050	CONC	0.25	63.5	1365.4	1.58	0.67	0.75
					0.00	15.40	0.01	0.65	0.02	2.15			0.00	0.00			0.00	0.00															
			0.05	0.65	0.09	15.49			0.00	2.15			0.00	0.00			0.00	0.00															
	1043	1049	0.05	0.65	0.09	15.58			0.00	2.15			0.00	0.00			0.00	0.00	18.33	54.88	74.14	86.78	126.65	1014	1050	1050	CONC	0.25	12.0	1365.4	1.58	0.13	0.74
Contribution From STREET 11, Pipe 1048 - 1049						13.64				45.56				0.00				0.00	27.11														
	1049	1050			0.00	29.22			0.00	47.71			0.00	0.00			0.00	0.00	27.11	42.84	57.73	67.51	98.40	4006	1950	1950	CONC	0.15	10.5	5511.2	1.85	0.09	0.73
					0.00	29.22	0.16	0.65	0.29	48.00			0.00	0.00			0.00	0.00															
					0.00	29.22	0.46	0.65	0.83	48.83			0.00	0.00			0.00	0.00															
	1050	1051	1.48	0.65	2.67	31.89			0.00	48.83			0.00	0.00			0.00	0.00	27.20	42.74	57.59	67.35	98.17	4176	1950	1950	CONC	0.15	110.0	5511.2	1.85	0.99	0.76
					0.00	31.89	0.15	0.65	0.27	49.10			0.00	0.00			0.00	0.00															
					0.00	31.89	0.27	0.65	0.49	49.59			0.00	0.00			0.00	0.00															
	1051	1052	1.03	0.65	1.86	33.75			0.00	49.59			0.00	0.00			0.00	0.00	28.19	41.74	56.23	65.75	95.83	4197	1950	1950	CONC	0.15	114.0	5511.2	1.85	1.03	0.76
	1052	1054			0.00	33.75			0.00	49.59			0.00	0.00			0.00	0.00	29.22	40.75	54.89	64.18	93.52	4098	1950	1950	CONC	0.15	7.5	5511.2	1.85	0.07	0.74
Contribution From BLOCK 13, Pipe 1053 - 1054						0.00				0.00				0.00				0.00	10.24					219									
					0.00	33.75	0.04	0.65	0.07	49.66			0.00	0.00			0.00	0.00															
	1054	1055	0.22	0.65	0.40	34.15			0.00	49.66			0.00	0.00			0.00	0.00	29.29	40.69	54.81	64.08	93.38	4330	1950	1950	CONC	0.15	21.0	5511.2	1.85	0.19	0.79
					0.00	34.15	0.15	0.65	0.27	49.93			0.00	0.00			0.00	0.00															
					0.00	34.15	0.52	0.65	0.94	50.87			0.00	0.00			0.00	0.00															
	1055	1056	0.80	0.65	1.45	35.60			0.00	50.87			0.00	0.00			0.00	0.00	29.48	40.51	54.57	63.80	92.97	4437	1950	1950	CONC	0.15	89.5	5511.2	1.85	0.81	0.81
					0.00	35.60	0.11	0.65	0.20	51.07			0.00	0.00			0.00	0.00															
					0.00	35.60	0.84	0.65	1.52	52.59			0.00	0.00			0.00	0.00															
	1056	1057	0.88	0.65	1.59	37.19			0.00	52.59			0.00	0.00			0.00	0.00	30.29	39.79	53.58	62.64	91.27	4516	1950	1950	CONC	0.15	89.5	5511.2	1.85	0.81	0.82
To BLOCK 14, Pipe 1057 - 1058						37.19				52.59				0.00				0.00	31.10					219									
BLOCK 14																																	
Contribution From STREET 9, Pipe 1056 - 1057						37.19				52.59				0.00				0.00	31.10					219									
	1057	1058			0.00	37.19			0.00	52.59			0.00	0.00			0.00	0.00	31.10	39.09	52.63	61.52	89.63	4440	1950	1950	CONC	0.15	5.0	5511.2	1.85	0.05	0.81
					0.00	37.19	0.07	0.65	0.13	52.72			0.00	0.00			0.00	0.00															
	1058	1059	0.32	0.65	0.58	37.77			0.00	52.72			0.00	0.00			0.00	0.00	31.14	39.05	52.57	61.46	89.54	4465	1950	1950	CONC	0.15	54.0	5511.2	1.85	0.49	0.81
			0.14	0.65	0.25	38.02			0.00	52.72			0.00	0.00			0.00	0.00															
	1059	1060			0.00	38.02	0.18	0.65	0.33	53.04			0.00	0.00			0.00	0.00	31.63	38.64	52.02	60.81	88.59	4447	1950	1950	CONC	0.15	48.5	5511.2	1.85	0.44	0.81
	1060	6018			0.00	38.02			0.00	53.04			0.00	0.00			0.00	0.00	32.07	38.28	51.53	60.24	87.76	4408	1950	1950	CONC	0.15	40.5	5511.2	1.85	0.37	0.80
	6018	1061			0.00	38.02			0.00	53.04			0.00	0.00			0.00	0.00	32.43	37.99	51.13	59.77	87.07	4376	1950	1950	CONC	0.15	21.0	5511.2	1.85	0.19	0.79
STREET4																																	
	5008	5009	0.34	0.65	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	47	300	300	PVC	0.65	39.5	78.0	1.10	0.60	0.61
					0.00	0.61	0.08	0.65	0.14	0.14			0.00	0.00			0.00	0.00															
	5009	5010	0.19	0.65	0.34	0.96			0.00	0.14			0.00	0.00			0.00	0.00	10.60	74.59	101.14	118.55	173.28	86	375	375	PVC	0.50	12.5	124.0	1.12	0.19	0.69
					0.00	0.96	0.11	0.65	0.20	0.34			0.00	0.00			0.00	0.00															
	5010	5011	0.42	0.65	0.76	1.72			0.00	0.34			0.00	0.00			0.00	0.00	10.78	73.93	100.23	117.48	171.71	161	450	450	CONC	0.65	54.5	229.9	1.45	0.63	0.70

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 8 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	FLOW (min)	Q/Q full
	5011	5012	0.26	0.65	0.47	2.19			0.00	0.34			0.00	0.00			0.00	0.00	11.41	71.78	97.29	114.01	166.61	190	450	450	CONC	0.70	45.5	238.5	1.50	0.51	0.80
To STREET 16, Pipe 5012 - 5013						2.19				0.34				0.00				0.00	11.92														
BLOCK 2																																	
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00						352									
	5003	5004			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	352	450	450	CONC	1.17	35.5	308.4	1.94	0.31	1.14
To STREET 1, Pipe 5004 - 5005						0.00				0.00				0.00				0.00	10.31					352									
STREET 1																																	
					0.00	0.00	0.21	0.65	0.38	0.38			0.00	0.00			0.00	0.00															
	1011	1012	0.96	0.65	1.73	1.73			0.00	0.38			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	173	600	600	CONC	0.15	61.5	237.8	0.84	1.22	0.73
To STREET 6, Pipe 1012 - 1013						1.73				0.38				0.00				0.00	11.22														
			0.34	0.65	0.61	0.61			0.00	0.00			0.00	0.00			0.00	0.00															
	5006	5007			0.00	0.61	0.66	0.65	1.19	1.19			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	171	525	525	CONC	0.25	29.0	215.0	0.99	0.49	0.80
To STREET 16, Pipe 5007 - 5012						0.61				1.19				0.00				0.00	10.49														
					0.00	0.00	0.15	0.65	0.27	0.27			0.00	0.00			0.00	0.00															
	1000	1001	0.39	0.65	0.70	0.70			0.00	0.27			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	82	300	300	PVC	1.70	53.0	126.1	1.78	0.50	0.65
					0.00	0.70	0.27	0.65	0.49	0.76			0.00	0.00			0.00	0.00															
	1001	1002	0.82	0.65	1.48	2.19			0.00	0.76			0.00	0.00			0.00	0.00	10.50	74.95	101.65	119.14	174.15	241	450	450	CONC	1.70	70.5	371.7	2.34	0.50	0.65
To STREET 5, Pipe 1002 - 1006						2.19				0.76				0.00				0.00	11.00														
	1009	1010	0.14	0.65	0.25	0.25			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	19	300	300	PVC	0.35	23.5	57.2	0.81	0.48	0.34
	1010	1012	1.18	0.65	2.13	2.39			0.00	0.00			0.00	0.00			0.00	0.00	10.48	75.00	101.70	119.21	174.25	179	675	675	CONC	0.30	61.0	460.4	1.29	0.79	0.39
To STREET 6, Pipe 1012 - 1013						2.39				0.00				0.00				0.00	11.27														
					0.00	0.00	0.06	0.65	0.11	0.11			0.00	0.00			0.00	0.00															
					0.00	0.00	0.13	0.65	0.23	0.34			0.00	0.00			0.00	0.00															
	4038	4039	0.52	0.65	0.94	0.94			0.00	0.34			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	108	450	450	CONC	0.25	42.0	142.6	0.90	0.78	0.76
					0.00	0.94	0.09	0.65	0.16	0.51			0.00	0.00			0.00	0.00															
	4039	4041	0.38	0.65	0.69	1.63			0.00	0.51			0.00	0.00			0.00	0.00	10.78	73.93	100.24	117.49	171.72	171	525	525	CONC	0.25	32.0	215.0	0.99	0.54	0.80
Contribution From BLOCK 1, Pipe 4040 - 4041						0.00				0.00				0.00				0.00	10.52					223									
					0.00	1.63	0.06	0.65	0.11	0.61			0.00	0.00			0.00	0.00															
	4041	4042	0.56	0.65	1.01	2.64			0.00	0.61			0.00	0.00			0.00	0.00	11.32	72.09	97.71	114.51	167.35	473	750	750	CONC	0.30	49.0	609.8	1.38	0.59	0.78
To STREET 19, Pipe 4042 - 4043						2.64				0.61				0.00				0.00	11.91					223									
					0.00	0.00	0.05	0.65	0.09	0.09			0.00	0.00			0.00	0.00															
	4024	4025	0.22	0.65	0.40	0.40			0.00	0.09			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	40	300	300	PVC	0.35	27.0	57.2	0.81	0.56	0.70
					0.00	0.40	0.03	0.65	0.05	0.14			0.00	0.00			0.00	0.00															
	4025	4026	0.11	0.65	0.20	0.60			0.00	0.14			0.00	0.00			0.00	0.00	10.56	74.73	101.34	118.79	173.63	59	375	375	PVC	0.30	25.0	96.0	0.87	0.48	0.62
					0.00	0.60	0.04	0.65	0.07	0.22			0.00	0.00			0.00	0.00															
	4026	4027	0.18	0.65	0.33	0.92			0.00	0.22			0.00	0.00			0.00	0.00	11.04	73.05	99.03	116.06	169.62	89	450	450	CONC	0.20	36.5	127.5	0.80	0.76	0.70
					0.00	0.92	0.04	0.65	0.07	0.29			0.00	0.00			0.00	0.00															
	4027	4028	0.16	0.65	0.29	1.21			0.00	0.29			0.00	0.00			0.00	0.00	11.79	70.54	95.58	112.00	163.67	113	450	450	CONC	0.25	34.5	142.6	0.90	0.64	0.79
To STREET 18, Pipe 4028 - 4029						1.21				0.29				0.00				0.00	12.44														
					0.00	0.00	0.06	0.65	0.11	0.11			0.00	0.00			0.00	0.00															
	5000	5001	0.55	0.65	0.99	0.99			0.00	0.11			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	88	375	375	PVC	1.00	35.5	175.3	1.59	0.37	0.50
	5001	5002			0.00	0.99			0.00	0.11			0.00	0.00			0.00	0.00	10.37	75.40	102.26	119.87	175.22	86	375	375	PVC	1.45	6.0	211.1	1.91	0.05	0.41
					0.00	0.99	0.10	0.65	0.18	0.29			0.00	0.00			0.00	0.00															
			0.39	0.65	0.70	1.70			0.00	0.29			0.00	0.00			0.00	0.00															
	5002	5004			0.00	1.70	0.93	0.65	1.68	1.97			0.00	0.00			0.00	0.00	10.43	75.21	102.00	119.56	174.76	329	525	525	CONC	0.95	67.5	419.2	1.94	0.58	0.78
Contribution From BLOCK 2, Pipe 5003 - 5004						0.00				0.00				0.00				0.00	10.31					352									
					0.00	1.70	0.07	0.65	0.13	2.10			0.00	0.00			0.00	0.00															
	5004	5005	0.22	0.65	0.40	2.10			0.00	2.10			0.00	0.00			0.00	0.00	11.01	73.15	99.16	116.22	169.86	713	750	750	CONC	0.65	42.5	897.6	2.03	0.35	0.79

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: 7000 Campeau Drive		
Checked: ADF	LOCATION: City of Ottawa		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 9 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Manning 0.013 Arterial Roads Return Frequency = 10 years

Ottawa

	LOCATION		AREA (Ha)																FLOW						SEWER DATA								
			2 YEAR				5 YEAR				10 YEAR				100 YEAR				Time of	Intensity	Intensity	Intensity	Intensity	Peak Flow	DIA. (mm)	DIA. (mm)	TYPE	SLOPE	LENGTH	CAPACITY	VELOCITY	TIME OF	RATIO
			AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	AREA	R	Indiv.	Accum.	Conc.	2 Year	5 Year	10 Year	100 Year										
Location	From Node	To Node	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(Ha)		2.78 AC	2.78 AC	(min)	(mm/h)	(mm/h)	(mm/h)	(mm/h)	Q (l/s)	(actual)	(nominal)		(%)	(m)	(l/s)	(m/s)	LOW (min	Q/Q full
					0.00	2.10	0.08	0.65	0.14	2.24			0.00	0.00			0.00	0.00															
	5005	5007	0.23	0.65	0.42	2.51			0.00	2.24			0.00	0.00			0.00	0.00	11.35	71.97	97.54	114.31	167.06	751	750	750	CONC	0.75	32.0	964.1	2.18	0.24	0.78
To STREET 16, Pipe 5007 - 5012						2.51				2.24				0.00				0.00	11.60					352									
					0.00	0.00	0.08	0.00	0.00	0.00			0.00	0.00			0.00	0.00															
	4004	4005	0.21	0.65	0.38	0.38			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	29	300	300	PVC	0.50	27.5	68.4	0.97	0.47	0.43
					0.00	0.38	0.17	0.65	0.31	0.31			0.00	0.00			0.00	0.00															
	4005	4006	0.37	0.65	0.67	1.05			0.00	0.31			0.00	0.00			0.00	0.00	10.47	75.03	101.75	119.27	174.34	110	450	450	CONC	0.50	58.0	201.6	1.27	0.76	0.55
Contribution From STREET 2, Pipe 4003 - 4006						2.26				0.49				0.00				0.00	12.75														
					0.00	3.31	0.33	0.65	0.60	1.39			0.00	0.00			0.00	0.00															
	4006	4008	0.44	0.65	0.80	4.10			0.00	1.39			0.00	0.00			0.00	0.00	12.75	67.65	91.61	107.33	156.81	405	675	675	CONC	0.40	68.5	531.6	1.49	0.77	0.76
Contribution From BLOCK 16, Pipe 4007 - 4008						0.00				5.02				0.00				0.00	14.38														
	4008	4010			0.00	4.10			0.00	6.41			0.00	0.00			0.00	0.00	14.38	63.27	85.62	100.27	146.45	809	825	825	CONC	0.50	8.0	1015.0	1.90	0.07	0.80
Contribution From STREET 2, Pipe 4009 - 4010						0.47				0.00				0.00				0.00	11.29														
					0.00	4.57	0.11	0.65	0.20	6.61			0.00	0.00			0.00	0.00															
	4010	4011	0.48	0.65	0.87	5.44			0.00	6.61			0.00	0.00			0.00	0.00	14.45	63.10	85.38	99.99	146.04	908	900	900	CONC	0.50	63.5	1280.1	2.01	0.53	0.71
					0.00	5.44	0.47	0.65	0.85	7.46			0.00	0.00			0.00	0.00															
	4011	4012	0.78	0.65	1.41	6.85			0.00	7.46			0.00	0.00			0.00	0.00	14.98	61.82	83.64	97.94	143.03	1047	900	900	CONC	0.55	63.5	1342.6	2.11	0.50	0.78
					0.00	6.85	0.22	0.65	0.40	7.86			0.00	0.00			0.00	0.00															
	4012	4014	0.80	0.65	1.45	8.29			0.00	7.86			0.00	0.00			0.00	0.00	15.48	60.66	82.05	96.07	140.29	1148	975	975	CONC	0.45	101.0	1503.3	2.01	0.84	0.76
Contribution From BLOCK 3, Pipe 4013 - 4014						0.00				0.00				0.00				0.00	11.07					958									
					0.00	8.29	0.25	0.65	0.45	8.31			0.00	0.00			0.00	0.00															
	4014	4020	0.90	0.65	1.63	9.92			0.00	8.31			0.00	0.00			0.00	0.00	16.31	58.83	79.54	93.13	135.96	2203	1500	1500	CONC	0.15	116.0	2737.8	1.55	1.25	0.80
Contribution From STREET 2, Pipe 4019 - 4020						7.05				1.73				0.00				0.00	14.15														
					0.00	16.97	0.15	0.65	0.27	10.32			0.00	0.00			0.00	0.00															
	4020	4021	0.58	0.65	1.05	18.02			0.00	10.32			0.00	0.00			0.00	0.00	17.56	56.32	76.10	89.09	130.03	2758	1650	1650	CONC	0.15	102.5	3530.0	1.65	1.03	0.78
					0.00	18.02	0.05	0.65	0.09	10.41			0.00	0.00			0.00	0.00															
	4021	4022	0.53	0.65	0.96	18.97			0.00	10.41			0.00	0.00			0.00	0.00	18.60	54.41	73.49	86.02	125.53	2755	1650	1650	CONC	0.15	53.5	3530.0	1.65	0.54	0.78
			0.10	0.65	0.18	19.15			0.00	10.41			0.00	0.00			0.00	0.00															
					0.00	19.15	0.33	0.65	0.60	11.00			0.00	0.00			0.00	0.00															
	4022	4023	0.71	0.65	1.28	20.44			0.00	11.00			0.00	0.00			0.00	0.00	19.14	53.46	72.21	84.51	123.32	2845	1650	1650	CONC	0.20	25.0	4076.1	1.91	0.22	0.70
					0.00	20.44	0.04	0.65	0.07	11.07			0.00	0.00			0.00	0.00															
	4023	4028	0.17	0.65	0.31	20.74			0.00	11.07			0.00	0.00			0.00	0.00	19.35	53.09	71.70	83.91	122.45	2853	1650	1650	CONC	0.20	34.5	4076.1	1.91	0.30	0.70
To STREET 18, Pipe 4028 - 4029						20.74				11.07				0.00				0.00	19.66					958									
STREET 16																																	
					0.00	0.00	0.16	0.65	0.29	0.29			0.00	0.00			0.00	0.00															
	5014	5015	0.28	0.65	0.51	0.51			0.00	0.29			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	69	600	600	CONC	0.15	57.0	237.8	0.84	1.13	0.29
					0.00	0.51	0.32	0.65	0.58	0.87			0.00	0.00			0.00	0.00															
	5015	5016	0.60	0.65	1.08	1.59			0.00	0.87			0.00	0.00			0.00	0.00	11.13	72.72	98.58	115.53	168.85	201	675	675	CONC	0.15	108.5	325.6	0.91	1.99	0.62
To BLOCK 18, Pipe 5016 - 5017						1.59				0.87				0.00				0.00	13.12														
Contribution From BLOCK 17, Pipe 5018 - 5019						0.00				0.00				0.00				0.00	10.13					104									
	5019	5020			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.13	76.29	103.49	121.31	177.34	104	675	675	CONC	1.20	56.0	920.8	2.57	0.36	0.11
To WESLOCK WAY, Pipe 5020 - 228						0.00				0.00				0.00				0.00	10.50					104									
Contribution From STREET 1, Pipe 5005 - 5007						2.51				2.24				0.00				0.00	11.60					352									
Contribution From STREET 1, Pipe 5006 - 5007						0.61				1.19				0.00				0.00	10.49														
					0.00	3.13	0.08	0.65	0.14	3.58			0.00	0.00			0.00	0.00															
	5007	5012	0.52	0.65	0.94	4.07			0.00	3.58			0.00	0.00			0.00	0.00	11.60	71.17	96.44	113.01	165.15	986	900	900	CONC	0.55	93.0	1342.6	2.11	0.73	0.73
Contribution From STREET4, Pipe 5011 - 5012						2.19				0.34				0.00				0.00	11.92														
					0.00	6.25	0.11	0.65	0.20	4.12			0.00	0.00			0.00	0.00															
					0.00	6.25	0.17	0.65	0.31	4.43			0.00	0.00			0.00	0.00															
	5012	5013	0.76	0.65	1.37	7.63			0.00	4.43			0.00	0.00			0.00	0.00	12.33	68.87	93.30	109.31	159.71	1290	900	900	CONC	1.10	91.0	1898.7	2.98	0.51	0.68
					0.00	7.63	0.08	0.65	0.14	4.57			0.00	0.00			0.00	0.00															
					0.00	7.63	0.10	0.65	0.18	4.75			0.00	0.00			0.00	0.00															
	5013	5016	0.41	0.65	0.74	8.37			0.00	4.75			0.00	0.00			0.00	0.00	12.84	67.38	91.25	106.90	156.17	1349	975	975	CONC	1.10	47.0	2350.4	3.15	0.25	0.57
To BLOCK 18, Pipe 5016 - 5017						8.37				4.75				0.00				0.00	13.09					352									

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 10 OF 11

STORM SEWER CALCULATION SHEET (RATIONAL METHOD)

Local Roads Return Frequency = 2 years
Collector Roads Return Frequency = 5 years
Arterial Roads Return Frequency = 10 years

Manning 0.013

LOCATION			AREA (Ha) 2 YEAR				5 YEAR				10 YEAR				100 YEAR				FLOW						SEWER DATA								
Location	From Node	To Node	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	AREA (Ha)	R	Indiv. 2.78 AC	Accum. 2.78 AC	Time of Conc. (min)	Intensity 2 Year (mm/h)	Intensity 5 Year (mm/h)	Intensity 10 Year (mm/h)	Intensity 100 Year (mm/h)	Peak Flow Q (l/s)	DIA. (mm) (actual)	DIA. (mm) (nominal)	TYPE	SLOPE (%)	LENGTH (m)	CAPACITY (l/s)	VELOCITY (m/s)	TIME OF LOW (min	RATIO Q/Q full
BLOCK 18																																	
Contribution From STREET 16, Pipe 5013 - 5016						8.37				4.75				0.00				0.00	13.09					352									
Contribution From STREET 16, Pipe 5015 - 5016						1.59				0.87				0.00				0.00	13.12														
	5016	5017			0.00	9.96			0.00	5.62			0.00	0.00			0.00	0.00	13.12	66.60	90.18	105.64	154.33	1521	975	975	CONC	0.75	25.5	1940.8	2.60	0.16	0.78

Definitions:
Q = 2.78 AIR, where
Q = Peak Flow in Litres per second (L/s)
A = Areas in hectares (ha)
I = Rainfall Intensity (mm/h)
R = Runoff Coefficient

Notes:
1) Ottawa Rainfall-Intensity Curve
2) Min. Velocity = 0.80 m/s

Designed: SLM	PROJECT: **7000 Campeau Drive**		
Checked: ADF	LOCATION: **City of Ottawa**		
Dwg. Reference: Storm Drainage Drawing No. 3	File Ref: 18-1061	Date: 28 May 2020	Sheet No. SHEET 11 OF 11

J.F. Sabourin and Associates Inc.
52 Springbrook Drive,
Ottawa, ON K2S 1B9
T 613-836-3884 F 613-836-0332

jfsa.com

Ottawa. ON
Paris. ON
Gatineau. QC
Montréal. QC
Québec. QC

July 09, 2020 Project Number: P1581-17

David Schaeffer Engineering Ltd
120 Iber Road, Unit 203
Ottawa, Ontario
K2S 1E9

Attention: **Kevin Murphy, P.Eng.**

Subject: **7000 Campeau Drive Subdivision - Preliminary Stormwater Management Plan**

Introduction

The proposed residential development at 7000 Campeau Drive in Kanata, Ontario, consists of four individual parcels equating to approximately 70.9 ha. These lands are a part of the Kanata Golf and Country Club and are currently zoned as Parks and Open Space (O1A). The proposed development will consist of single detached homes, front drive towns, back to back towns, stacked towns and medium density blocks. The proposed development will be serviced by five (5) Stormwater Management Facilities (SWMF). Four (4) of the facilities will have stormwater management (SWM) ponds and will be equipped with oil-grit separators (OGS). Due to the small drainage area, one SWMF will be serviced solely by an OGS unit (SWMF 3). The stormwater management facilities have been strategically located at low points within the proposed development, where each facility can outlet to the existing trunk storm sewer that runs along Knudson Drive and Weslock Way. Figure 1 provides an overview of the proposed development area relative to existing infrastructure along with the respective locations of the proposed SWM facilities. This memo intends to assess and ensure that the preliminary design of the proposed development meets several fundamental stormwater management requirements. As such, this memo will document and assess:

(i) The adequacy of the proposed minor system to convey the 2- and 100-year storm flows from within the development to the stormwater management (SWM) facilities.

(ii) The capacity of the proposed major system to safely convey the excess 100-year flows to the SWM facilities.

(iii) The operation of the proposed SWM facilities based on quality and quantity control requirements.

(iv) The hydraulic impacts of the proposed subdivision and SWM facilities on the upstream and downstream existing SWM infrastructure.

(v) The peak flows into the Beaver Pond Facility for pre- and post-development conditions.

(vi) The emergency overflow from the proposed development under the 100 Year + 20% stress test.

All analyses documented in this memo were completed using the PCSWMM hydrologic and hydraulic modelling software package. The City of Ottawa provided JFSA with an existing condition PCSWMM model of the study area, which this study has built upon. The following discusses in detail the pre- and post-development PCSWMM modelling components and the findings of this preliminary analysis.

Figure 1: Development Overview and Proposed SWM Facilities

Existing Conditions Model

Model Overview

To assess the stormwater operations of the proposed development the City of Ottawa provided JFSA with a detailed PCSWMM (hydrologic & hydraulic) model of the existing major and minor stormwater system that discharges to the Beaver Pond. This model is highly detailed and was developed using the vast amounts of GIS data available to the City (natural topography, minor system pipe network, catch basin locations etc.).The City model consists of two individual models, the Kinematic Wave model and the Dynamic Wave model. The Kinematic Wave model is used to simulate the subcatchment runoff, the major system flow paths and the total flow into the minor system. Note that the representation of the major system flow paths in the Kinematic Wave model is simplistic and does not fully consider the existing grading and topography of the land. The major system in this model simply allows for any excess flow that can not enter a catchbasin to flow to the next nearest catchbasin. The flows diverted to the minor system network simulated by the Kinematic model are then extracted into an Interface File (text file). The Interface File contains approximately 734 individual hydrographs at all inflow locations into the minor system. This interface file is then read into the Dynamic Wave model to simulate the operations of the minor system.

Modifications and Corrections

A few minor errors/issues were noted in the City models as provided. This included minor system pipe inverts that were incorrect (STM12459 & STM11997) which were corrected to reflect as-built values collected by DSEL from the City of Ottawa. One minor system node (MHSTM12321) had an invert elevation of 0 m, which resulted in inflows to pond at this node until the water surface reached the elevation of the outlet pipe invert (98.43 m). A detailed review of the external drainage areas to the Beaver Pond was completed by DSEL, based on City of Ottawa 1K mapping data, which found that there were several locations along the drainage boundary that would drain to external subcatchments and not to the Beaver Pond. This generally included developed lands that had minor system infrastructure that would direct flow to neighbouring watercourses. Some 1.445 ha of land was added to the model's total drainage area and 1.975 ha removed from the model's total drainage area, resulting in a net 0.53 ha (0.2% of the total model drainage area) reduction in the total modelled drainage area. Images of the identified issues addressed above have been documented in Attachment A.

Field Verification

The City model was reviewed against the data obtained from the flow monitoring program completed by JFSA from June 2019 to October 2019 within the Campeau Drive and Weslock Way minor systems. Full details of this monitoring program have been provided in JFSA's July 2020 report titled "Kanata Golf & Country Club - 2019 Monitoring & Hydrologic Model Calibration Report". Refer to Attachment A for plots comparing the simulated and observed flows for all "Significant Events[1]" recorded during the 2019 monitoring period at Campeau Drive and Weslock Way.

[1] A "Significant Event" is defined as a rainfall event with a total rainfall volume greater than 5 mm which was followed by at least 12 hours without any additional rainfall.

From visual inspection of the results, it appears that the City's model is generally (but not always) overestimating the peak flows into the minor system at both locations; with the peak flows simulated by the model overestimating slightly more at Weslock Way than at Campeau Drive. Numerically reviewing the two datasets it was found that on average the City model appears to overestimate the peak flows into the minor system by 47% and 26% at Weslock Way and Campeau Drive, respectively. It was also found that the City model overestimated the total runoff volume into the minor system at both locations, with the simulated total volumes being 69% and 27% larger than the observed volumes at Weslock Way and Campeau Drive, respectively.

The models have a reasonable coefficient of determination (R^2) of 0.64 and 0.75 at Weslock Way and Campeau Drive, respectively. Although the Nash-Sutcliffe model efficiency coefficients for these locations do not present such a positive outlook, with values of -0.2 and 0.38 at Weslock Way and Campeau Drive, respectively. Note that the closer the coefficient of determination (R^2) and Nash-Sutcliffe model efficiency coefficient are to 1.0, the better the fit. Based on the statistical analysis the model appears to produce a better fit for the observed flows at Campeau Drive than at Weslock Way for both the R^2 and Nash Sutcliffe efficiency. Full statistical summaries have been provided in Tables 1 & 2 below. Note that no events greater than the 2-year event were observed during this monitoring period.

Table 1: Weslock Way 2019 Monitoring Summary – Field observations vs City Model

Parameter	Value
Total Rainfall Volume (mm)	264.04
Minimum Peak Flow Ratio (Sim/Meas)	0.58
Average Peak Flow Ratio (Sim/Meas)	1.47
Maximum Peak Flow Ratio (Sim/Meas)	2.09
Measured Volume (m^3)	46696
Simulated Volume (m^3)	78903
Volume Difference (m^3)	32207
Volume Ratio (Sim/Meas)	1.69
R^2	0.64
Nash-Sutcliffe	-0.2

Table 2: Campeau Drive 2019 Monitoring Summary – Field observations vs City Model

Parameter	Value
Total Rainfall Volume (mm)	239.43
Minimum Peak Flow Ratio (Sim/Meas)	0.56
Average Peak Flow Ratio (Sim/Meas)	1.26
Maximum Peak Flow Ratio (Sim/Meas)	1.78
Measured Volume (m^3)	11714
Simulated Volume (m^3)	14890
Volume Difference (m^3)	3177
Volume Ratio (Sim/Meas)	1.27
R^2	0.75
Nash-Sutcliffe	0.38

Based on the above findings, it is concluded that the City's model is not a perfect reflection of the existing stormwater operations of the area, as it tends to overestimate both the peak flows and total flows into the system. Although this model has been considered a reasonable representation for the purposes of this study, as it generally tends to produce a conservative estimate of peak flows and total volume into the existing minor system, based on the field data currently available. As such, this model has been used to establish the existing hydraulic and hydrologic conditions of the study area.

Downstream Boundary Condition and Hot Start File

The City model, as provided, assumed a free outlet at the Beaver Pond. To ensure that the analysis completed in this study is conservative the downstream boundary of the model was fixed to the 100-year peak water level in the Beaver Pond of 92.55 m. The new downstream boundary created a backwater that propagates up the existing storm sewer system. To ensure this boundary was stable, a hot start file was generated to allow the backwatered storm sewer to stabilize before a simulated event. After making the above refinements the model was simulated using the 5-year 3-hour Chicago storm, 100-year 24-hour SCS storm and 100-year +20% 24-hour SCS storm. The results of this analysis would function as the existing conditions targets for the proposed development.

Proposed Conditions Model

Model Overview

Like the existing conditions modelling, the proposed condition analysis consisted of two models, the Kinematic Wave model and the Dynamic Wave model. For the proposed conditions, the Kinematic Wave model was adjusted to contain only the existing external lands to the development site, and the area that makes up the proposed development lands was removed, as it would be simulated in the Dynamic Wave model. The following sections document the development of the proposed conditions model and the results of this analysis.

Subcatchments

To ensure that there was no overlap or gaps in subcatchments between the two models, the Kinematic Wave model subcatchment boundaries had to be slightly adjusted to ensure that they would match up with the proposed development boundaries in the Dynamic Wave model. This required either slightly clipping or slightly extending the existing subcatchment boundaries in the Kinematic Wave model, this was primarily completed along the rear yards of the existing residential developments. After ensuring that there were no intersections of subcatchment boundaries between the two models, the drainage areas of the Kinematic Wave model were updated based on their new drainage area. If a subcatchment area changed by more than 10% that subcatchment Width / Flow Length parameter was also recalculated. The remaining subcatchment parameters in the Kinematic Wave model remained unaltered. Figures B1 & B2 in Attachment B provides an overview of the subcatchment areas simulated in the Kinematic and Dynamic models.

The drainage areas within the proposed development were provided by DSEL. As the development is only at the preliminary design stage, the majority of the subcatchments have been assumed to be 64% impervious (Runoff Coefficient=0.65). Default Manning's and depression storage values of 0.013, 0.25, 1.57 mm & 4.67 mm have been applied for impervious and pervious surfaces, respectively. City default Horton's infiltration values of 76.2 mm/hr, 13.2 mm/hr, 4.14 1/hr & a 7 Day drying time have also been applied to the model. Note that these above parameters conform to the parameters used in the City's Kinematic Wave model.

Nodes, Links & Interfacing Files

The entire existing minor system included in the City's PCSWMM model was imported into the development Dynamic Wave model, along with all the "Mid-Point" nodes and associated links. These "Mid-Point" nodes were imported into the Dynamic model to ensure that the flows external to the development simulated in the Kinematic Wave model are appropriately passed and represented in the Dynamic Wave model. In locations where there is an existing major system spill to the golf course, additional nodes were added to the Kinematic Wave model from the Dynamic Wave model. The inclusion of these nodes allows for the external flows onto the golf course simulated by the Kinematic Wave model to be passed to the correct location within the Dynamic Wave model, these include external major system flows into the development.

Development Major system

Preliminary grading of the proposed major system has been included in the model, with generic road cross-section transects reflective of the proposed Right of Way (ROW) at each respective location. Roads with preliminary centreline grades less than 0.65% will be designed with a 'saw tooth' or 'sagged' road profile. The runoff from the development will be conveyed to catchbasins located at low points on the street. Flows above the minor system capture rate will temporarily be stored within the surface storage present within these sags and released slowly to the storm sewers. If the low point storage is surpassed, the flow will be conveyed overland to the next downstream road segment. Note that as the development is only at the preliminary design stage, the exact details of the saw toothing have not been included in the model and only overall high and low points within the development have been included. Note that the future inclusion of the road saw toothing will provide greater storage within the development major system than what has been simulated in this model. Refer to Figure B3 in Attachment B for an overview of the major system flow routes and general high and low points within the proposed development.

As per City standards, for the 100-year storm, the maximum total depth of water (static + dynamic) on all roads shall not exceed 35 cm at the gutter and product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads. Table C-1 in Attachment C provides a summary of the maximum major system flow depths along with the flow depth velocity product for the 100-year SCS 24 hour and Chicago 3-hour storm. From this preliminary analysis, it was found that all flow depths within the development for both 100-year events are less than 0.35 m and the depth velocity product is less than 0.60 m^2/s.

Development Minor System

Per the City of Ottawa standards, the minor system has been designed to accommodate, at a minimum, the 2-year post-development flows from within the site. The minor system surrounding the existing development was designed with a 5-year level of service, and as such, any external lands that will discharge to the development's minor system have been sized to ensure that the 5 year level of service will be maintained. Refer to the following section "External Minor system" regarding the checks completed to ensure the same level of service will be provided. The minor system within the development was preliminarily sized based on Rational Method calculations, refer to the Rational Method design sheets provided by DSEL in Attachment B for full details. The pipe sizes determined from the Rational Method calculations were included in the Dynamic Wave model. A Manning's roughness of 0.013 was applied to all proposed pipes within the development and minor system loss coefficients applied to all pipes based on each pipe's respective orientation, refer to Attachment B for the respective minor system loss coefficients applied in this model.

A minor system hydraulic grade line (HGL) analysis was completed for the proposed development based on the 100-year 3-hour Chicago and 100-year 24-hour SCS design storms. From this analysis it was found that the maximum pipe velocities are no greater than 6.0 m/s for all proposed pipes, in locations where the proposed simulated pipe velocities are less than 0.8 m/s, these pipes can be downsized at detailed design. Table C2 in Attachment C provided the maximum HGL with the minor system for these design storms. These results show that on average the maximum depth within the proposed storm sewer is 2.641 m below the top of the maintenance hole, and no maintenance holes are surcharged. Note that due to grading constraints within the development sump pumps will service several homes. Further details of these exact locations will be provided at the detailed design stage. There are a few locations where the 100-year hydraulic grade line is less than 1.8 m below the proposed ground elevation, these locations are either located within the pond block, do not have storm sewer connections to buildings, or the buildings that connect to these locations will be on sump pumps; therefore the high 100-year hydraulic grade line at these locations will not have any negative impacts.

Major/Minor System Connections

Within the development, flows have been passed from the major system to the minor system using outlet links. These outlets have been included in the model to function as an approximate representation of the flow capture provided by the proposed catch basins within the development. Depth/Flow curves for each outlet were generated based on the 2-year peak flow from the proposed development and 5-year peak flow from the existing external rear yards that will discharge to the proposed storm sewer at each respective location. The flow for each of these curves was increased by 14% at a depth of 0.3 m to account for additional inflows due to the increased head applied to standard inlet control devices and catch basins during the 100-year storm. To ensure that major system flow does not spill back onto the existing development, 100% capture for the 100-year event has been implemented at several locations within the proposed development.

SWM Ponds

The preliminary SWM pond sizes have been based on the "Kanata Golf and Country Club SWM Sizing" analysis completed by JFSA in September 2019, and has been updated based on the latest erosion threshold requirements set out by GEO Morphix July 2020 report " Kizell Drain Downstream of 7000 Campeau Drive -Geomorphological and Erosion Threshold Assessment". The total drainage area to each of the SWM Facilities is approximately 57.87 ha, 26.22 ha, 48.50 ha, 9.34 ha and 12.66 ha for SWMF's 1, 2, 3, 4 & 5, respectively. Note that due to the small drainage area to SWMF 3 (9.34 ha), it was determined that this location would be better serviced solely by an OGS unit. Each SWM pond will also be equipped with an oil-grit separator (OGS) and provide greater than 80% TSS removal. The exact sizing of each of these OGS units have been provided in Attachment B. Figure B5 in Attachment B (produced by DSEL) provides an overview of the drainage areas to each of the SWM facilities.

The SWM ponds have been represented in the model using storage nodes, which use a depth/area relationship to represent the pond footprint and storage volume provided. Note that as some of these ponds will have submerged inlets, the total pond storage volume (permanent pool and active storage) have been included in the model, with an initial depth applied to all of the ponds to fill the permanent pool before the start of the simulation. Tables 3 - 6 summarize the peak water levels, inflow, outflow and storage volume used in each of the ponds for the 5-year 3 hour Chicago storm, 100-year 3 hour Chicago storm, 100-year 24-hour SCS and 100-year 24-hour SCS +20%.

Table 3: SWMF 1 – Pond Summary
Drainage Area: 57.87 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	95.972	5.840	0.091	11,020
100 Year Chicago 3hr	96.724	8.858	0.157	21,430
100 Year SCS 24hr	96.966	8.670	0.173	25,150
100 Year SCS 24hr +20%	97.307	10.150	0.198	30,700

Table 4: SWMF 2 – Pond Summary
Drainage Area 26.22 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	96.441	3.628	0.084	5,702
100 Year Chicago 3hr	97.403	8.454	0.383	12,642
100 Year SCS 24hr	97.500	7.158	0.400	13,392
100 Year SCS 24hr +20%	97.905	9.924	1.012	16,722

Table 5: SWMF 4 - Pond Summary
Drainage Area: 45.50 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	94.878	5.934	0.094	10,340
100 Year Chicago 3hr	95.750	11.750	0.161	22,440
100 Year SCS 24hr	95.956	10.340	0.173	25,560
100 Year SCS 24hr +20%	96.363	11.980	0.338	32,040

Table 6: SWMF 5 - Pond Summary
Drainage Area: 12.66 ha

Event	Max WSE (m)	Max Inflow (m^3/s)	Max Outflow (m^3/s)	Max Storage Volume (m^3)
5 Year Chicago 3Hr	95.650	1.934	0.082	2,885
100 Year Chicago 3hr	96.403	4.017	0.137	6,036
100 Year SCS 24hr	96.584	3.542	0.147	6,903
100 Year SCS 24hr +20%	96.851	4.821	0.539	8,267

As a part of this analysis, a design stress test has been completed, based on a 20% increase in the intensity of the 100-year 24-hour SCS design storm. Each of the proposed SWM ponds will have emergency flow routes implemented to deal with such an event. Under this stress test, Pond 1 will discharge a peak flow of 0.005 m³/s to the proposed road within the development downstream of the pond. Pond 2 will discharge a maximum flow of 0.549 m³/s to an emergency overflow drop structure that will connect to the existing trunk sewer on Weslock Way. This analysis showed that the additional flow will increase the max HGL in the trunk system by a maximum of 3 cm without increasing the risk of basement flooding. Pond 4 will discharge 0.144 m³/s to a ditch in Weslock Park, and Pond 5 will spill 0.379 m³/s to Weslock Park. The above is a preliminary assessment of the emergency overflow measures. A comprehensive assessment of each of these measures will be completed at the detailed design stage.

External Minor system

There are currently eleven (11) locations where the minor system of the existing developed lands can freely discharge to the golf course. Under post-development conditions, these inflows to the site will be picked up by the proposed development's minor system and directed to the respective SWM ponds. The minor system within the development has been sized to ensure that there will be no increases in the existing storm sewer HGL once it is connected to the proposed development's minor system. Table C3 in Attachment C provides a complete summary of the existing and proposed peak HGLs at the outlets of the existing storm sewers. From this analysis, it is seen that there will be no increases in the existing HGL storm sewers due to the connection of these outlets to the proposed development minor system for the various design storms. Note that MHST12204 & MHST01107 see slight increases (maximum 3 cm) in HGL, these increases are due to the slight difference created in making the existing development drainage areas abut with the proposed development drainage boundaries in the proposed condition modelling, and are simply a modelling artifact and not a true HGL increase.

Downstream Impacts

The peak inflows to the Beaver Pond on the Knudson Drive / Weslock Way trunk sewer have been extracted based on existing and proposed conditions detailed modelling. Table 7 below provides a full summary of the existing and proposed peak flows and total volumes to the Beaver Pond from the Knudson Drive / Weslock Way trunk sewer.

Table 7: Peak flow and total volume into the Beaver Pond from Knudson Drive / Weslock Way trunk storm sewer

Event	Existing Conditions		Proposed Conditions		Difference	
	Peak Flow (m³/s) [1]	Total Volume (m³) [2]	Peak Flow (m³/s) [3]	Total Volume (m³) [4]	Peak Flow (m³/s) [3]-[1]	Total Volume (m³) [4]-[2]
5 Year Chicago 3Hr	6.707	21,190	6.315	34,590	-0.392	13,400
100 Year Chicago 3hr	10.03	44,580	9.933	81,230	-0.097	36,650
100 Year SCS 24hr	10.24	61,690	10.2	113,000	-0.04	51,310
100 Year SCS 24hr +20%	10.69	73,240	11.02	137,100	0.33	63,860

From this analysis it was found that peak flows to the Beaver Pond for the simulated design storms are either equal to or less than pre-development conditions due to the proposed SWM ponds, except for the stress test (100 Year SCS 24Hr +20%). As expected, the total runoff volume to the Beaver Pond has increased under proposed conditions. The impacts of these volumetric increases due to the development have been assessed in a separate memo by JFSA "Downstream of 7000 Campeau Drive – Hydrologic Assessment" July 2020, which reviews and quantifies the downstream impacts of the development on the greater Watts Creek watershed.

Table C4 in Attachment C provides a comparison of the existing and proposed HGL in the existing Knudson Drive / Weslock Way trunk sewer at the various SWMF outlet locations. From these results, it is seen that the proposed development either matches or reduces the existing peak HGL in this system.

Conclusion

The detailed PCSWMM models provided by the City for the lands draining to the Beaver Pond were updated to correct a few minor issues and compared with field measured flows from 2019. This investigation showed that this model provided a reasonably good correlation with the field observed data, and accordingly this model was used to establish the existing hydraulic and hydrologic conditions of the study area. This model was then updated to reflect the proposed development at 7000 Campeau Drive. Full details of this update have been outlined in this memo. From this analysis, it was found that:

- The proposed minor system within the development is adequately sized to safely convey the 5- and 100-year storm flows to the proposed SWM facilities.
- The proposed major system within the development is adequately sized to safely convey the excess 100-year flows to the proposed SWM facilities.
- The operation of the proposed SWM facilities has been shown to meet quantity control requirements, with quality control requirements assessed at detailed design through the implementation of OGS units.
- The proposed development will not result in any HGL increases on the existing stormwater infrastructure upstream or downstream of the proposed development.
- The proposed development peak flows into the Beaver Pond from the Knudson Drive / Weslock Way trunk sewer, are either equal to or less than existing peak flows.
- The peak HGL in the existing Knudson Drive/ Westlock Way will not be increased due to the proposed development.

Yours truly,
J.F Sabourin and Associates Inc.

Jonathon Burnett, B.Eng, P.Eng
Water Resources Engineer

cc: J.F Sabourin, M.Eng, P.Eng
Director of Water Resources Projects

Table 1A: Beaver Pond Inflow/Outflow Summary

Design Storms	MVCA				KWEX				KWEX_KNL9					KWEX_KGC					KWEX_KGC_KNL9					
	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Qp/Qp_{KNL9}
25 mm CHI 4Hr	n/a	n/a	n/a	n/a	415.850	4.626	0.139	3.570	430.020	5.878	0.173	4.020	1.245	422.910	4.610	0.135	6.180	0.971	437.090	5.862	0.169	6.540	1.216	0.977
2Yr SCS 12 hour	477.350	1.352	0.454	18.140	415.850	4.644	0.314	7.360	430.020	5.811	0.369	8.180	1.175	422.910	4.635	0.301	11.730	0.959	437.090	5.801	0.354	12.390	1.127	0.959
5Yr SCS 12 hour	477.350	2.439	0.615	26.800	415.850	7.164	0.486	11.680	430.020	9.071	0.538	12.840	1.107	422.910	6.976	0.486	17.570	1.000	437.090	8.884	0.541	18.510	1.113	1.006
10Yr SCS 12 hour	473.450	3.248	0.671	33.000	415.850	9.686	0.599	15.680	430.020	12.049	0.640	17.040	1.068	422.910	9.145	0.598	22.620	0.998	437.090	11.516	0.644	23.690	1.075	1.006
25Yr SCS 12 hour	466.660	5.342	0.775	41.160	415.850	13.964	0.718	21.710	430.020	16.894	0.757	23.280	1.054	422.910	12.818	0.710	29.770	0.989	437.090	15.872	0.754	31.020	1.050	0.996
50Yr SCS 12 hour	462.310	7.378	0.859	47.110	415.850	17.893	0.792	26.340	429.920	20.057	0.826	28.040	1.043	422.810	16.207	0.776	35.080	0.980	436.980	18.721	0.817	36.400	1.032	0.989
100Yr SCS 12 hour	458.300	9.941	0.924	53.220	415.800	24.521	0.854	31.250	429.460	27.228	0.889	33.050	1.041	422.360	22.463	0.829	40.540	0.971	436.530	25.285	0.873	41.940	1.022	0.982
2Yr SCS 24 hour	n/a	n/a	n/a	n/a	415.850	6.603	0.358	9.390	430.020	8.420	0.414	10.310	1.156	422.910	6.531	0.345	14.170	0.964	437.090	8.348	0.401	14.900	1.120	0.969
5Yr SCS 24 hour	n/a	n/a	n/a	n/a	415.850	10.871	0.548	15.280	430.020	13.567	0.589	16.480	1.075	422.910	10.447	0.550	21.570	1.004	437.090	13.145	0.593	22.520	1.082	1.007
10Yr SCS 24 hour	n/a	n/a	n/a	n/a	415.850	14.605	0.642	19.840	430.020	17.877	0.684	21.200	1.065	422.910	13.705	0.644	27.000	1.003	437.090	17.003	0.690	28.060	1.075	1.009
25Yr SCS 24 hour	n/a	n/a	n/a	n/a	415.850	19.100	0.745	26.090	429.660	23.390	0.783	27.620	1.051	422.560	17.703	0.740	34.170	0.993	436.730	22.127	0.786	35.300	1.055	1.004
50Yr SCS 24 hour	n/a	n/a	n/a	n/a	415.480	23.303	0.813	31.260	428.680	27.929	0.846	32.900	1.041	421.570	21.150	0.804	39.780	0.989	435.750	25.811	0.846	41.050	1.041	1.000
100Yr SCS 24 hour	n/a	n/a	n/a	n/a	415.010	34.161	0.881	37.050	428.230	37.596	0.911	38.780	1.034	421.120	31.104	0.863	45.960	0.980	435.300	34.662	0.905	47.250	1.027	0.993
2Yr CHI 3Hr	n/a	n/a	n/a	n/a	415.850	7.098	0.238	5.290	430.020	8.959	0.288	5.920	1.210	422.910	7.063	0.224	8.940	0.941	437.090	8.924	0.274	9.390	1.151	0.951
5Yr CHI 3Hr	n/a	n/a	n/a	n/a	415.850	12.180	0.437	9.240	430.020	15.038	0.480	10.110	1.098	422.910	11.968	0.431	14.610	0.986	437.090	14.827	0.478	15.250	1.094	0.996
10Yr CHI 3Hr	n/a	n/a	n/a	n/a	415.850	15.175	0.533	12.140	429.780	19.126	0.578	13.170	1.084	422.680	14.609	0.530	18.610	0.994	436.850	18.563	0.582	19.370	1.092	1.007
25Yr CHI 3Hr	n/a	n/a	n/a	n/a	415.680	19.916	0.626	16.000	428.370	24.857	0.667	17.230	1.065	421.260	18.521	0.621	23.790	0.992	435.440	23.466	0.672	24.680	1.073	1.007
50Yr CHI 3Hr	n/a	n/a	n/a	n/a	415.090	25.585	0.692	19.130	427.580	29.438	0.728	20.520	1.052	420.470	24.101	0.682	27.880	0.986	434.650	27.734	0.727	28.850	1.051	0.999
100Yr CHI 3Hr	n/a	n/a	n/a	n/a	414.440	29.457	0.750	22.650	426.980	35.943	0.790	24.180	1.053	419.870	27.388	0.733	32.310	0.977	434.040	33.955	0.785	33.380	1.047	0.994
100Yr SCS 24Hr + 20%	n/a	n/a	n/a	n/a	413.860	50.926	1.007	50.190	427.240	57.648	1.039	52.080	1.032	420.130	46.983	0.969	59.390	0.962	434.300	53.839	1.020	60.750	1.013	0.982

Scenario Summary:

MVCA	MVCA 2017 Future Conditions Model of Record
KWEX	JFSA updated Existing Conditions
KWEX_KNL9	JFSA updated Existing Conditions + KNL Stage 9 Development
KWEX_KGC	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls
KWEX_KGC_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls + KNL Stage 9 Development
KWEX_KGC- LIDs3mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs
KWEX_KGC- LIDs5mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs
KWEX_KGC- LIDs3mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs + KNL Stage 9 Development
KWEX_KGC- LIDs5mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs + KNL Stage 9 Development

Tabl 1B: Beaver Pond Inflow/Outflow Summary - With LIDs

Design storms	KWEX_KGC- LIDs3mm					KWEX_KGC- LIDs5mm					KWEX_KGC- LIDs3mm_KNL9						KWEX_KGC- LIDs5mm_KNL9					
	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Qp/Qp_{KNL9}	Area (ha)	Qp In (m^3/s)	Qp Out (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Qp/Qp_{KNL9}
25 mm CHI 4Hr	422.910	4.579	0.132	5.860	0.950	422.910	4.499	0.129	5.590	0.928	437.090	5.765	0.160	6.140	1.151	0.925	437.090	5.546	0.155	5.830	1.115	0.896
2Yr SCS 12 hour	422.910	4.604	0.293	11.370	0.933	422.910	4.552	0.288	11.120	0.917	437.090	5.714	0.342	11.940	1.089	0.927	437.090	5.590	0.334	11.640	1.064	0.905
5Yr SCS 12 hour	422.910	6.946	0.479	17.250	0.986	422.910	6.925	0.474	16.960	0.975	437.090	8.796	0.530	18.070	1.091	0.985	437.090	8.665	0.523	17.760	1.076	0.972
10Yr SCS 12 hour	422.910	9.112	0.594	22.240	0.992	422.910	9.086	0.591	22.000	0.987	437.090	11.427	0.638	23.270	1.065	0.997	437.090	11.361	0.634	22.980	1.058	0.991
25Yr SCS 12 hour	422.910	12.781	0.708	29.490	0.986	422.910	12.752	0.706	29.220	0.983	437.090	15.784	0.750	30.640	1.045	0.991	437.090	15.716	0.748	30.370	1.042	0.988
50Yr SCS 12 hour	422.810	16.187	0.774	34.810	0.977	422.810	16.172	0.772	34.540	0.975	436.980	18.661	0.814	36.050	1.028	0.985	436.980	18.610	0.813	35.800	1.027	0.984
100Yr SCS 12 hour	422.360	22.445	0.828	40.200	0.970	422.360	22.432	0.827	40.000	0.968	436.530	25.249	0.871	41.590	1.020	0.980	436.530	25.218	0.869	41.350	1.018	0.978
2Yr SCS 24 hour	422.910	6.502	0.337	13.860	0.941	422.910	6.486	0.332	13.630	0.927	437.090	8.262	0.389	14.500	1.087	0.940	437.090	8.116	0.382	14.250	1.067	0.923
5Yr SCS 24 hour	422.910	10.425	0.545	21.290	0.995	422.910	10.404	0.540	21.030	0.985	437.090	13.081	0.587	22.160	1.071	0.997	437.090	13.026	0.583	21.880	1.064	0.990
10Yr SCS 24 hour	422.910	13.669	0.641	26.740	0.998	422.910	13.646	0.638	26.490	0.994	437.090	16.922	0.683	27.710	1.064	0.999	437.090	16.870	0.683	27.470	1.064	0.999
25Yr SCS 24 hour	422.560	17.678	0.738	33.910	0.991	422.560	17.661	0.736	33.630	0.988	436.730	22.087	0.782	34.980	1.050	0.999	436.730	22.052	0.780	34.760	1.047	0.996
50Yr SCS 24 hour	421.570	21.137	0.802	39.520	0.986	421.570	21.128	0.801	39.270	0.985	435.750	25.789	0.843	40.720	1.037	0.996	435.750	25.768	0.842	40.510	1.036	0.995
100Yr SCS 24 hour	421.120	31.092	0.861	45.710	0.977	421.120	31.084	0.860	45.410	0.976	435.300	34.650	0.903	46.940	1.025	0.991	435.300	34.641	0.902	46.730	1.024	0.990
2Yr CHI 3Hr	422.910	7.032	0.221	8.560	0.929	422.910	6.980	0.218	8.310	0.916	437.090	8.838	0.264	8.960	1.109	0.917	437.090	8.635	0.257	8.650	1.080	0.892
5Yr CHI 3Hr	422.910	11.924	0.424	14.210	0.970	422.910	11.887	0.420	13.950	0.961	437.090	14.728	0.467	14.800	1.069	0.973	437.090	14.626	0.459	14.490	1.050	0.956
10Yr CHI 3Hr	422.680	14.567	0.525	18.270	0.985	422.680	14.534	0.521	17.940	0.977	436.850	18.012	0.576	18.910	1.081	0.997	436.850	17.927	0.572	18.600	1.073	0.990
25Yr CHI 3Hr	421.260	18.474	0.617	23.440	0.986	421.260	18.442	0.615	23.080	0.982	435.440	23.335	0.666	24.210	1.064	0.999	435.440	23.235	0.662	23.890	1.058	0.993
50Yr CHI 3Hr	420.470	24.032	0.679	27.520	0.981	420.470	23.989	0.676	27.120	0.977	434.650	27.596	0.723	28.370	1.045	0.993	434.650	27.494	0.720	28.050	1.040	0.989
100Yr CHI 3Hr	419.870	27.329	0.730	31.940	0.973	419.870	27.288	0.729	31.540	0.972	434.040	33.782	0.780	32.900	1.040	0.987	434.040	33.668	0.777	32.580	1.036	0.984
100Yr SCS 24Hr + 20%	420.130	46.971	0.968	59.150	0.961	420.130	46.963	0.967	58.770	0.960	434.300	53.829	1.019	60.440	1.012	0.981	434.300	53.822	1.018	60.240	1.011	0.980

Scenario Summary:

MVCA	MVCA 2017 Future Conditions Model of Record
KWEX	JFSA updated Existing Conditions
KWEX_KNL9	JFSA updated Existing Conditions + KNL Stage 9 Development
KWEX_KGC	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls
KWEX_KGC_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls + KNL Stage 9 Development
KWEX_KGC- LIDs3mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs
KWEX_KGC- LIDs5mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs
KWEX_KGC- LIDs3mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs + KNL Stage 9 Development
KWEX_KGC- LIDs5mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs + KNL Stage 9 Development

Table 2A: Outlet to Ottawa River Summary

Design Storms	MVCA			KWEX			KWEX_KNL9				KWEX_KGC				KWEX_KGC_KNL9				
	Area (ha)	Qp (m^3/s)	Runoff (mm)	Area (ha)	Qp (m^3/s)	Runoff (mm)	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Qp/Qp_{KNL9}
25 mm CHI 4Hr	n/a	n/a	n/a	2550.680	3.572	3.470	2549.940	3.573	4.020	1.0003	2550.680	3.568	3.900	0.999	2549.940	3.573	4.020	1.000	1.000
2Yr SCS 12 hour	2590.480	8.051	16.290	2550.680	6.176	7.630	2549.940	6.186	8.570	1.002	2550.680	6.164	8.350	0.998	2549.940	6.186	8.570	1.002	1.000
5Yr SCS 12 hour	2590.480	12.467	25.080	2550.680	9.396	11.880	2549.940	9.437	13.180	1.004	2550.680	9.379	12.860	0.998	2549.940	9.437	13.180	1.004	1.000
10Yr SCS 12 hour	2586.580	15.905	31.460	2550.680	11.946	15.470	2549.940	11.997	16.990	1.004	2550.680	11.925	16.630	0.998	2549.940	11.997	16.990	1.004	1.000
25Yr SCS 12 hour	2579.790	20.780	39.920	2550.680	16.548	21.150	2549.940	16.645	22.930	1.006	2550.680	16.508	22.490	0.998	2549.940	16.645	22.930	1.006	1.000
50Yr SCS 12 hour	2575.440	24.531	46.120	2550.570	20.883	25.910	2549.830	21.018	27.840	1.006	2550.580	20.832	27.360	0.998	2549.830	21.018	27.840	1.006	1.000
100Yr SCS 12 hour	2571.430	28.263	52.480	2550.120	25.754	31.120	2549.380	25.900	33.170	1.006	2550.130	25.703	32.660	0.998	2549.380	25.900	33.170	1.006	1.000
2Yr SCS 24 hour	n/a	n/a	n/a	2550.680	6.225	9.340	2549.940	6.232	10.380	1.001	2550.680	6.213	10.130	0.998	2549.940	6.232	10.380	1.001	1.000
5Yr SCS 24 hour	n/a	n/a	n/a	2550.680	9.900	15.050	2549.940	9.942	16.430	1.004	2550.680	9.869	16.100	0.997	2549.940	9.942	16.430	1.004	1.000
10Yr SCS 24 hour	n/a	n/a	n/a	2550.680	13.432	19.800	2549.940	13.507	21.360	1.006	2550.680	13.399	20.980	0.998	2549.940	13.507	21.360	1.006	1.000
25Yr SCS 24 hour	n/a	n/a	n/a	2550.320	18.763	26.310	2549.580	18.868	28.080	1.006	2550.330	18.721	27.650	0.998	2549.580	18.868	28.080	1.006	1.000
50Yr SCS 24 hour	n/a	n/a	n/a	2549.340	23.492	31.870	2548.600	23.617	33.740	1.005	2549.340	23.443	33.270	0.998	2548.600	23.617	33.740	1.005	1.000
100Yr SCS 24 hour	n/a	n/a	n/a	2548.890	28.781	38.250	2548.150	28.927	40.210	1.005	2548.890	28.721	39.720	0.998	2548.150	28.927	40.210	1.005	1.000
2Yr CHI 3Hr	n/a	n/a	n/a	2550.680	4.959	4.890	2549.940	4.963	5.660	1.001	2550.680	4.951	5.490	0.998	2549.940	4.963	5.660	1.001	1.000
5Yr CHI 3Hr	n/a	n/a	n/a	2550.680	7.749	8.210	2549.940	7.768	9.340	1.002	2550.680	7.734	9.100	0.998	2549.940	7.768	9.340	1.002	1.000
10Yr CHI 3Hr	n/a	n/a	n/a	2550.440	10.781	11.190	2549.700	10.816	12.560	1.003	2550.450	10.760	12.260	0.998	2549.700	10.816	12.560	1.003	1.000
25Yr CHI 3Hr	n/a	n/a	n/a	2549.030	15.301	15.250	2548.290	15.373	16.880	1.005	2549.030	15.270	16.520	0.998	2548.290	15.373	16.880	1.005	1.000
50Yr CHI 3Hr	n/a	n/a	n/a	2548.240	19.003	18.510	2547.500	19.097	20.340	1.005	2548.240	18.967	19.940	0.998	2547.500	19.097	20.340	1.005	1.000
100Yr CHI 3Hr	n/a	n/a	n/a	2547.640	22.967	22.110	2546.890	23.074	24.130	1.005	2547.640	22.931	23.680	0.998	2546.890	23.074	24.130	1.005	1.000
100Yr SCS 24Hr + 20%	n/a	n/a	n/a	2547.900	41.079	52.640	2547.150	41.245	54.690	1.004	2547.900	41.024	54.160	0.999	2547.150	41.245	54.690	1.004	1.000

Scenario Summary:

MVCA	MVCA 2017 Future Conditions Model of Record
KWEX	JFSA updated Existing Conditions
KWEX_KNL9	JFSA updated Existing Conditions + KNL Stage 9 Development
KWEX_KGC	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls
KWEX_KGC_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls + KNL Stage 9 Development
KWEX_KGC- LIDs3mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs
KWEX_KGC- LIDs5mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs
KWEX_KGC- LIDs3mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs + KNL Stage 9 Development
KWEX_KGC- LIDs5mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs + KNL Stage 9 Development

Table 2B: Outlet to Ottawa River Summary - With LID's

Design Storms	KWEX_KGC- LIDs3mm				KWEX_KGC- LIDs5mm				KWEX_KGC- LIDs3mm_KNL9					KWEX_KGC- LIDs5mm_KNL9				
	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Qp/Qp_{KNL9}	Area (ha)	Qp (m^3/s)	Runoff (mm)	Qp/Qp_{KWEX}	Qp/Qp_{KNL9}
25 mm CHI 4Hr	2550.680	3.568	3.840	0.999	2550.680	3.568	3.800	0.999	2549.940	3.571	3.950	1.000	0.999	2549.940	3.571	3.890	1.000	0.999
2Yr SCS 12 hour	2550.680	6.163	8.290	0.998	2550.680	6.163	8.250	0.998	2549.940	6.180	8.490	1.001	0.999	2549.940	6.177	8.430	1.000	0.999
5Yr SCS 12 hour	2550.680	9.378	12.810	0.998	2550.680	9.378	12.760	0.998	2549.940	9.429	13.100	1.004	0.999	2549.940	9.424	13.040	1.003	0.999
10Yr SCS 12 hour	2550.680	11.924	16.560	0.998	2550.680	11.923	16.530	0.998	2549.940	11.989	16.920	1.004	0.999	2549.940	11.983	16.860	1.003	0.999
25Yr SCS 12 hour	2550.680	16.506	22.450	0.997	2550.680	16.506	22.410	0.997	2549.940	16.635	22.860	1.005	0.999	2549.940	16.627	22.810	1.005	0.999
50Yr SCS 12 hour	2550.580	20.830	27.320	0.997	2550.580	20.829	27.270	0.997	2549.830	21.006	27.770	1.006	0.999	2549.830	20.997	27.720	1.005	0.999
100Yr SCS 12 hour	2550.130	25.701	32.610	0.998	2550.130	25.700	32.580	0.998	2549.380	25.889	33.110	1.005	1.000	2549.380	25.881	33.070	1.005	0.999
2Yr SCS 24 hour	2550.680	6.212	10.080	0.998	2550.680	6.212	10.050	0.998	2549.940	6.227	10.310	1.000	0.999	2549.940	6.223	10.260	1.000	0.999
5Yr SCS 24 hour	2550.680	9.867	16.050	0.997	2550.680	9.866	16.010	0.997	2549.940	9.936	16.360	1.004	0.999	2549.940	9.931	16.310	1.003	0.999
10Yr SCS 24 hour	2550.680	13.396	20.940	0.997	2550.680	13.395	20.910	0.997	2549.940	13.499	21.300	1.005	0.999	2549.940	13.493	21.260	1.005	0.999
25Yr SCS 24 hour	2550.330	18.718	27.610	0.998	2550.330	18.716	27.580	0.997	2549.580	18.860	28.020	1.005	1.000	2549.580	18.853	27.970	1.005	0.999
50Yr SCS 24 hour	2549.340	23.440	33.230	0.998	2549.340	23.438	33.200	0.998	2548.600	23.608	33.680	1.005	1.000	2548.600	23.603	33.640	1.005	0.999
100Yr SCS 24 hour	2548.890	28.718	39.680	0.998	2548.890	28.701	39.650	0.997	2548.150	28.919	40.150	1.005	1.000	2548.150	28.913	40.110	1.005	1.000
2Yr CHI 3Hr	2550.680	4.951	5.430	0.998	2550.680	4.951	5.390	0.998	2549.940	4.961	5.580	1.000	1.000	2549.940	4.959	5.520	1.000	0.999
5Yr CHI 3Hr	2550.680	7.734	9.030	0.998	2550.680	7.733	8.990	0.998	2549.940	7.764	9.260	1.002	0.999	2549.940	7.761	9.200	1.002	0.999
10Yr CHI 3Hr	2550.450	10.759	12.200	0.998	2550.450	10.759	12.150	0.998	2549.700	10.811	12.470	1.003	1.000	2549.700	10.808	12.410	1.003	0.999
25Yr CHI 3Hr	2549.030	15.270	16.470	0.998	2549.030	15.270	16.420	0.998	2548.290	15.365	16.790	1.004	0.999	2548.290	15.360	16.730	1.004	0.999
50Yr CHI 3Hr	2548.240	18.966	19.880	0.998	2548.240	18.966	19.830	0.998	2547.500	19.088	20.250	1.004	1.000	2547.500	19.082	20.190	1.004	0.999
100Yr CHI 3Hr	2547.640	22.931	23.630	0.998	2547.640	22.931	23.590	0.998	2546.890	23.065	24.040	1.004	1.000	2546.890	23.059	23.980	1.004	0.999
100Yr SCS 24Hr + 20%	2547.900	41.020	54.120	0.999	2547.900	41.018	54.090	0.999	2547.150	41.235	54.640	1.004	1.000	2547.150	41.228	54.600	1.004	1.000

Scenario Summary:

MVCA	MVCA 2017 Future Conditions Model of Record
KWEX	JFSA updated Existing Conditions
KWEX_KNL9	JFSA updated Existing Conditions + KNL Stage 9 Development
KWEX_KGC	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls
KWEX_KGC_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls + KNL Stage 9 Development
KWEX_KGC- LIDs3mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs
KWEX_KGC- LIDs5mm	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs
KWEX_KGC- LIDs3mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 3mm equivalent LIDs + KNL Stage 9 Development
KWEX_KGC- LIDs5mm_KNL9	JFSA updated Existing Conditions + The Kanata Golf and Country Club Development with SWM controls with 5mm equivalent LIDs + KNL Stage 9 Development

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

CONTECH ENGINEERED SOLUTIONS

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	1	**Report Date:**	15-May-20

Area	54.99	ha	**Rainfall Station #**	215	
Weighted C	0.62		**Particle Size Distribution**	FINE	
CDS Model	5668	(TWIN)	**CDS Treatment Capacity**	1076	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	9.2%	9.2%	47.4	47.4	4.4	97.6	8.9
1.0	10.6%	19.8%	94.8	94.8	8.8	96.3	10.2
1.5	9.9%	29.7%	142.2	142.2	13.2	95.1	9.4
2.0	8.4%	38.1%	189.6	189.6	17.6	93.8	7.9
2.5	7.7%	45.8%	237.0	237.0	22.0	92.5	7.1
3.0	5.9%	51.7%	284.3	284.3	26.4	91.3	5.4
3.5	4.4%	56.1%	331.7	331.7	30.8	90.0	3.9
4.0	4.7%	60.7%	379.1	379.1	35.2	88.8	4.1
4.5	3.3%	64.0%	426.5	426.5	39.6	87.5	2.9
5.0	3.0%	67.1%	473.9	473.9	44.0	86.2	2.6
6.0	5.4%	72.4%	568.7	568.7	52.8	83.7	4.5
7.0	4.4%	76.8%	663.5	663.5	61.7	81.2	3.5
8.0	3.5%	80.3%	758.2	758.2	70.5	78.7	2.8
9.0	2.8%	83.2%	853.0	853.0	79.3	76.1	2.1
10.0	2.2%	85.3%	947.8	947.8	88.1	73.6	1.6
15.0	7.0%	92.3%	1421.7	1076.2	100.0	53.1	3.7
20.0	4.5%	96.9%	1895.6	1076.2	100.0	39.8	1.8
25.0	1.4%	98.3%	2369.5	1076.2	100.0	31.9	0.5
30.0	0.7%	99.0%	2843.4	1076.2	100.0	26.6	0.2
35.0	0.5%	99.5%	3317.3	1076.2	100.0	22.8	0.1
40.0	0.5%	100.0%	3791.2	1076.2	100.0	19.9	0.1
45.0	0.0%	100.0%	4265.1	1076.2	100.0	17.7	0.0
50.0	0.0%	100.0%	4739.0	1076.2	100.0	15.9	0.0
							83.5
						Removal Efficiency Adjustment[2] =	0.0%
						Predicted Net Annual Load Removal Efficiency =	**83.5%**
						Predicted % Annual Rainfall Treated =	**94.4%**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
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

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

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	2	**Report Date:**	15-May-20

Area	24.96	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5678		**CDS Treatment Capacity**	708	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	9.2%	9.2%	22.6	22.6	3.2	97.9	9.0
1.0	10.6%	19.8%	45.1	45.1	6.4	97.0	10.3
1.5	9.9%	29.7%	67.7	67.7	9.6	96.1	9.5
2.0	8.4%	38.1%	90.2	90.2	12.7	95.2	8.0
2.5	7.7%	45.8%	112.8	112.8	15.9	94.3	7.2
3.0	5.9%	51.7%	135.3	135.3	19.1	93.4	5.5
3.5	4.4%	56.1%	157.9	157.9	22.3	92.5	4.0
4.0	4.7%	60.7%	180.4	180.4	25.5	91.6	4.3
4.5	3.3%	64.0%	203.0	203.0	28.7	90.6	3.0
5.0	3.0%	67.1%	225.5	225.5	31.9	89.7	2.7
6.0	5.4%	72.4%	270.6	270.6	38.2	87.9	4.7
7.0	4.4%	76.8%	315.7	315.7	44.6	86.1	3.7
8.0	3.5%	80.3%	360.8	360.8	51.0	84.2	3.0
9.0	2.8%	83.2%	405.9	405.9	57.3	82.4	2.3
10.0	2.2%	85.3%	451.0	451.0	63.7	80.6	1.8
15.0	7.0%	92.3%	676.5	676.5	95.6	71.5	5.0
20.0	4.5%	96.9%	902.1	708.0	100.0	55.1	2.5
25.0	1.4%	98.3%	1127.6	708.0	100.0	44.1	0.6
30.0	0.7%	99.0%	1353.1	708.0	100.0	36.7	0.2
35.0	0.5%	99.5%	1578.6	708.0	100.0	31.5	0.1
40.0	0.5%	100.0%	1804.1	708.0	100.0	27.5	0.2
45.0	0.0%	100.0%	2029.6	708.0	100.0	24.5	0.0
50.0	0.0%	100.0%	2255.1	708.0	100.0	22.0	0.0
							87.8
						Removal Efficiency Adjustment[2] =	6.5%
						Predicted Net Annual Load Removal Efficiency =	**81.3%**
						Predicted % Annual Rainfall Treated =	**97.6%**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
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

CONTECH ENGINEERED SOLUTIONS

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

CDS TECHNOLOGIES

Project Name:	7000 Campeau Drive	**Engineer:**	**DSEL**
Location:	Kanata, ON	**Contact:**	S. Merrick, P.Eng.
OGS #:	3	**Report Date:**	15-May-20

Area	9.34	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5640		**CDS Treatment Capacity**	255	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	9.2%	9.2%	8.4	8.4	3.3	97.9	9.0
1.0	10.6%	19.8%	16.9	16.9	6.6	97.0	10.3
1.5	9.9%	29.7%	25.3	25.3	9.9	96.0	9.5
2.0	8.4%	38.1%	33.8	33.8	13.2	95.1	8.0
2.5	7.7%	45.8%	42.2	42.2	16.6	94.1	7.2
3.0	5.9%	51.7%	50.6	50.6	19.9	93.2	5.5
3.5	4.4%	56.1%	59.1	59.1	23.2	92.2	4.0
4.0	4.7%	60.7%	67.5	67.5	26.5	91.3	4.3
4.5	3.3%	64.0%	75.9	75.9	29.8	90.3	3.0
5.0	3.0%	67.1%	84.4	84.4	33.1	89.4	2.7
6.0	5.4%	72.4%	101.3	101.3	39.7	87.5	4.7
7.0	4.4%	76.8%	118.1	118.1	46.4	85.6	3.7
8.0	3.5%	80.3%	135.0	135.0	53.0	83.7	3.0
9.0	2.8%	83.2%	151.9	151.9	59.6	81.8	2.3
10.0	2.2%	85.3%	168.8	168.8	66.2	79.9	1.7
15.0	7.0%	92.3%	253.2	253.2	99.3	70.4	4.9
20.0	4.5%	96.9%	337.5	254.9	100.0	53.0	2.4
25.0	1.4%	98.3%	421.9	254.9	100.0	42.4	0.6
30.0	0.7%	99.0%	506.3	254.9	100.0	35.3	0.2
35.0	0.5%	99.5%	590.7	254.9	100.0	30.3	0.1
40.0	0.5%	100.0%	675.1	254.9	100.0	26.5	0.1
45.0	0.0%	100.0%	759.5	254.9	100.0	23.6	0.0
50.0	0.0%	100.0%	843.9	254.9	100.0	21.2	0.0
							87.4
						Removal Efficiency Adjustment[2] =	6.5%
						Predicted Net Annual Load Removal Efficiency =	**80.9%**
						Predicted % Annual Rainfall Treated =	**97.4%**

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
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4 - CDS design flowrate and scaling based on standard manufacturer model & product specifications

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

Project Name: 7000 Campeau Drive
Location: Kanata, ON
OGS #: 4

Engineer: DSEL
Contact: S. Merrick, P.Eng.
Report Date: 25-May-20

Area	46.47	ha	**Rainfall Station #**	215	
Weighted C	0.65		**Particle Size Distribution**	FINE	
CDS Model	5653	(TWIN)	**CDS Treatment Capacity**	793	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	9.2%	9.2%	42.0	42.0	5.3	97.3	8.9
1.0	10.6%	19.8%	84.0	84.0	10.6	95.8	10.2
1.5	9.9%	29.7%	126.0	126.0	15.9	94.3	9.3
2.0	8.4%	38.1%	167.9	167.9	21.2	92.8	7.8
2.5	7.7%	45.8%	209.9	209.9	26.5	91.3	7.0
3.0	5.9%	51.7%	251.9	251.9	31.8	89.8	5.3
3.5	4.4%	56.1%	293.9	293.9	37.1	88.2	3.8
4.0	4.7%	60.7%	335.9	335.9	42.4	86.7	4.0
4.5	3.3%	64.0%	377.9	377.9	47.7	85.2	2.8
5.0	3.0%	67.1%	419.9	419.9	52.9	83.7	2.5
6.0	5.4%	72.4%	503.8	503.8	63.5	80.6	4.3
7.0	4.4%	76.8%	587.8	587.8	74.1	77.6	3.4
8.0	3.5%	80.3%	671.8	671.8	84.7	74.6	2.6
9.0	2.8%	83.2%	755.7	755.7	95.3	71.5	2.0
10.0	2.2%	85.3%	839.7	793.0	100.0	66.3	1.4
15.0	7.0%	92.3%	1259.6	793.0	100.0	44.2	3.1
20.0	4.5%	96.9%	1679.4	793.0	100.0	33.1	1.5
25.0	1.4%	98.3%	2099.3	793.0	100.0	26.5	0.4
30.0	0.7%	99.0%	2519.1	793.0	100.0	22.1	0.1
35.0	0.5%	99.5%	2939.0	793.0	100.0	18.9	0.1
40.0	0.5%	100.0%	3358.9	793.0	100.0	16.6	0.1
45.0	0.0%	100.0%	3778.7	793.0	100.0	14.7	0.0
50.0	0.0%	100.0%	4198.6	793.0	100.0	13.3	0.0
							80.9

Removal Efficiency Adjustment[2] = 0.0%

Predicted Net Annual Load Removal Efficiency = 80.9%

Predicted % Annual Rainfall Treated = 92.8%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
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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

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

Project Name: 7000 Campeau Drive
Location: Kanata, ON
OGS #: 5

Engineer: DSEL
Contact: S. Merrick, P.Eng.
Report Date: 15-May-20

Area 11.83 ha
Weighted C 0.65
CDS Model 5653

Rainfall Station # 215
Particle Size Distribution FINE
CDS Treatment Capacity 396 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	9.2%	9.2%	10.7	10.7	2.7	98.1	9.0
1.0	10.6%	19.8%	21.4	21.4	5.4	97.3	10.3
1.5	9.9%	29.7%	32.1	32.1	8.1	96.5	9.6
2.0	8.4%	38.1%	42.8	42.8	10.8	95.8	8.0
2.5	7.7%	45.8%	53.4	53.4	13.5	95.0	7.3
3.0	5.9%	51.7%	64.1	64.1	16.2	94.2	5.6
3.5	4.4%	56.1%	74.8	74.8	18.9	93.4	4.1
4.0	4.7%	60.7%	85.5	85.5	21.6	92.7	4.3
4.5	3.3%	64.0%	96.2	96.2	24.3	91.9	3.0
5.0	3.0%	67.1%	106.9	106.9	27.0	91.1	2.8
6.0	5.4%	72.4%	128.3	128.3	32.3	89.6	4.8
7.0	4.4%	76.8%	149.6	149.6	37.7	88.0	3.8
8.0	3.5%	80.3%	171.0	171.0	43.1	86.5	3.1
9.0	2.8%	83.2%	192.4	192.4	48.5	84.9	2.4
10.0	2.2%	85.3%	213.8	213.8	53.9	83.4	1.8
15.0	7.0%	92.3%	320.7	320.7	80.9	75.7	5.3
20.0	4.5%	96.9%	427.5	396.5	100.0	65.1	3.0
25.0	1.4%	98.3%	534.4	396.5	100.0	52.1	0.8
30.0	0.7%	99.0%	641.3	396.5	100.0	43.4	0.3
35.0	0.5%	99.5%	748.2	396.5	100.0	37.2	0.2
40.0	0.5%	100.0%	855.1	396.5	100.0	32.5	0.2
45.0	0.0%	100.0%	962.0	396.5	100.0	28.9	0.0
50.0	0.0%	100.0%	1068.8	396.5	100.0	26.0	0.0
							89.6

Removal Efficiency Adjustment[2] = 6.5%

Predicted Net Annual Load Removal Efficiency = 83.1%

Predicted % Annual Rainfall Treated = 98.5%

1 - Based on 42 years of hourly rainfall data from Canadian Station 6105976, Ottawa ON
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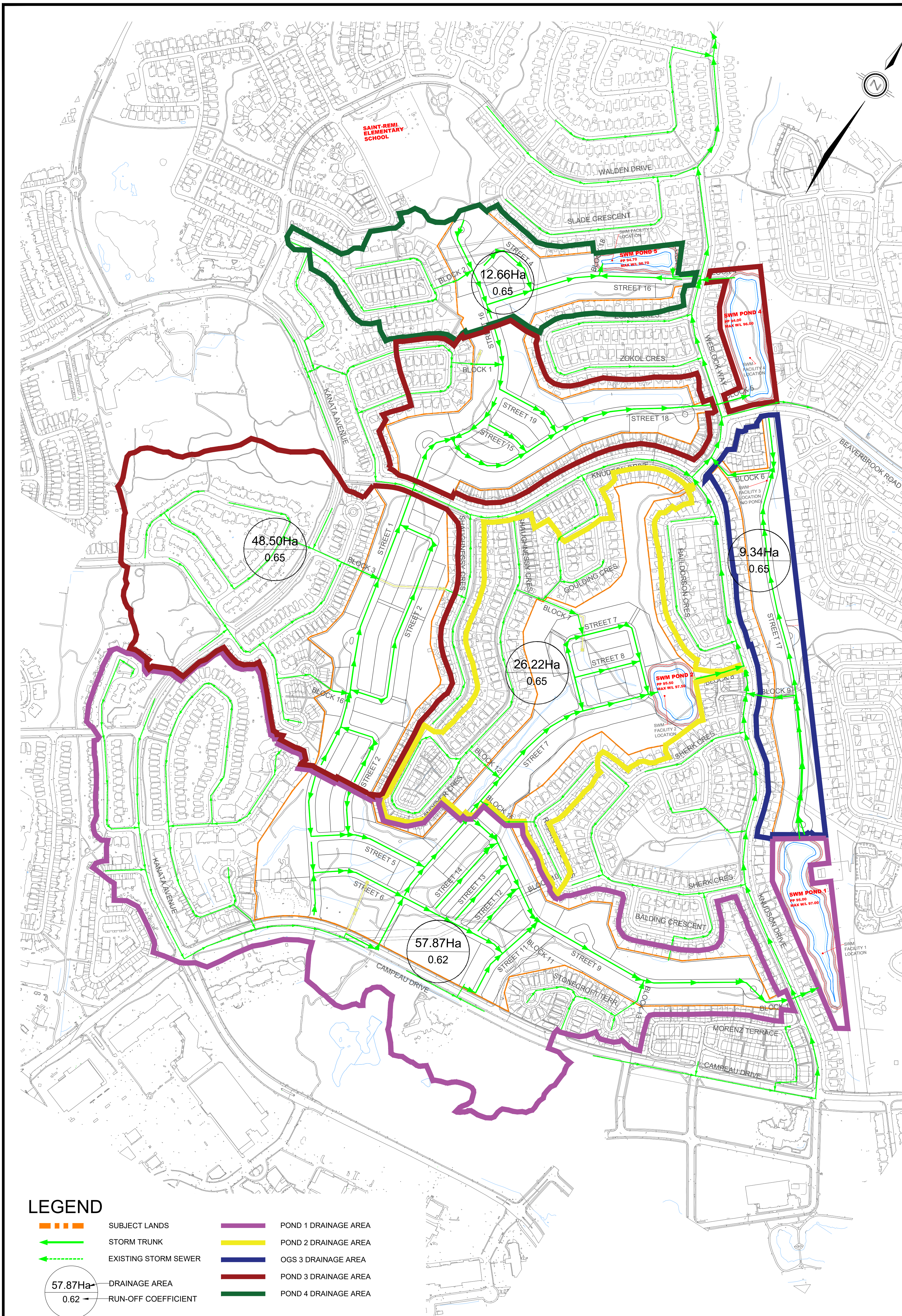


CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

DSEL
david schaeffer engineering ltd

120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

7000 CAMPEAU DRIVE

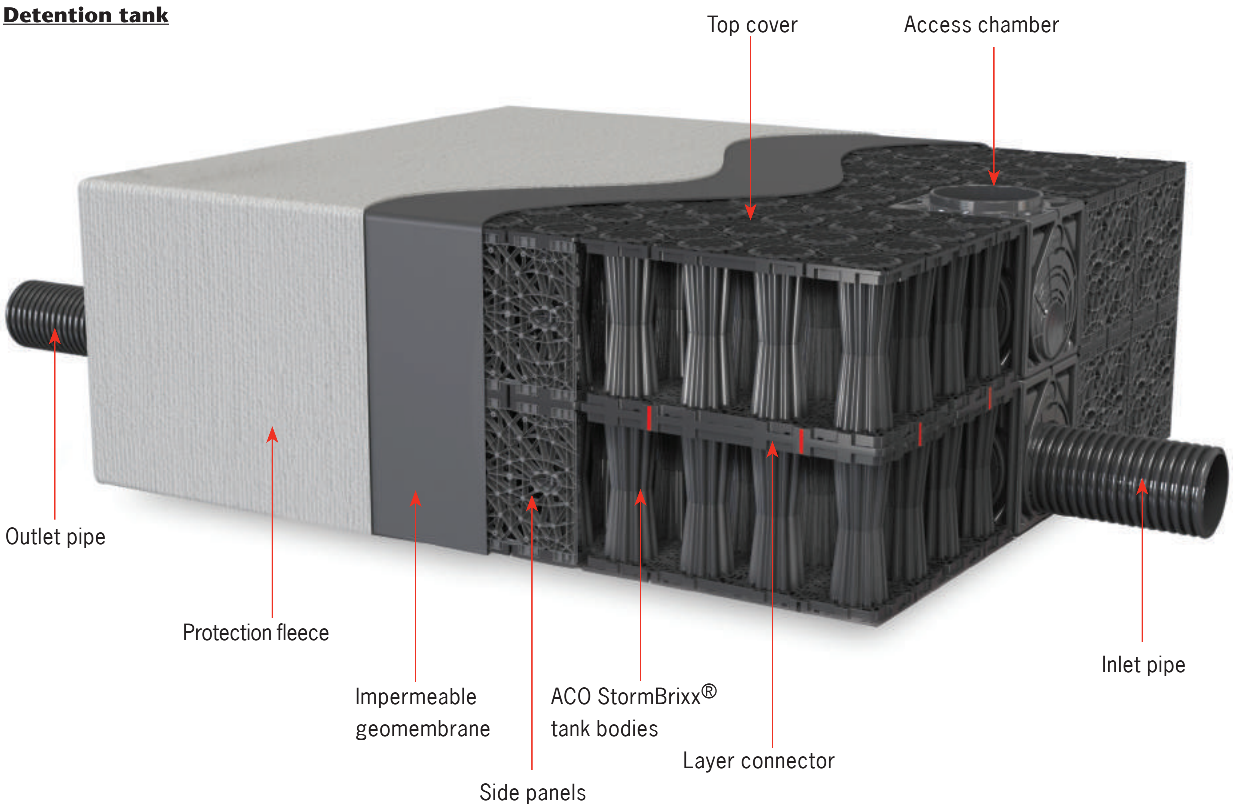
CITY OF OTTAWA

STORM DRAINAGE FIGURE

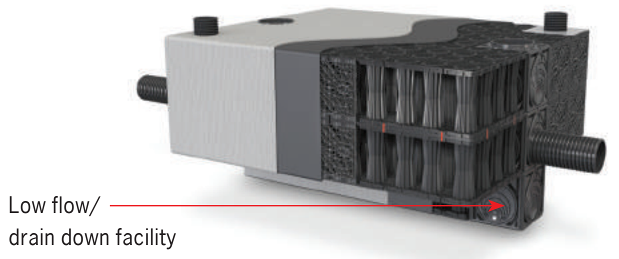
SCALE:	1:7000	PROJECT No.:	1061
DATE:	MAY 2020	FIGURE:	02F

ACO StormBrixx® - Detention (Attenuation), Retention and Infiltration systems

Detention tank



Sediment channel option



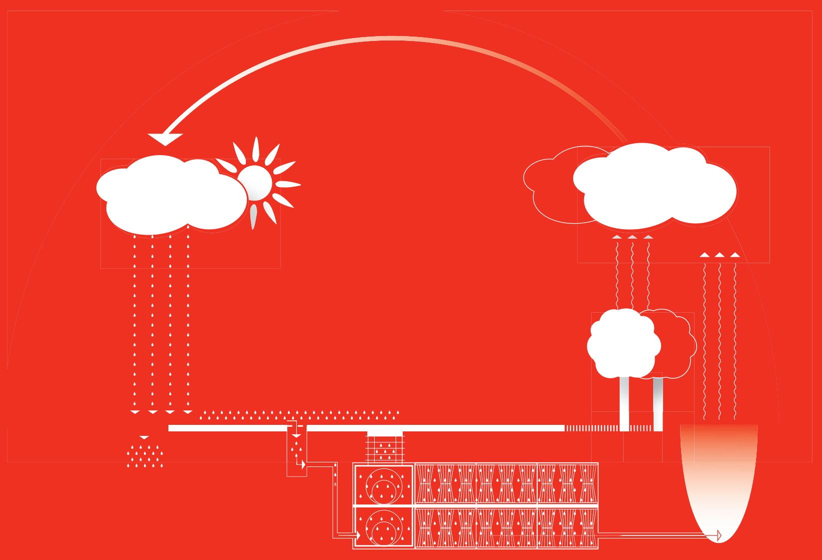
Definition of a detention (attenuation) system

Detention is the process of spreading the peak flow of a storm event over a longer period of time, releasing the water slowly, and mitigating the surge effect downstream.

Definition of a retention system

Retention is the subsequent process of storing the water for infiltration or reuse.

Sediment can be removed before water enters the StormBrixx® unit or a sediment tunnel and/or drain down facility can be incorporated into the tank design.



APPENDIX E

GRADING AND DRAWINGS

PERMISSIBLE GRADE RAISE

- UP TO 2.0m
- UP TO 2.5m
- NO GRADE RAISE RESTRICTIONS

LEGEND:

- BOREHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE WITH MONITORING WELL LOCATION, CURRENT INVESTIGATION
- PROBEHOLE LOCATION, CURRENT INVESTIGATION
- BOREHOLE LOCATION, PREVIOUS INVESTIGATION, PATERSON GROUP REPORT PG4135, JANUARY 2018
- BOREHOLE LOCATION BY OTHERS

105.20 GROUND SURFACE ELEVATION (m)

[104.29] BEDROCK SURFACE ELEVATION (m)

(104.40) PRACTICAL REFUSAL TO AUGERING ELEVATION (m)

{88.83} ELEVATION AT BOTTOM OF TEST HOLE, REFUSAL NOT ENCOUNTERED (m)

TEST HOLE LOCATIONS AND GROUND SURFACE ELEVATIONS (CURRENT INVESTIGATION) PROVIDED BY STANTEC GEOMATICS LIMITED.

SCALE: 1:2000

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
4	REVISED TO LATEST BASE PLAN	05/15/2019	DJG
3	REVISED TO LATEST BASE PLAN	03/17/2019	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN - ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	SD

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Stamp:

Scale:	1:2000
Drawn by:	MPG
Checked by:	RG
Approved by:	DJG
Date:	03/2019
Report No.:	PG4135
Drawing No.:	PG4135-3
Revision No.:	4

patersongroup
consulting engineers

154 Colonnade Road South
Ottawa, Ontario K2E 7J5
Tel: (613) 226-7381 Fax: (613) 226-6344

NO.	REVISIONS	DATE	INITIAL
4	REVISED TO LATEST BASE PLAN	05/15/2019	DJG
3	REVISED TO LATEST BASE PLAN - NEW BOREHOLES ADDED	03/17/2019	RG
2	REVISED TO LATEST BASE PLAN	07/26/2019	SD
1	REVISED TO LATEST BASE PLAN - ADDED BOREHOLES AND PROBEHOLES DURING MARCH 2019	04/04/2019	SD

MINTO COMMUNITIES INC.

GEOTECHNICAL INVESTIGATION
KANATA GOLF AND COUNTRY CLUB
OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Stamp:

Scale: 1:2000	Report No.: PG4135
Drawn by: MPG	Drawing No.: PG4135-4
Checked by: RG	
Approved by: DJG	
Date: 03/2019	Revision No.: 4

Where a building is founded partly on bedrock and partly on soil, it is recommended to decrease the soil bearing resistance value by 25% for the footings placed on soil bearing media to reduce the potential long term total and differential settlements. Also, at the soil/bedrock and bedrock/soil transitions, it is recommended that the upper 0.5 m of the bedrock be removed for a minimum length of 2 m (on the bedrock side) and replaced with nominally compacted OPSS Granular A or Granular B Type II material. The width of the subexcavation should be at least the proposed footing width plus 0.5 m. Steel reinforcement, extending at least 3 m on both sides of the 2 m long transition, should be placed in the top part of the footings and foundation walls.

Bearing resistance values for footing design should be determined on a per lot basis at the time of construction.

Lateral Support

The bearing medium under footing-supported structures is required to be provided with adequate lateral support with respect to excavations and different foundation levels. Adequate lateral support is provided to a sound bedrock bearing medium when a plane extending horizontally and vertically from the footing perimeter at a minimum of 1H:6V (or shallower) passing through sound bedrock or a material of the same or higher capacity as the bedrock, such as concrete.

Adequate lateral support is provided to a firm to stiff silty clay, compact glacial till or engineered fill above the groundwater table when a plane extending horizontally and vertically from the underside of the footing at a minimum of 1.5H:1V passing through in situ soil of the same or higher bearing capacity as the bearing medium soil.

Settlement and Permissible Grade Raise

Consideration must be given to potential settlements which could occur due to the presence of the silty clay deposit and the combined loads from the proposed footings, any groundwater lowering effects, and grade raise fill. The foundation loads to be considered for the settlement case are the continuously applied loads which consist of the unfactored dead loads and the portion of the unfactored live load that is considered to be continuously applied. For dwellings, a minimum value of 50% of the live load is recommended by Paterson.

The potential post construction total and differential settlements are dependent on the position of the long term groundwater level when buildings are situated over deposits of compressible silty clay. Efforts can be made to reduce the impacts of the proposed development on the long term groundwater level by placing clay dykes in the service trenches, reducing the sizes of paved areas, leaving green spaces to allow for groundwater recharge or limiting planting of trees to areas away from the buildings. However, it is not economically possible to control the groundwater level.

To reduce potential long term liabilities, consideration should be given to accounting for a larger groundwater lowering and to provide means to reduce long term groundwater lowering (e.g. clay dykes, restriction on planting around the dwellings, etc). Buildings on silty clay deposits increases the likelihood of movements and therefore of cracking. The use of steel reinforcement in foundations placed at key structural locations will tend to reduce foundation cracking compared to unreinforced foundations.

Based on the undrained shear strength values, our experience with Ottawa clays and consolidation testing results, permissible grade raise areas have been defined for the proposed development. The recommended permissible grade raise areas are presented in Drawings PG4135-3 and 4 - Permissible Grade Raise Plan in Appendix 2.

Where proposed grade raises exceed our permissible grade raise recommendations, several options could be considered for the foundation support of the proposed buildings:

Scenario A

Where the grade raise is close to, but below, the maximum permissible grade raise, consideration should be given to using more reinforcement in the design of the foundation (footings and walls) to reduce the risks of cracking in the concrete foundation. The use of control joints within the brick work between the garage and basement area should also be considered.

Scenario B

Where the grade raise cannot be accommodated with soil fill, the following options could be used alone or in combination.

Option 1 - Use of Lightweight Fill

Lightweight fill (LWF) can be used, consisting of EPS (expanded polystyrene) Type 19 or 22 blocks or other light weight materials which allow for raising the grade without adding a significant load to the underlying soils. However, these materials are expensive and, in the case of the EPS, are more difficult to use under the groundwater level, as they are buoyant, and must be protected against potential hydrocarbon spills. Use lightweight fill within the interior of the garage and porch areas to reduce the fill-related loads.

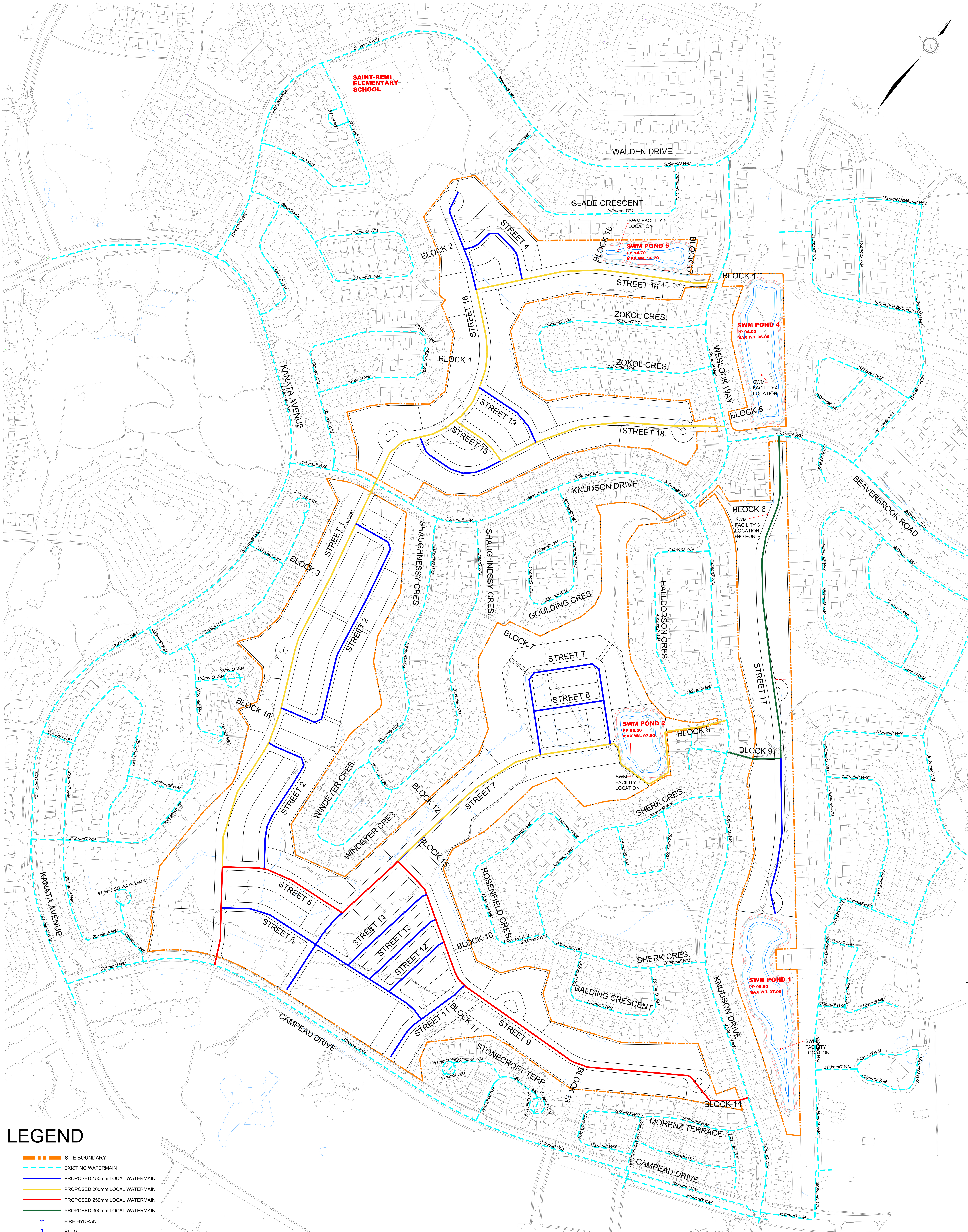
Option 2 - Preloading or Surcharging

It is possible to preload or surcharge the proposed site in localized areas provided sufficient time is available to achieve the desired settlements based on theoretical values from the settlement analysis. If this option is considered, a monitoring program using settlement plates will have to be implemented. This program will determine the amount of settlement in the preloaded or surcharged areas. Obviously, preloading to proposed finished grades will allow for consolidation of the underlying clays over a longer time period. Surcharging the site with additional fill above the proposed finished grade will add additional load to the underlying clays accelerating the consolidation process and allowing for accelerated settlements. Once the desired settlements are achieved, the site can be unloaded and the fill can be used elsewhere on site.

Once the required grade raises are established, the above options could be further discussed along with further recommendations on specific requirements.

5.4 Design for Earthquakes

It should be noted that where foundations are placed over glacial till, engineered fill over bedrock or directly over bedrock, Part 9 of the current OBC 2012 standard should be used for design purposes. Also, where foundations are placed over a silty clay, Part 4 of the current OBC 2012 standard should be used for design purposes. The area requiring permissible grade raise restrictions outlined in Drawings PG4135-3 and 4 - Permissible Grade Raise Plan in Appendix 2 should be used to delineate the houses where silty clay is anticipated below footing level.



CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

DSEL
david schaeffer engineering ltd

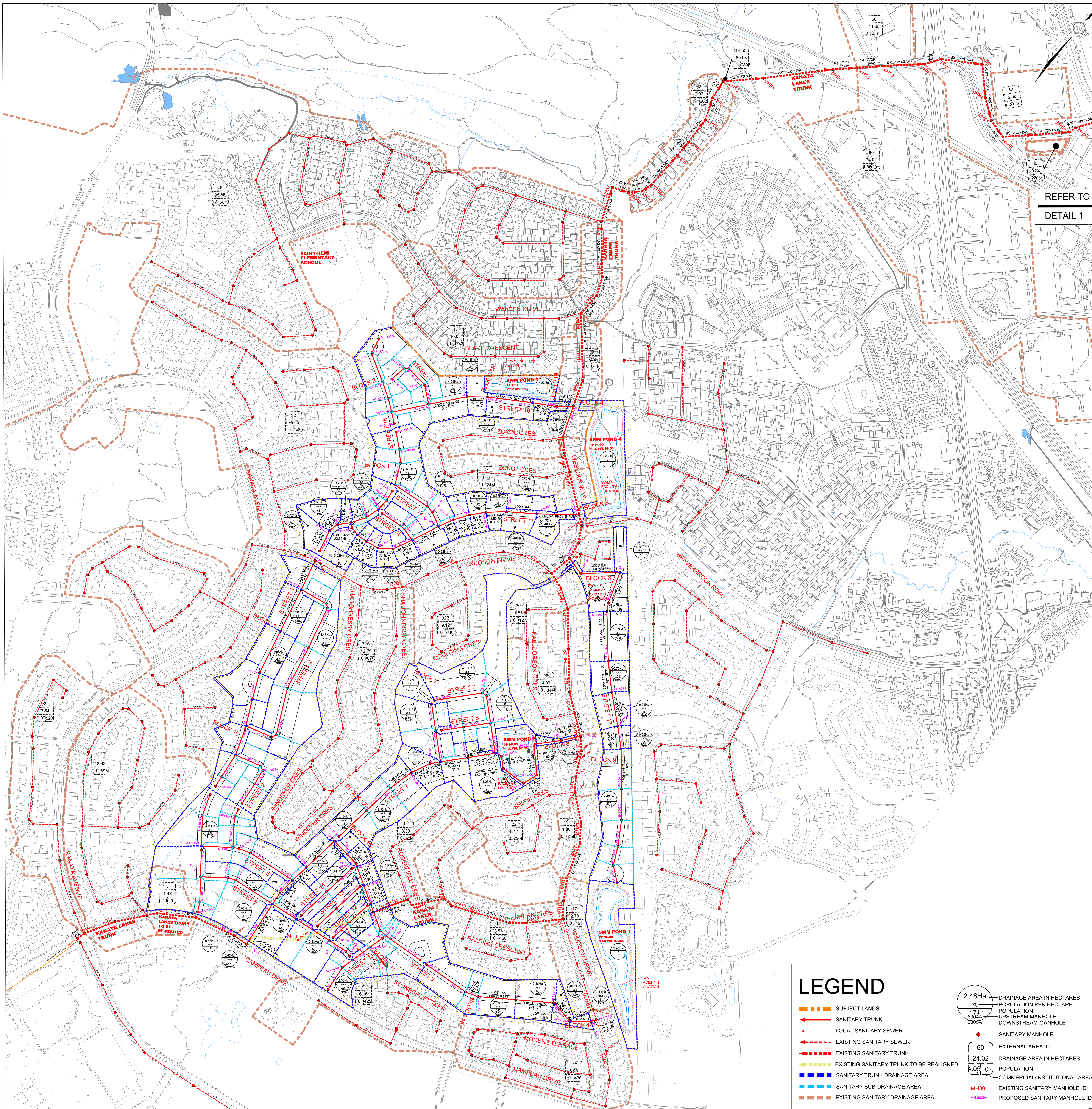
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

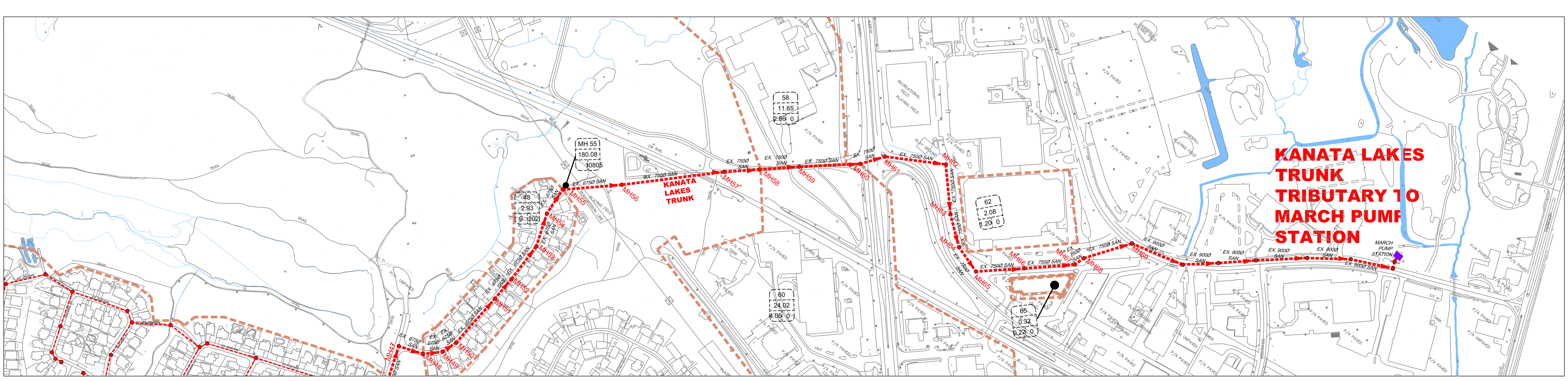
7000 CAMPEAU DRIVE

CITY OF OTTAWA

WATERMAIN SERVICING PLAN

SCALE:	1:2000	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING No.:	01D





DETAIL 1

CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

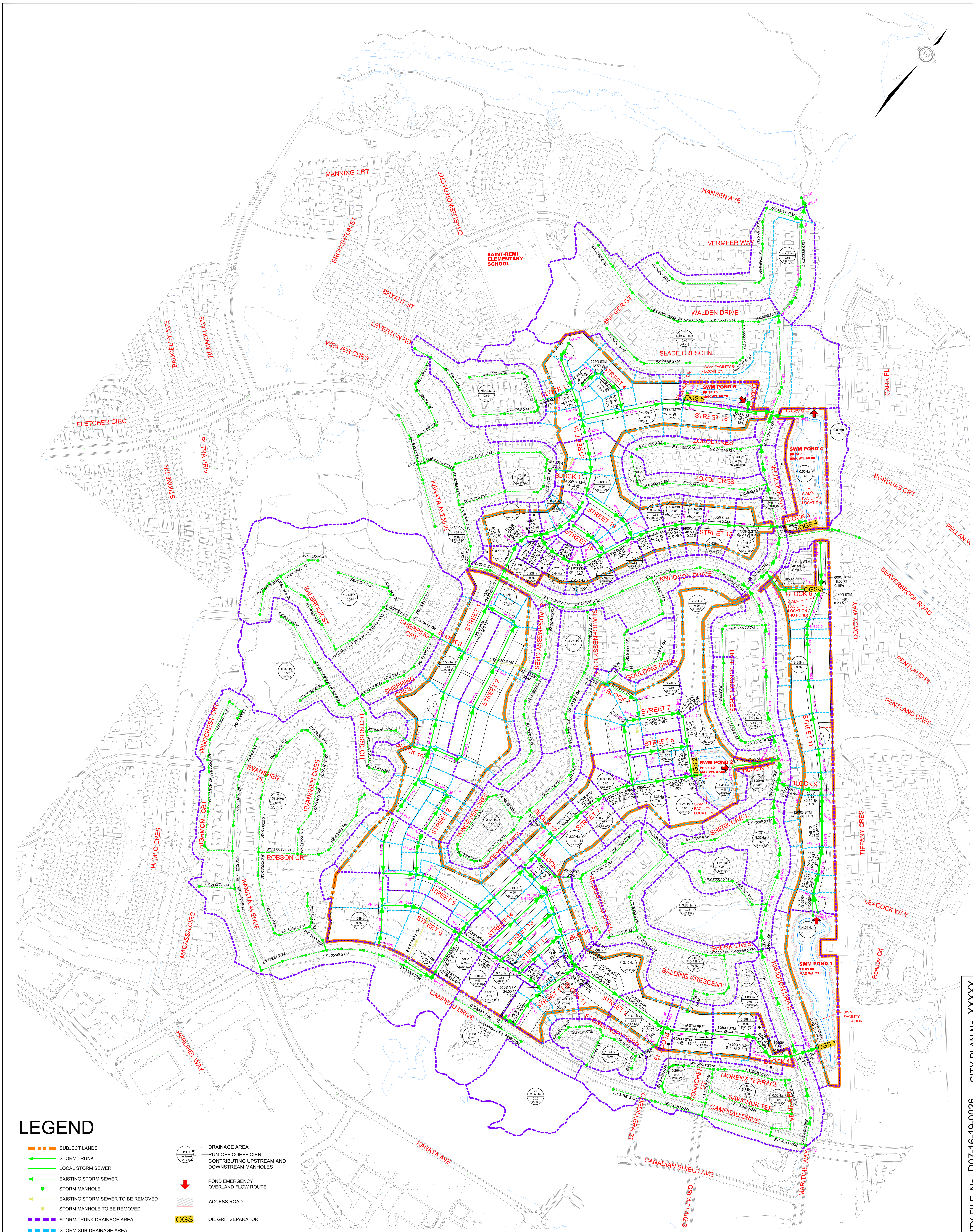
DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

SANITARY SERVICING AND DRAINAGE PLAN

SCALE:	1:3000	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING No.:	02D



CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

DSEL
david schaeffer engineering ltd

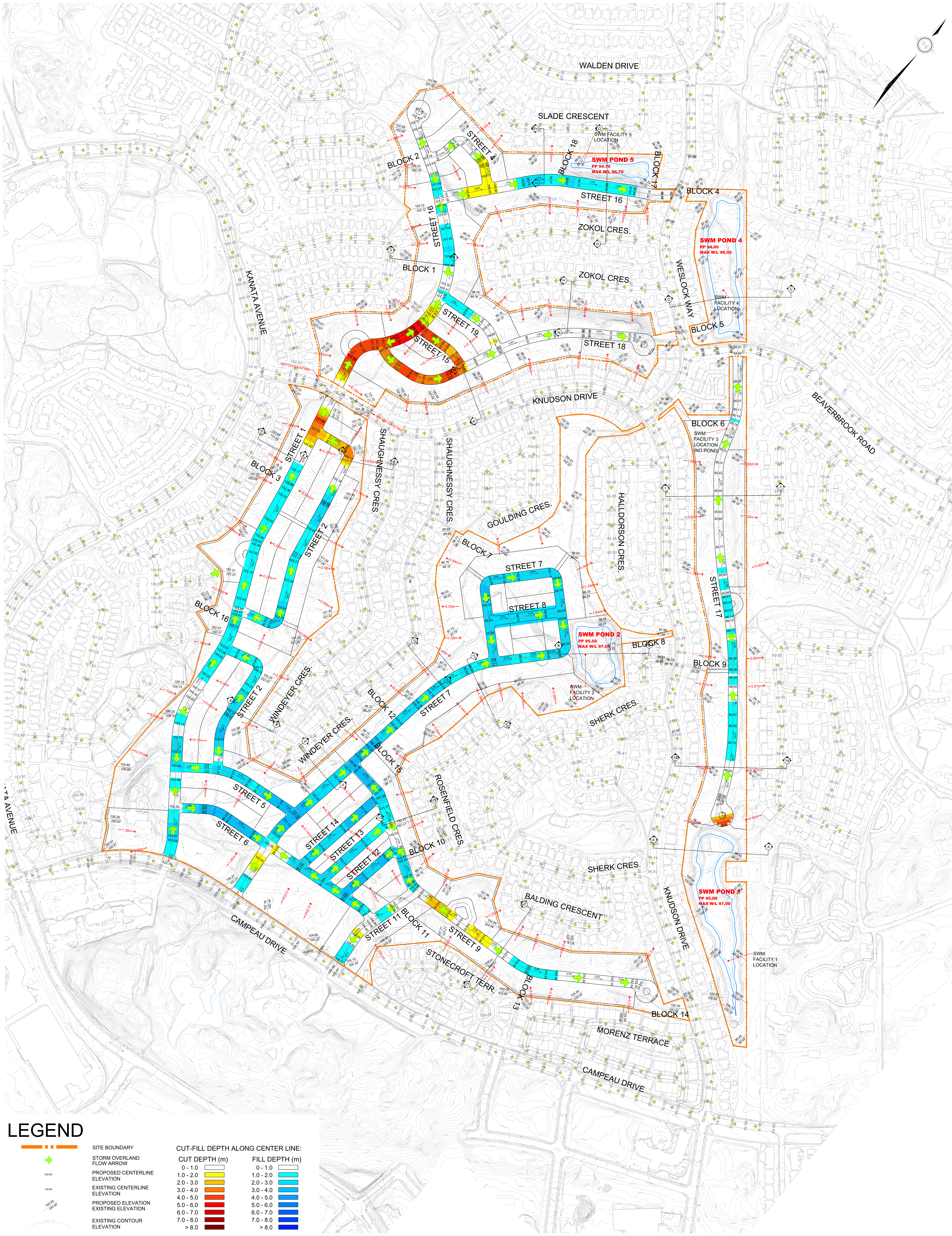
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

STORM SERVICING AND DRAINAGE PLAN

SCALE:	1:2500	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING No.:	03D



CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

7000 CAMPEAU DRIVE

CITY OF OTTAWA

PRELIMINARY GRADING PLAN

SCALE:	1:2000	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING No.:	04D

CITY FILE No. D07-16-19-0026 CITY PLAN No. XXXXX

DSEL
david schaeffer engineering ltd
120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
www.DSEL.ca

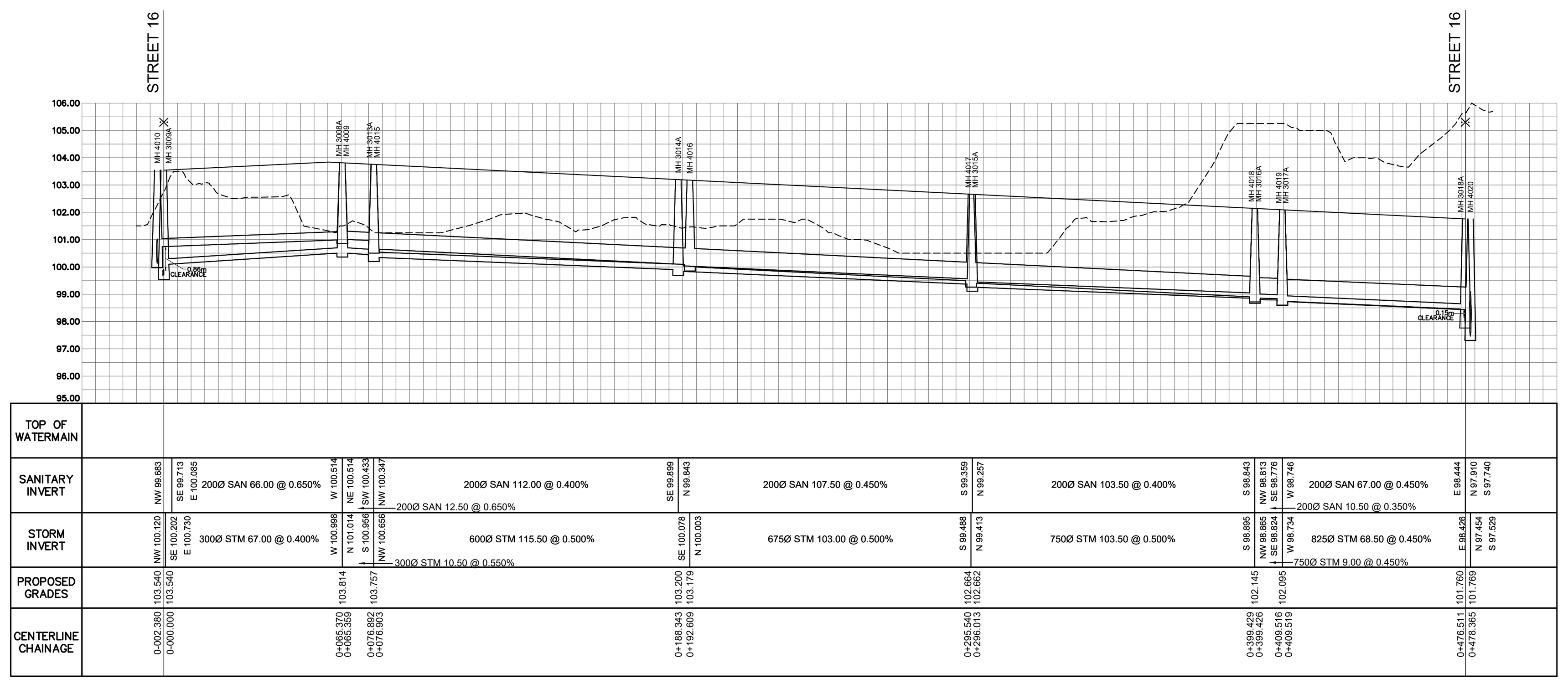
7000 CAMPEAU DRIVE

CITY OF OTTAWA

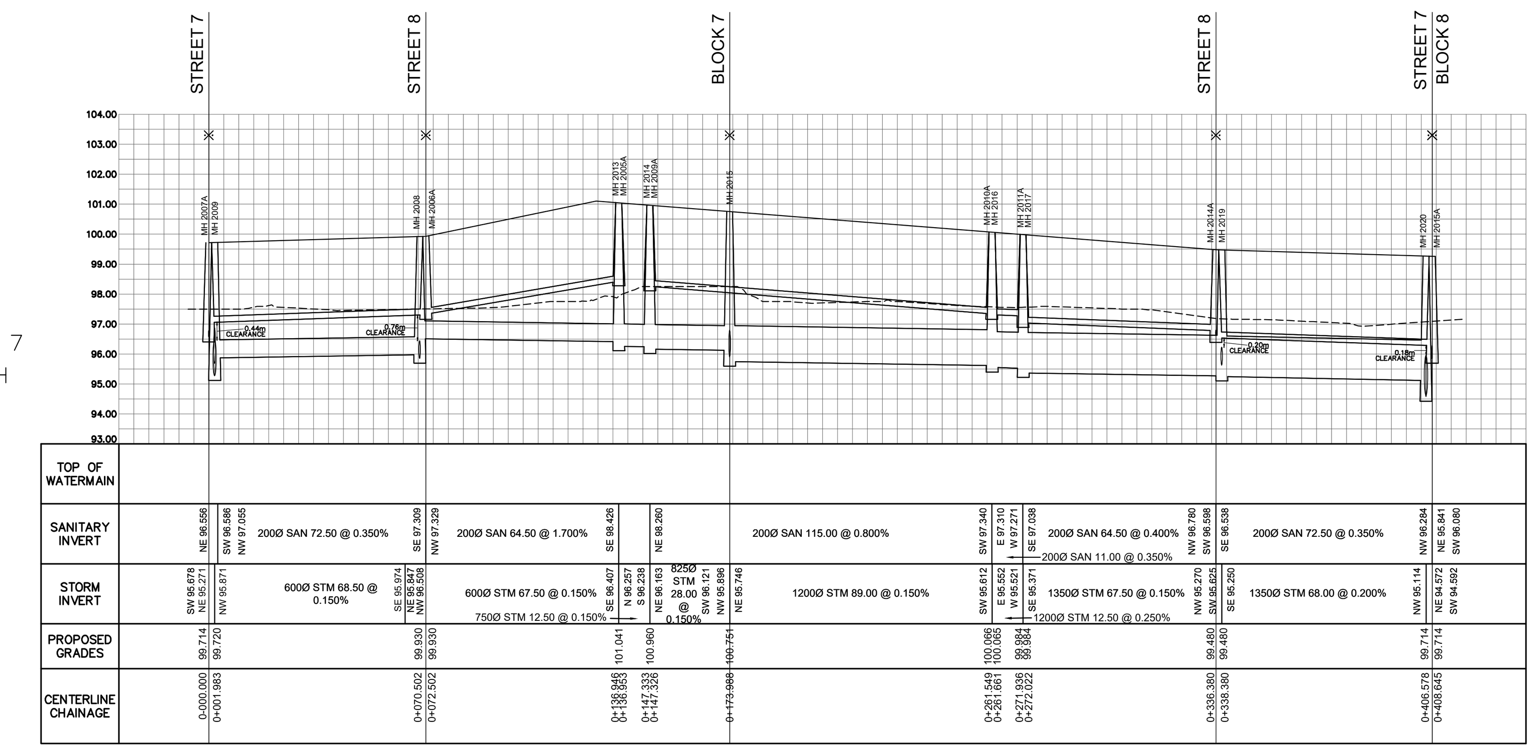
PROFILES

SCALE:	1:2000	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING:	05D

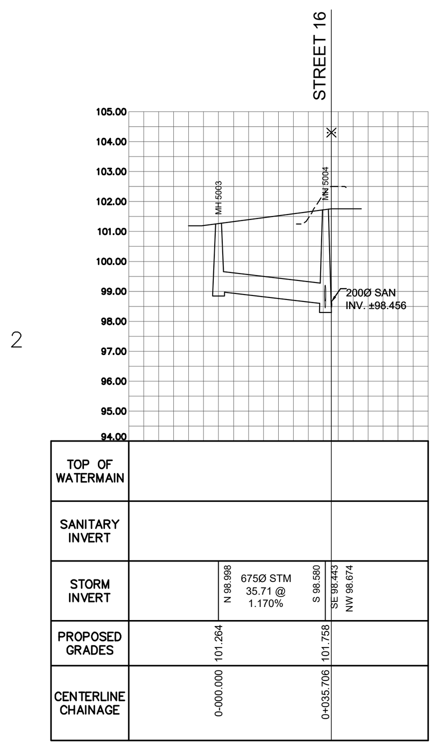
STREET 2



STREET 7 NORTH



BLOCK 2



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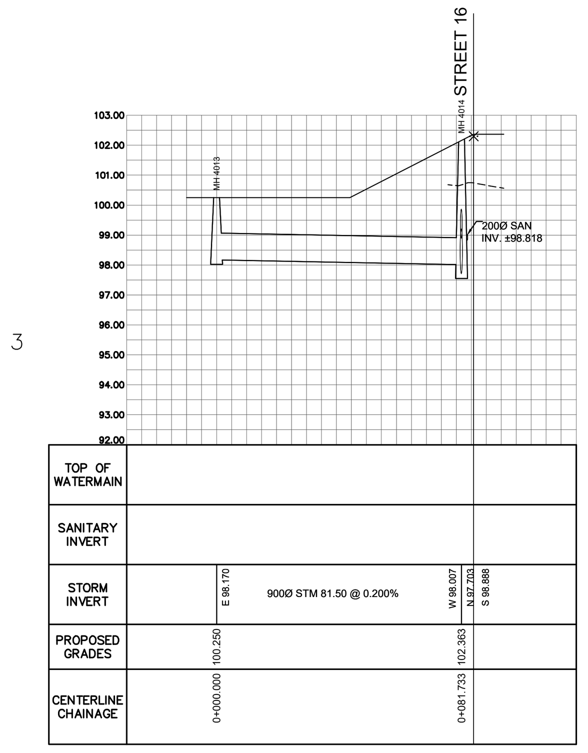
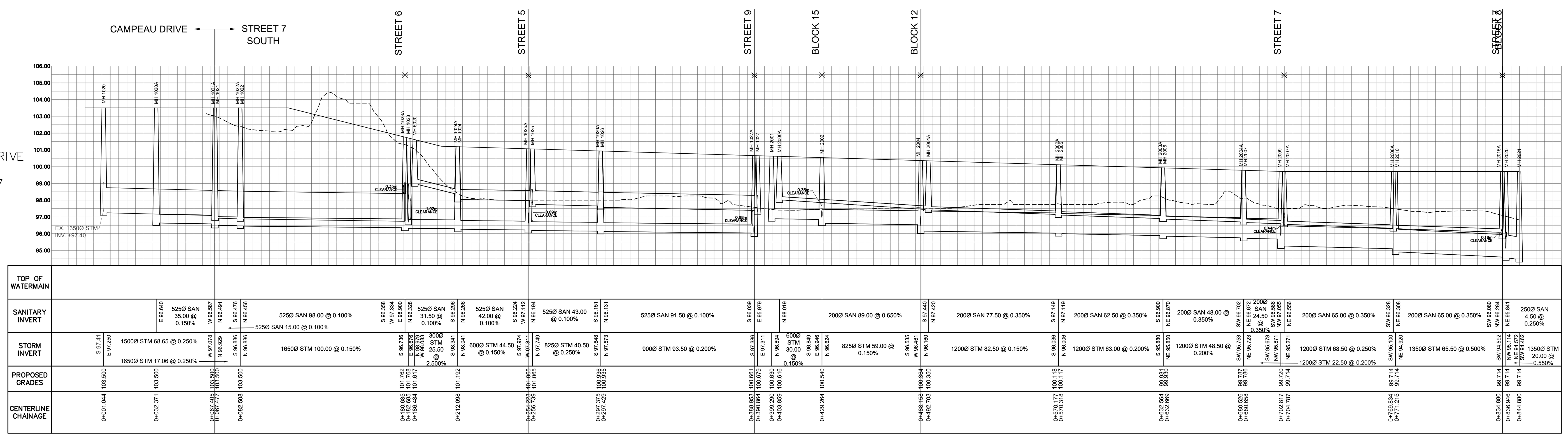


CAMPEAU DRIVE & STREET 7 SOUTH



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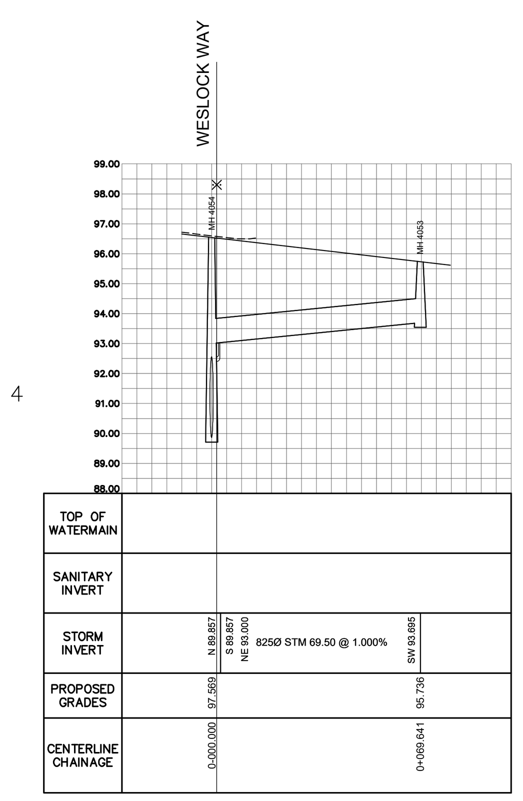

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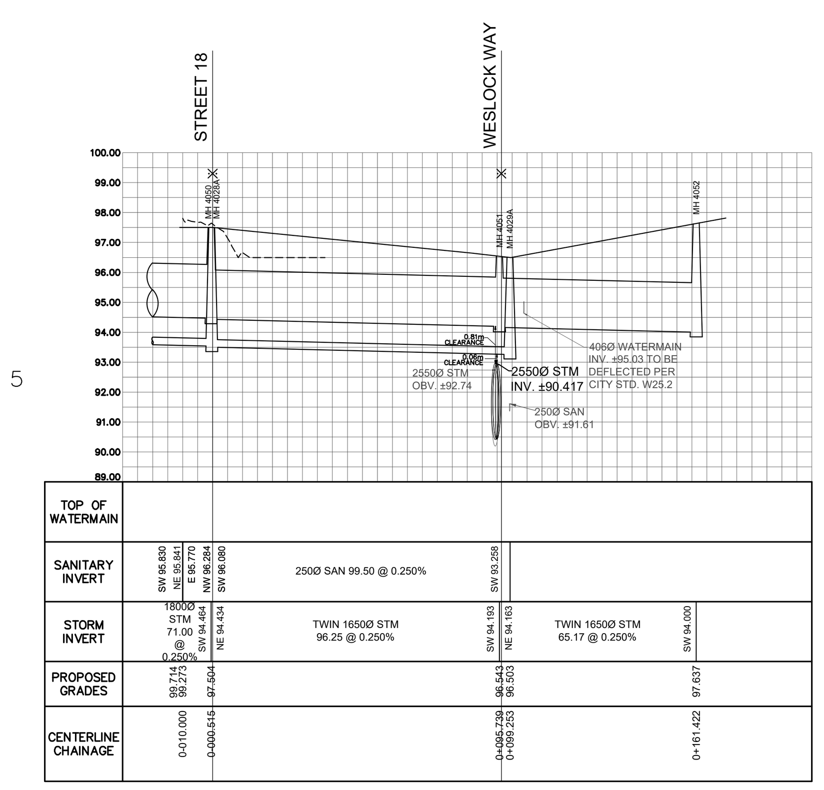

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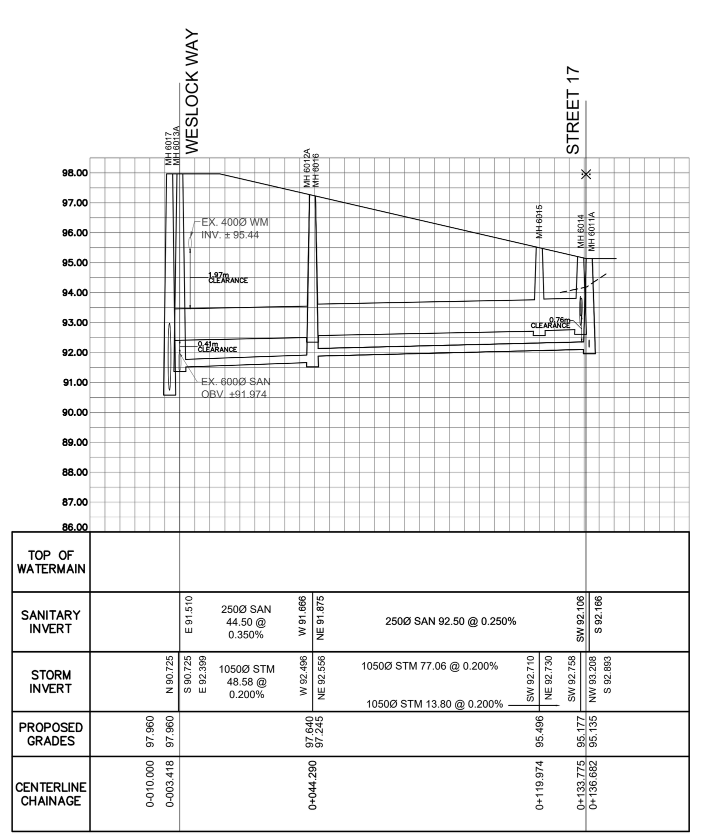

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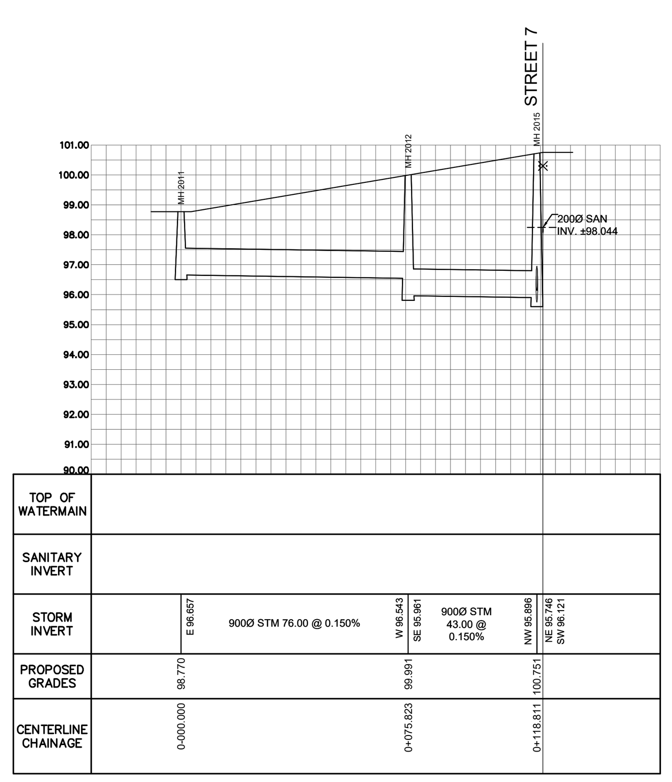

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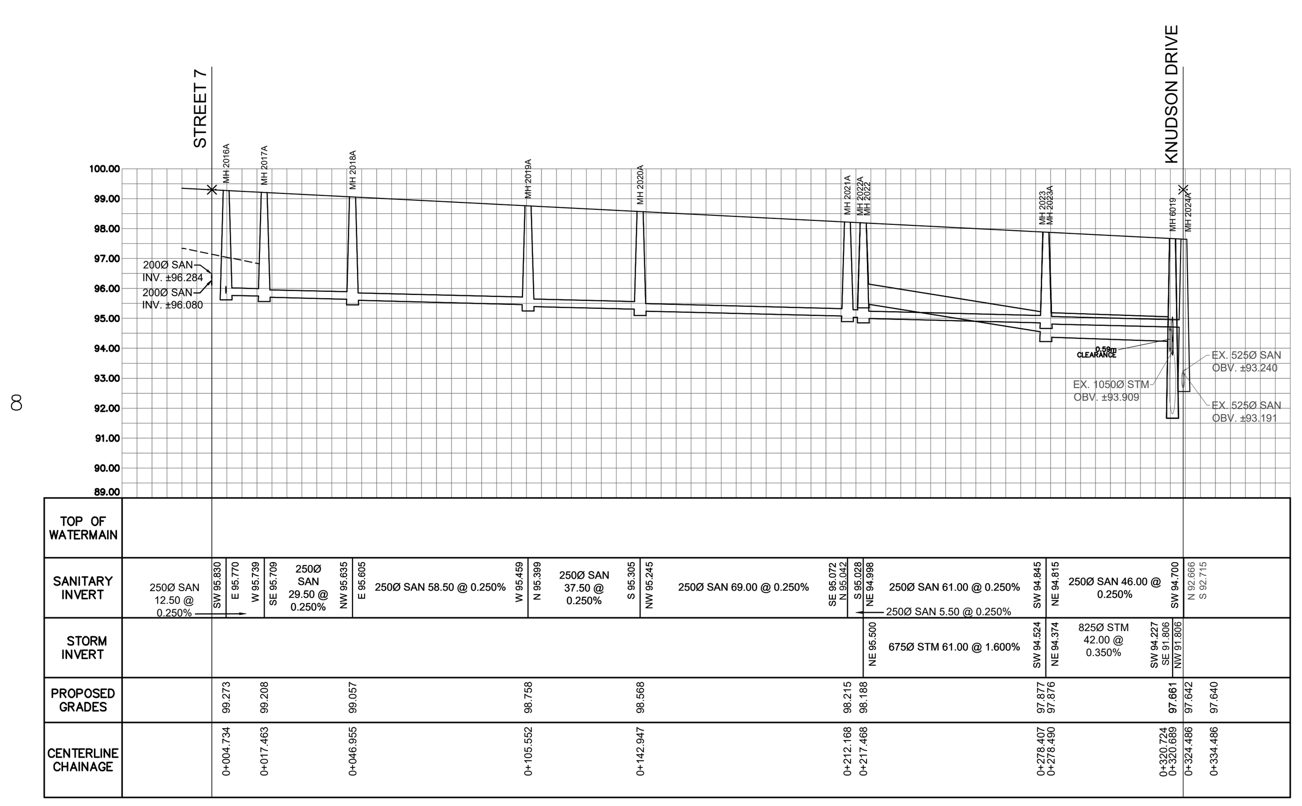

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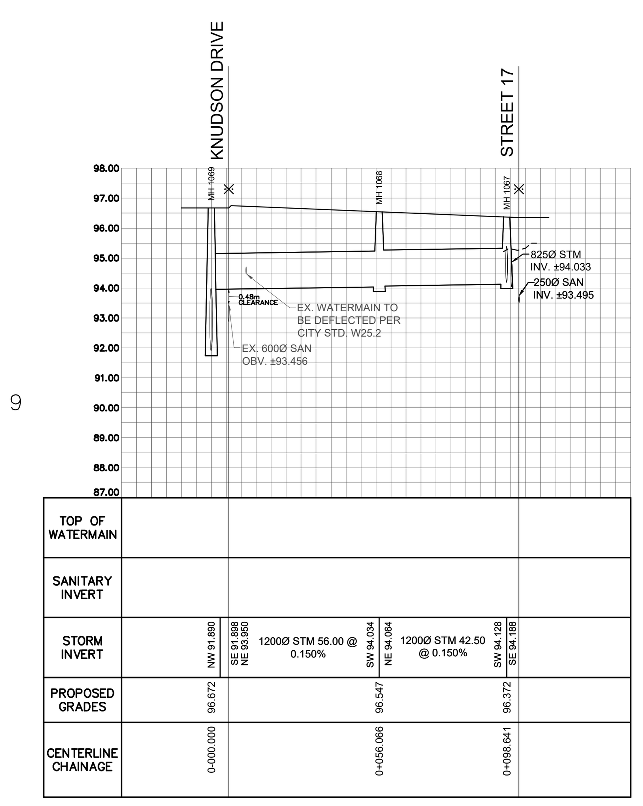

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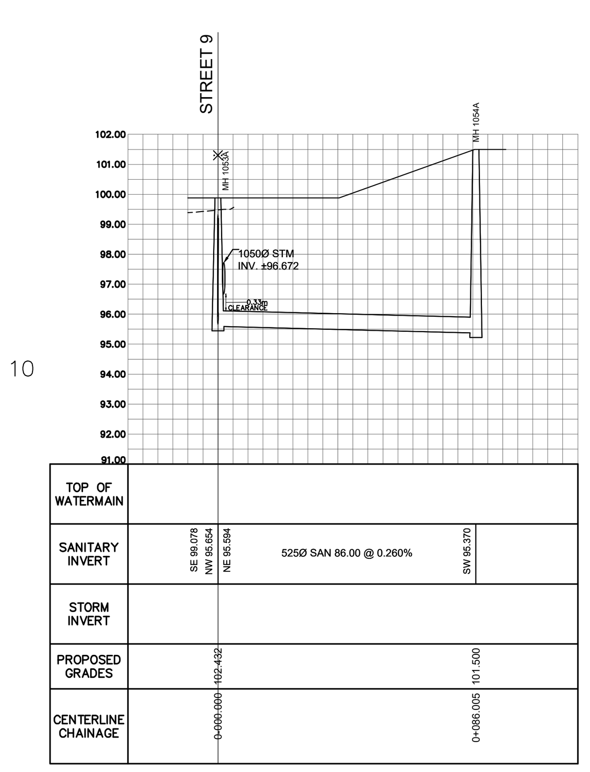

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120 Iber Road, Unit 103
Stittsville, Ontario, K2S 1E9
Tel. (613) 836-0856
Fax. (613) 836-7183
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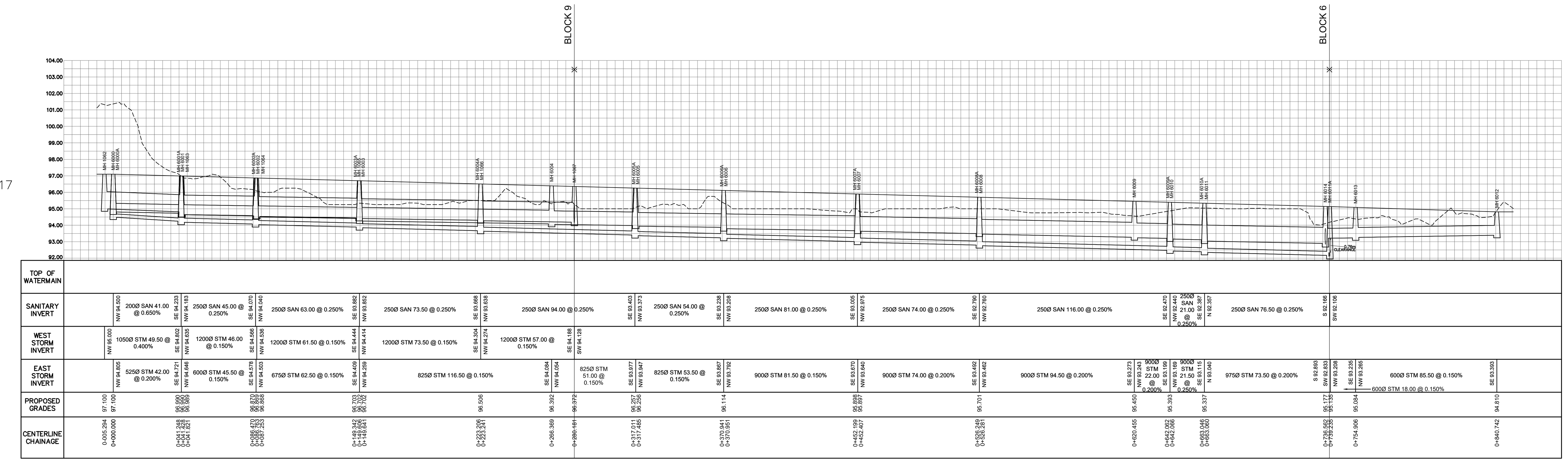
SCALE:	1:2000	PROJECT No.:	1061
DATE:	MAY 2020	DRAWING:	07D

STREET 17



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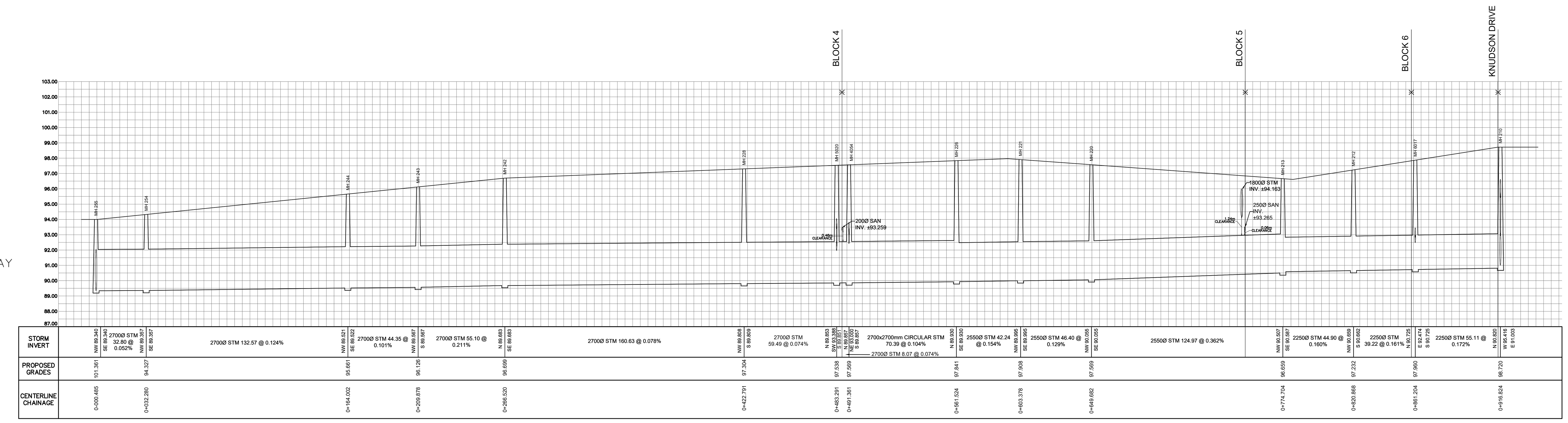

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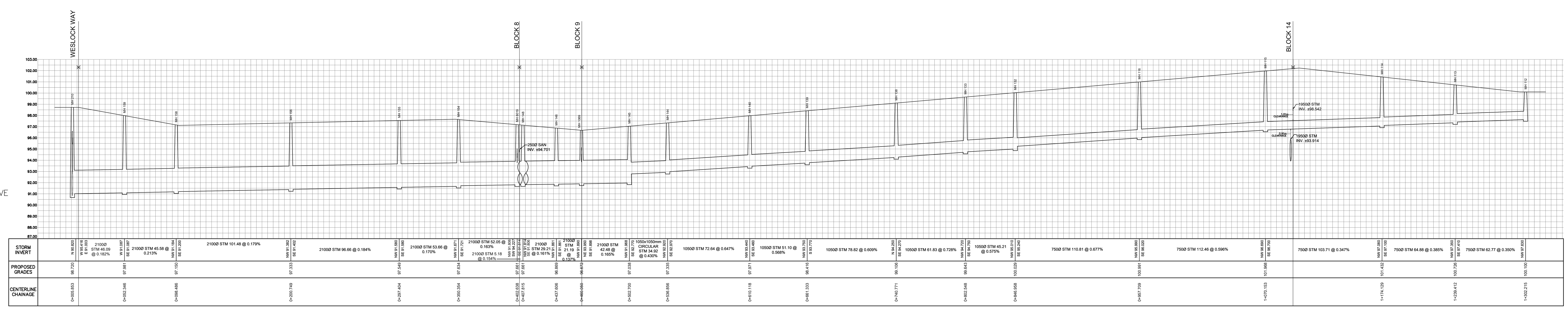

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SCALE:	1:2000	PROJECT No.:	1061
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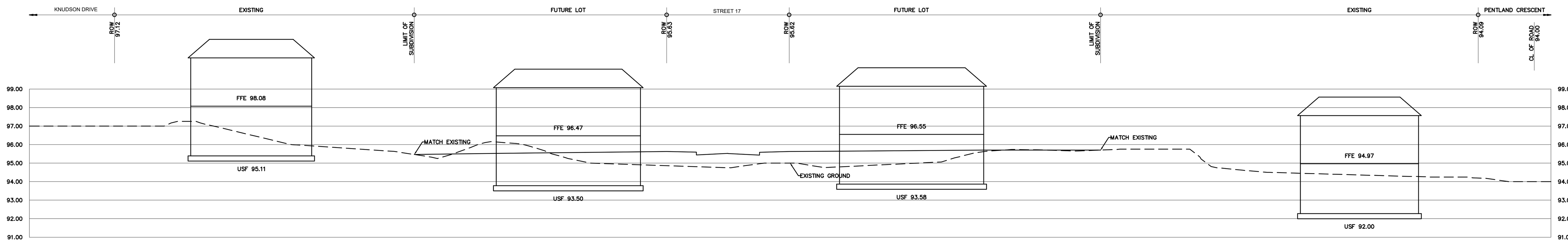

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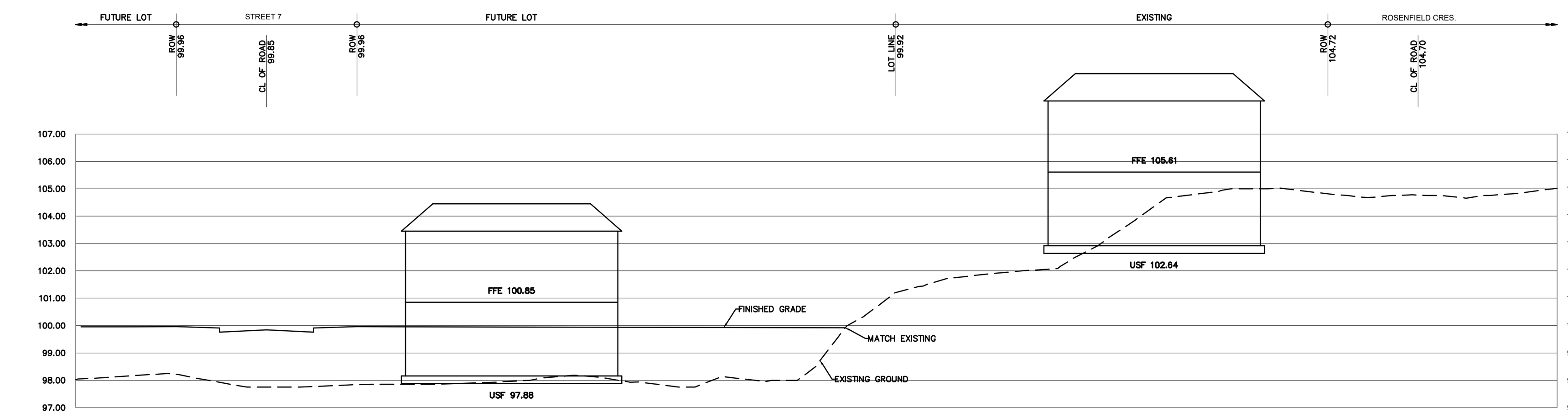
SCALE HOR. 1:250
VER. 1:100



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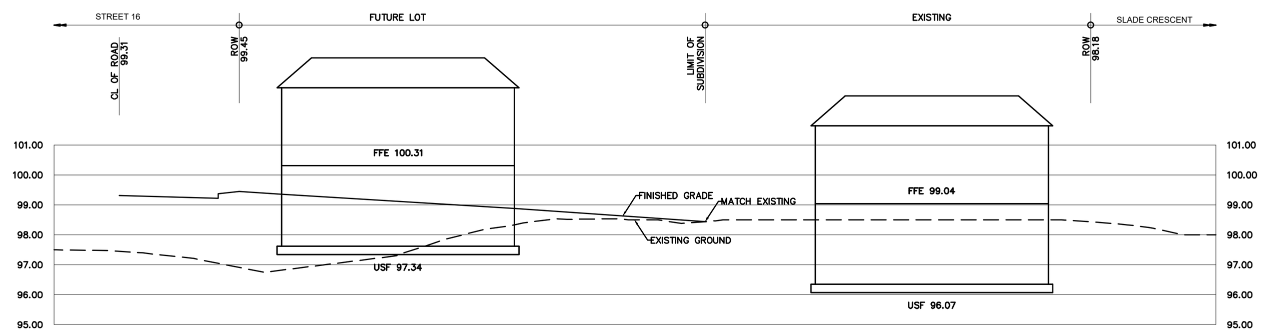

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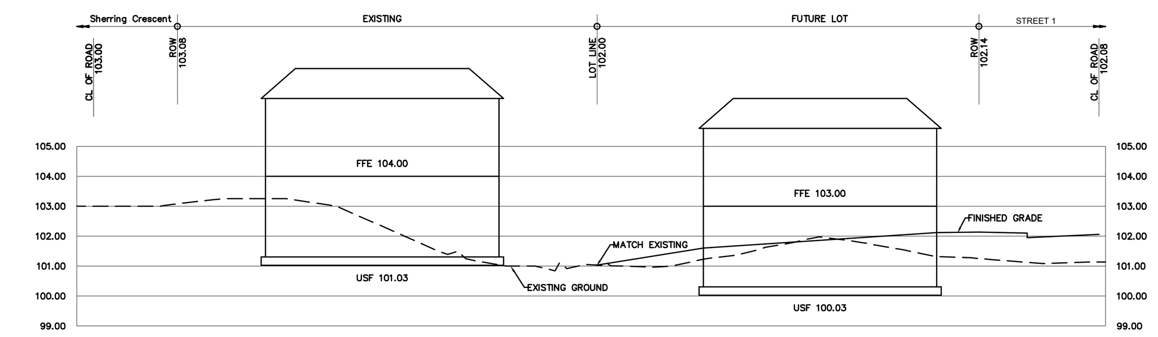

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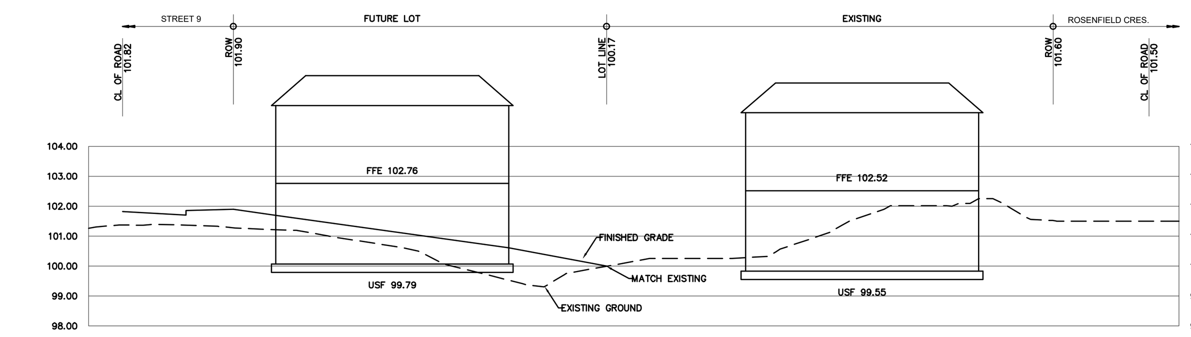

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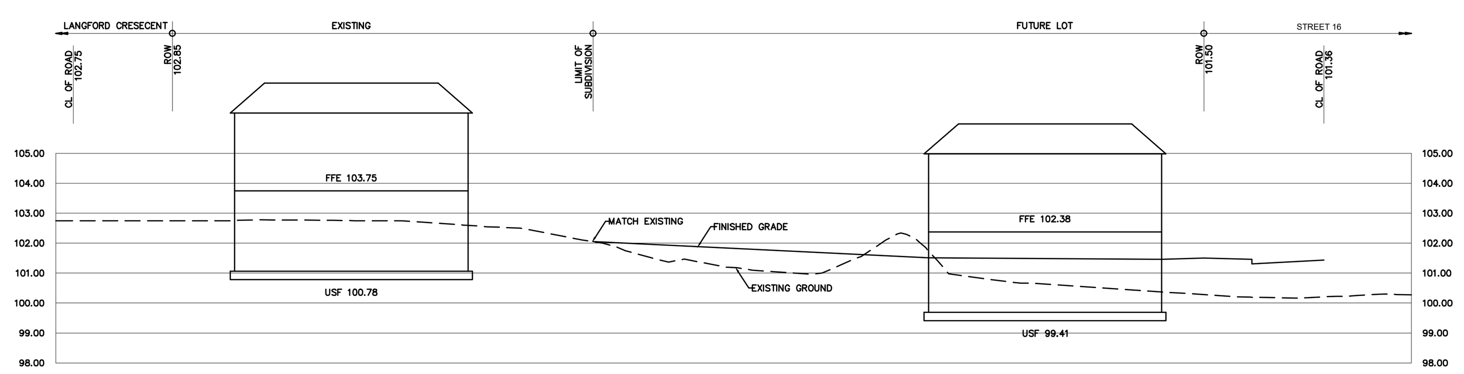

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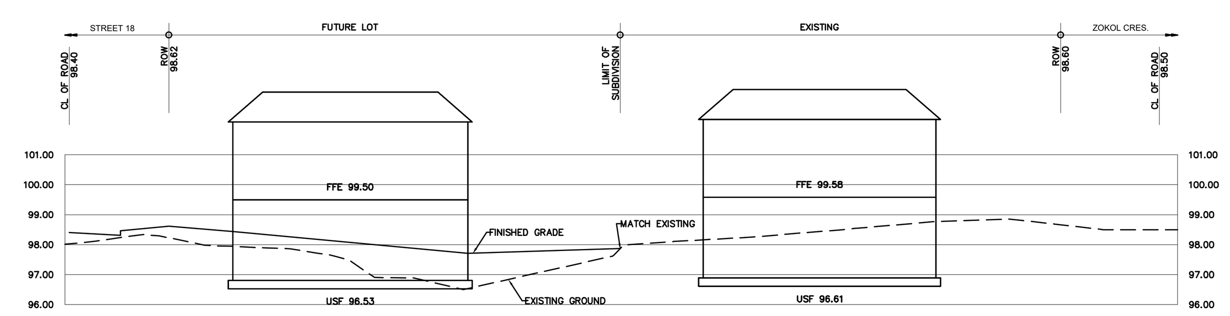
VER. 1:100



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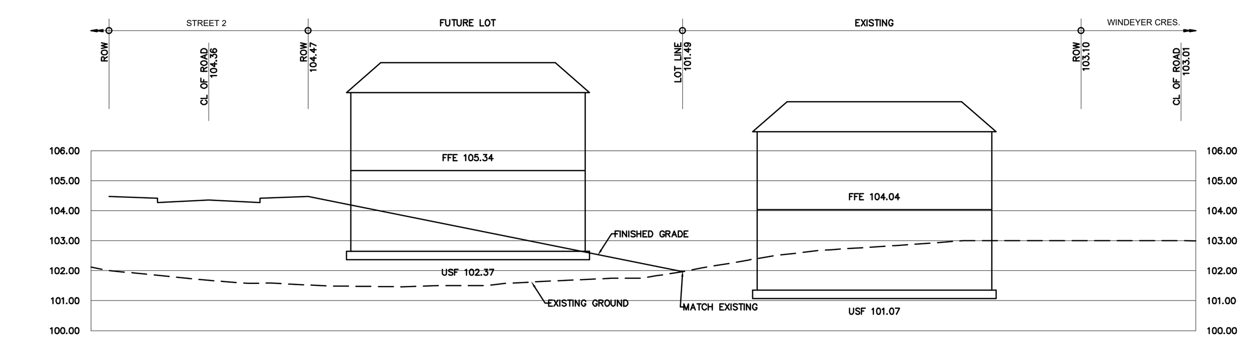

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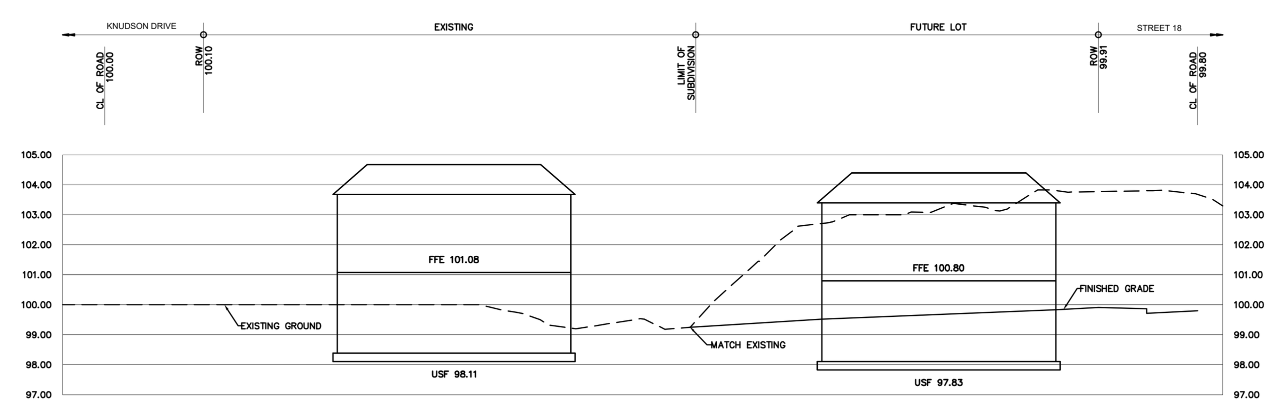

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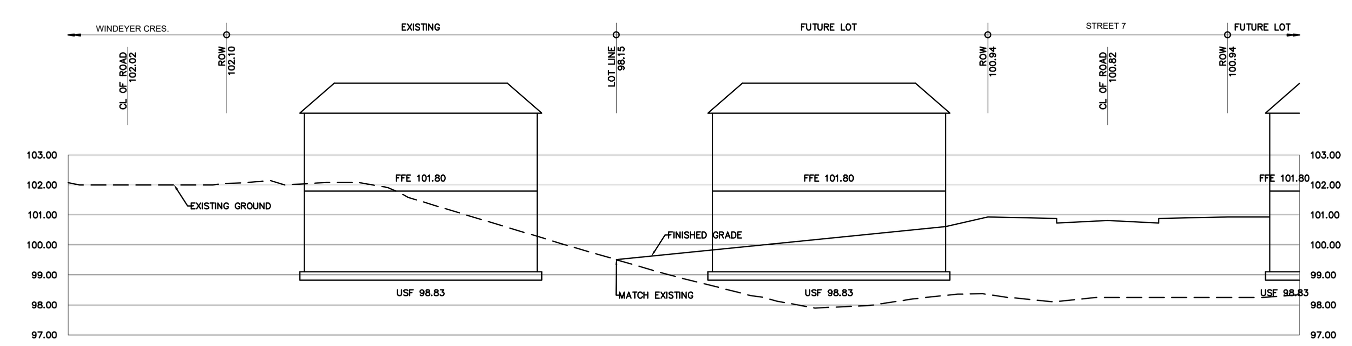

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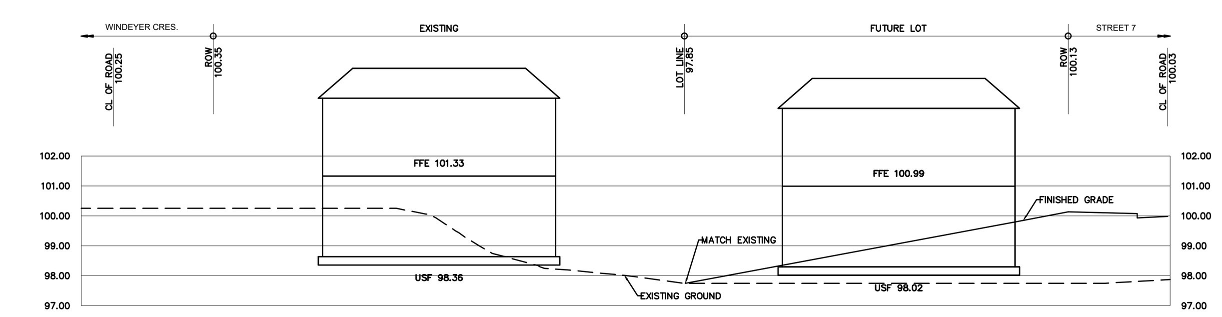

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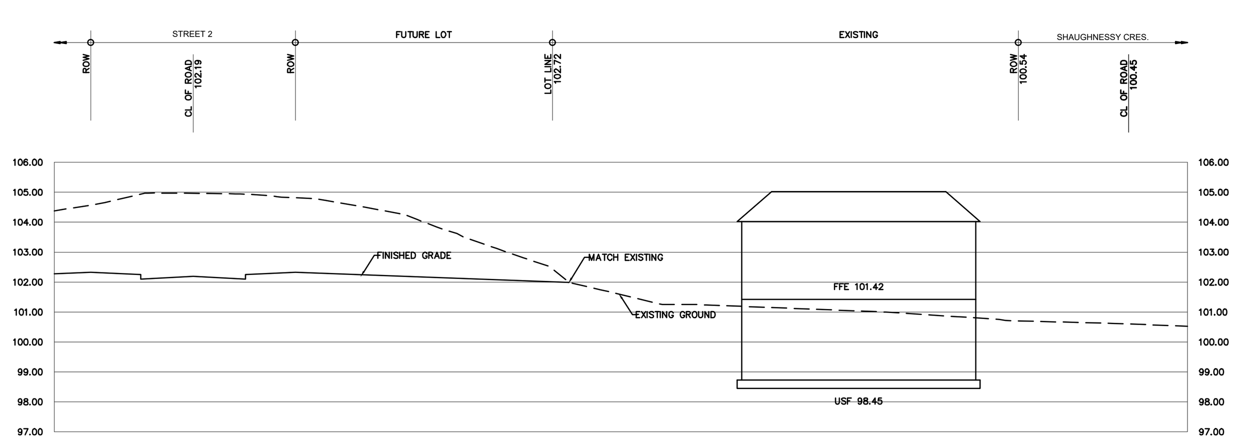

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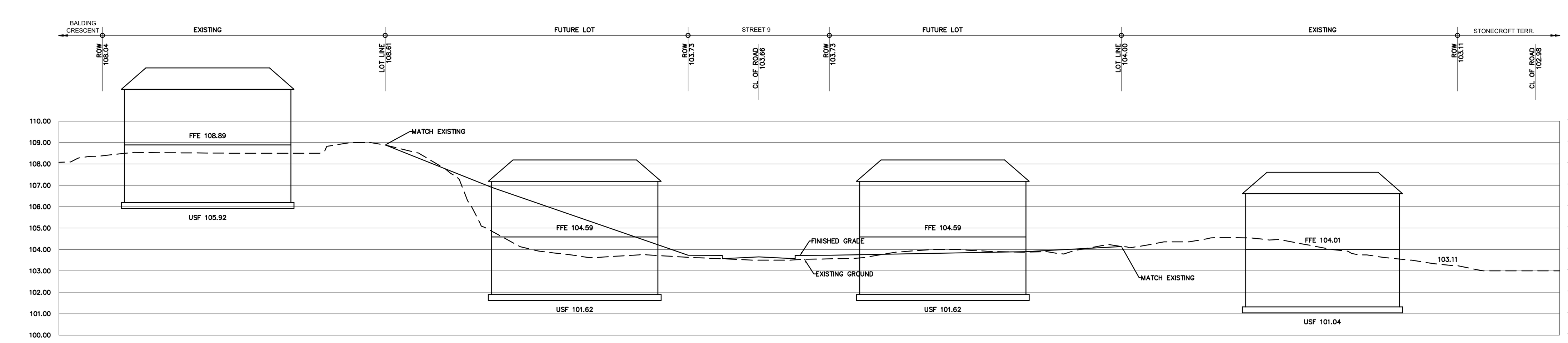

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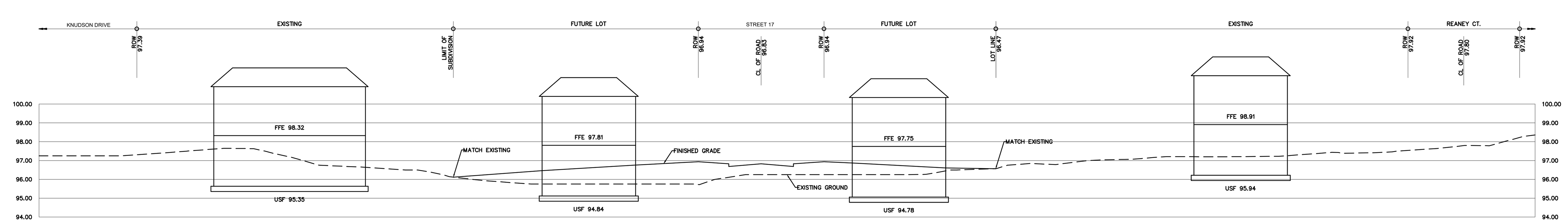

SECTION 14–14
SCALE HOR. 1:250
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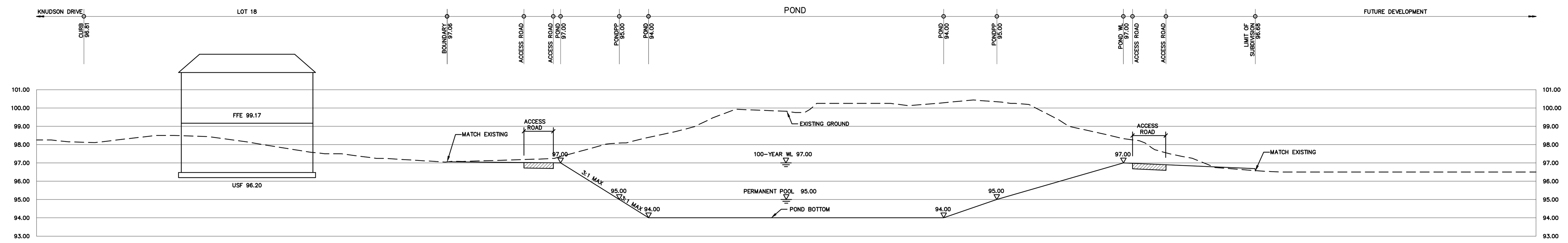

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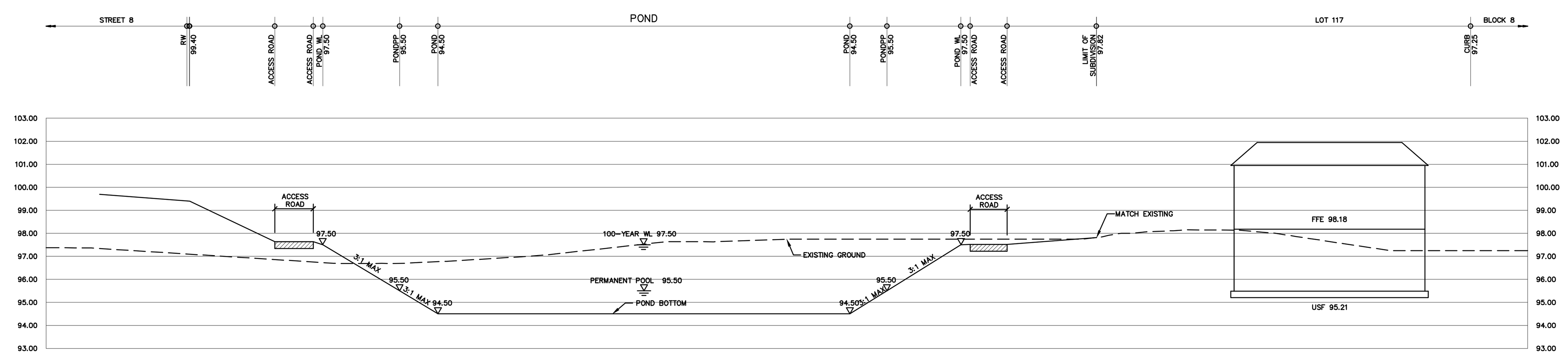

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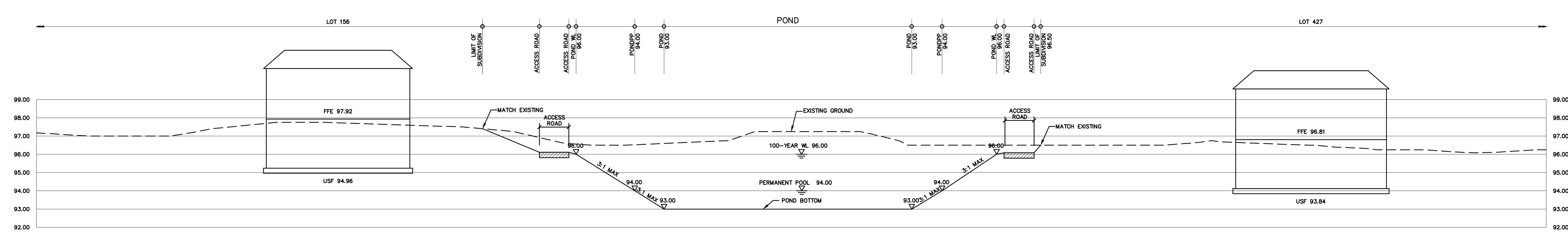

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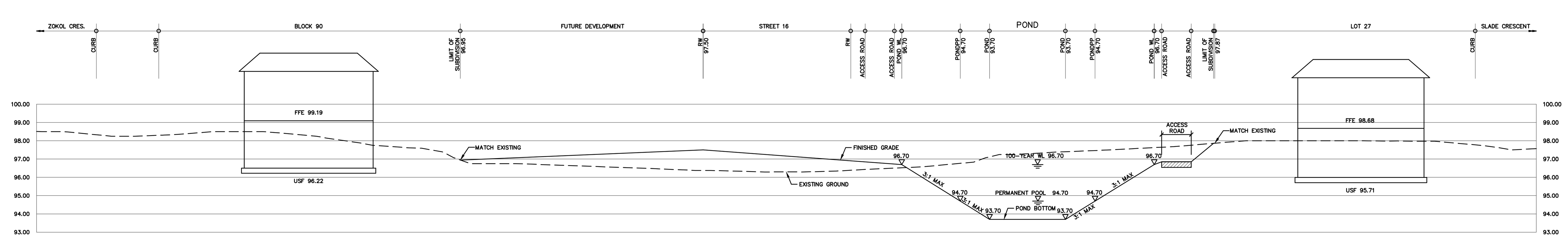

SECTION D–D
SCALE HOR. 1:250
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