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FUNCTIONAL SERVICING REPORT

FOR

CAIVAN COMMUNITIES

BRAZEAU LANDS

3809 BORRISOKANE ROAD

CITY OF OTTAWA

PROJECT NO.: 18-1030

SEPTEMBER 11, 2019
3RD SUBMISSION

FUNCTIONAL SERVICING REPORT
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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained to prepare a Functional Servicing Report (FSR) in support of the Brazeau Lands development area on behalf of Caivan Communities (CC).

The proposed Brazeau Lands development area is located at 3809 Borrisokane Road within the Barrhaven South Urban Expansion Area (***BSUEA***). As illustrated in ***Figure 1*** (see ***Appendix A***) the site is located north of Barnsdale Road, east of Highway 416 (and Borrisokane Road), south of Cambrian Road and west of the future New Greenbank Road alignment. The current zoning is Mineral Extraction (ME) and is proposed to be amended to permit low-rise residential uses. The western portion of the property is outside of the urban boundary and will remain at the current zoning while the eastern side (approximately 24.5 ha) is within the urban boundary and will be rezoned as noted above. The lands are planned to be developed with a mix of detached single homes, townhomes, park blocks, SWM blocks, open space and a road network (see ***Figure 2*** for the preliminary lotted Concept Plan SK-17 in ***Appendix A***).

The objective of this report is to provide sufficient detail to demonstrate that the proposed development area can be supported by municipal services.

1.1 Existing Conditions

The Brazeau Lands property is currently an aggregate extraction pit and is operated in accordance with the Ontario Aggregate Resources Act and Regulations.

The property ground surface is significantly disturbed as a result of the mineral extraction activities that have occurred over the years with stockpiles of materials at various locations and elevations. The eastern portion of the site adjacent to the New Greenbank Road future alignment range in elevations from approximately 108.0m to 104.5m. On-site elevations vary due to the various stockpiles of materials but are general averaging about 99.0m. Drainage is generally conveyed westward towards Borrisokane Road which is owned by, and under the jurisdiction of, the Ministry of Transportation.

The property is within the Jock River watershed and is under the jurisdiction of the Rideau Valley Conservation Authority (RVCA).

2.0 GUIDELINES, PREVIOUS STUDIES, AND REPORTS

2.1 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, Revisions to Ottawa Design Guidelines - Sewer
    City of Ottawa, February 5, 2014.
    (ISDTB-2014-01)

  - Technical Bulletin PIEDTB-2016-01, Revisions to Ottawa Design Guidelines – Sewer
    City of Ottawa, September 6, 2016.
    (PIEDTB-2016-01)

- Ottawa Design Guidelines – Water Distribution
  City of Ottawa, July 2010.
  (Water Supply Guidelines)

  - Technical Bulletin ISD-2010-2
    City of Ottawa, December 15, 2010.
    *(*ISDTB-2010-2*)*

  - Technical Bulletin ISDTB-2014-02
    City of Ottawa, May 27, 2014.
    *(*ISDTB-2014-02*)*

- Design Guidelines for Sewage Works,
  Ministry of the Environment, Conservation and Parks, 2008. (formerly MOECC)
  (MECP Design Guidelines*)*

- Highway Drainage Design Standards (MTO 2008)

- Drainage Management Manual (MTO 1997),
  Ministry of Transportation.
  (MTO Manuals)

- Stormwater Planning and Design Manual,
  Ministry of the Environment, March 2003.
  (SWMP Design Manual)

- City of Ottawa Official Plan,
  adopted by Council 2003.
  (Official Plan)

- South Nepean Collector: Phase 2 Hydraulics Review / Assessment Technical Memorandum
  Novatech, August 2015
  (Novatech SNC Memo)

- Master Servicing Study – Barrhaven South Urban Expansion Area, J.L. Richards & Associates Limited, Revision 2, May 2018
  (BSUEA MSS)

- Servicing Brief – Quinn's Pointe Residential Stages 2, 3 & 4, J.L. Richards & Associates Limited, Revision 1, October 2018 (File No. 26610-001.1)
  (Quinn's Pointe Brief)

- Jock River Reach One Subwatershed Study
  Stantec, 2007
  (Jock River SWS)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The ***BSUEA MSS*** provided an overview of the existing watermain infrastructure associated with the BSUEA. An assessment of the water supply for the area was completed to examine the feasibility of the extension of existing infrastructure that would meet the required City and MECP criteria for the whole of the development area.

The 'Master Watermain" plan (Drawing MWM) from the ***BSUEA MSS*** is provided in ***Appendix B*** and illustrates the existing watermains in proximity to the Brazeau Lands. In addition, a conceptual watermain plan (Drawing CWM) from the preliminary Servicing Brief for Minto's Quinn's Pointe (Stages 2, 3 & 4) residential area is provided for reference. The anticipated watermain servicing connections points for the Brazeau Lands are as follows:

- Existing 300mm diameter watermain terminating at Dundonald Drive and the future New Greenbank Road alignment
- Existing 300mm diameter watermain on Kilbirnie Drive at Alex Polowin Avenue
- Existing 250mm diameter watermain at the current south termination of Fameflower Street

3.2 Water Supply Servicing Design

The ***BSUEA MSS*** presents overall watermain infrastructure details for the BSUEA. The subject property was deemed serviceable and the ***MSS*** reviewed a number of servicing scenarios (i.e. existing and built-out conditions) that confirmed that the area could be adequately serviced conforming to relevant City and MECP Guidelines and Policies. At the time of detailed design any required easements or land crossing permissions will be obtained to support the water supply infrastructure.

The proposed water servicing is presented in ***Figure 3*** in ***Appendix B***. The Brazeau Lands development will require a minimum of two watermain feeds to the service the property. The advancement of adjacent development areas and their associated watermain networks/sizing will ultimately dictate the preferred connection locations based on where those future terminations will be.

Based on the nearby existing infrastructure, and surrounding development plans, it is proposed that an interim extension of the existing Dundonald Drive 300mm watermain will provide service to the northeast portion of the property. In addition, the second proposed feed to service Brazeau will be through the Drummond Lands from the proposed 300mm watermain that is being advanced for the Tamarack Meadows development north of the property (Note: Servicing through the Drummond Lands is

being advanced based on an agreement with that landowner. A permission letter from Drummond will be provided at detailed design once the alignments are finalized). Other future connections will be via an extension of the existing 300mm watermain along Kilbirnie Drive (proposed in Stage 2 of Quinn's Pointe) which will provide service to the site through the Minto property to provide service to the south portion of the property (if required). If necessary, an additional interim feed could be provided from the 250mm watermain from Fameflower Street. This requirement would be assessed at detailed design for the development area. Coordination with the adjacent landowners/designers at the time of detailed design will be undertaken in order to minimize throwaway interim infrastructure where possible.

The ***BSUEA MSS*** detailed various scenarios for the watermain network and at the time of detailed design, detailed hydraulic modelling will be undertaken to verify that the proposed on-site, and any off-site, watermains are in conformance with all relevant criteria for the development area as a whole or based on any phased development. This would include consideration given to the advancement of the Minto Quinn's Pointe development to the south of the Brazeau Lands based on the current submission to the City of the "Servicing Brief – Quinn's Pointe Residential Stages 2, 3 & 4" prepared by J.L. Richards (October 2018) in support of the proposed Minto draft plan. The proposed phasing and watermain layout are found in the "*BSUEA Conceptual Watermain*" *Drawing CWM* found in ***Appendix B***.

The water analysis contained in the ***BSUEA MSS*** and the Quinn's Pointe design report utilized system level water demands as developed by the City due to the fact that the number of units and densities resulted in an overall population that would exceed 3,000. The system level demands listed in Table 7-1 of the ***MSS*** can be found in ***Appendix B*** and are summarized as follows:

Table 1A: Water Supply Design Criteria (System Level Demands)

Land Use Type	Consumption Rate
JLR BSUEA MSS, May 2018 for Population Exceeding 3000 Persons	
Single Family Residential	180 L/cap/day
Multi-unit Residential (Townhouse / Back to Back)	198 L/cap/day
Apartment Residential	219 L/cap/day
Commercial	50,000 L/ha/day
Institutional	50,000 L/ha/day
Outdoor Water Demand	1049 L/unit/day (single detached)

At the detailed design stage, if desired by the City, the typical Water Supply Design Criteria to be used is as summarized in the following table:

Table 1B: Water Supply Design Criteria (Typical)

Design Parameter	Value
Extracted from Section 4: Ottawa Design Guidelines, Water Distribution (July 2010)	
Residential – Detached Single	3.4 p/unit
Residential – Townhome/ Semi	2.7 p/unit
Residential – Apartment	1.8 p/unit
Minimum Watermain Size	150 mm diameter
Minimum Depth of Cover	2.4 m top of watermain to finished grade
Normal operating conditions desired operating pressures	350 kPa and 480kPa
During fire flow operating pressure must not drop below	140 kPa

Alternatively, the MECP Design Criteria will be used to calculate water demands during detailed design.

The estimated water demands within the ***BSUEA MSS*** were summarized in Table 7-2 (excerpt found in ***Appendix B***). The table summarized a total population of 1,194 for the Brazeau Lands development area along with some commercial and institutional components. Based on the current development concept the water demand table would need to be refined to reflect a revised residential unit count and the removal of the commercial, institutional and high density components. Based on the current development concept illustrated in ***Figure 2*** the development area is proposed to have approximately 381 single family homes and 170 towns with associated populations of 1,296 and 459 respectively. The adjusted water demands are summarized in the following table:

Table 1C: Estimated Water Demands - Brazeau Land Updates

Design Parameter	Area (ha)	Units	Pop.	ADD SFH [1]	ADD MLT [2]	ADD APT [3]	ADD COM [4]	ADD INS [5]	Total BSDY	OWD [6]	Total MXDY
From Table 7-2 of MSS	12.72	398	1194	1.56	0.87	0.17	0.39	0.85	3.84	2.67	6.51
Revised per Updated Concept Plan	24.39	551[7]	1755	2.70	1.05	0	0	0	3.75	4.63	8.38
		+153	+561						**+0.09**	+1.96	**+1.87**

1 Daily Demand, Single Family Homes, L/s (see Table 1A for Consumption Rate)
2 Average Daily Demand, Multi-Units (Townhouses and Back to Back Unit) L/s
3 Average Daily Demand, Apartment Units, L/s
4 Average Daily Demand, Commercial, L/s
5 Average Daily Demand, Institutional, L/s
6 Outdoor Water Demand, L/s, calculated as 1,049 L per SFH unit per day per MSS
7 Comprised of 381 Singles Family Homes and 170 Townhouses (maximum yield based on roadway frontages)

From Table 7-2 the overall Total BSDY increased by 0.09 L/s (to 18.75 L/s) which is a 0.5% increase over the previous 18.66 L/s. The total MXDY increases by 1.87 L/s which is a 5.9% increase over the previous 31.48 L/s.

Fire Flow requirements are to be confirmed in accordance with Local Guidelines (Fire Underwriters Survey), City of Ottawa Water Supply Guidelines, and the Ontario Building Code, upon development of detailed concepts for the detached singles, townhomes, and the parks.

3.3 Water Supply Conclusion

The subject lands have been reviewed within the ***BSUEA MSS*** for the BSUEA development areas. It is anticipated that in the interim condition the Brazeau Lands can be serviced by City of Ottawa infrastructure by the extension of existing watermains that are east of the property and a future connection north of the property. At the time of detailed design the site will be subject to detailed watermain analysis that will consider any adjacent system expansions (i.e. Quinn's Pointe development area) and confirmation of any staged/interim infrastructure that may be required to facilitate development of the Brazeau Lands. The proposed water supply design will conform to all relevant City and MECP Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

Sanitary flows from the BSUEA were proposed to outlet to the existing 900mm diameter Greenbank Road sanitary trunk sewer. The existing South Nepean Collector (SNC) will provide the sanitary outlet for the entire Barrhaven South Community, which includes the BSUEA development area.

Trunk sanitary sewers exist north of the Brazeau Lands area and are located along Cambrian Road (see JLR's *Master Sanitary Drainage Area* plan 'MSAN' in ***Appendix C***). The outlet connection point to existing for the Brazeau Lands is as follows:

- Existing 500 mm / 600 mm / 750 mm diameter sanitary trunk running east on Cambrian Road then extending north along existing Greenbank Road and east to the South Nepean Collector (SNC). The current sewer termination is at the New Greenbank Road alignment.

As per the ***BSUEA MSS***, the subject property is tributary to the existing sanitary trunk sewer along Cambrian Road.

4.2 Wastewater Design

The subject property is planned to be serviced by an internal gravity sanitary sewer system that will generally follow the local road network with select servicing easements and land crossing permissions as required to achieve efficiencies in servicing and

grading designs. The wastewater servicing plan (***Drawing 3***), design sheets and background BSUEA MSS information can all be found in ***Appendix C***.

The ***BSUEA MSS*** had proposed that the wastewater outlet from the Brazeau Lands would tie into the off-site Cambrian Road trunk sewer at existing sanitary 'EX MH57A' via the Future Greenbank Road alignment. The *Master Sanitary Drainage Area* plan 'MSAN' from the ***BSUEA MSS*** is provided in ***Appendix C*** for reference. Also shown in the 'MSAN' drawing is the proposed sanitary routing for the Drummond Lands immediately north of the Brazeau Lands. The Drummond lands are proposed to be conveyed to Cambrian Road (MA11 to MA10) through Tamarack's "The Meadows Phase 7 & 8" (***Meadows***) development area at 3640 Greenbank Road (D07-16-18-0011). Given the advancement of the Tamarack development (also being designed by DSEL – Project No. 19-1089) this alignment is now also the preferred routing option being proposed for the Brazeau Lands. Discussions have been advanced with both of the landowners to the north and permissions will ultimately be obtained to facilitate this routing.

4.2.1 Brazeau Lands

In the ***BSUEA MSS***, Table 6-3 (provided in ***Appendix C***) summarized the anticipated flows from the Brazeau Lands. With a more detailed development concept, the site statistics are refined and the sanitary design sheet found in ***Appendix C*** more accurately reflects the anticipated sanitary flows. As per Section 3.2 of this report, the anticipated unit count is 381 single family homes and 170 townhouse units. Applying the City of Ottawa wastewater design criteria to the development area, the estimated peak sanitary flows from the Brazeau property are projected to be approximately 25.78L/s versus the 21.50L/s (+4.28/s) previously summarized in the JLR's Table 6-3.

Table 6-4 in the ***BSUEA MSS*** identified critical residual capacities in existing trunk sanitary sewers associated with the BSUEA area. Specifically, the Cambrian Road sewer is the outlet for the Brazeau Lands property and has a limiting pipe reach from existing MH13A to MH15A with a residual capacity of approximately 52.9L/s. The additional 4.28L/s of anticipated sanitary flows uses approximately 8% of the residual capacity leaving 48.62L/s. Review of the ***BSUEA MSS*** sanitary design sheet indicates that there are no other sanitary sewer constraints up to the SNC.

4.2.2 Tamarack Development (The Meadows)

Detailed design submissions for Tamarack's ***Meadows*** development have been submitted to the City of Ottawa. The design and reporting for the development incorporated the inclusion of future flows from both the Drummond and Brazeau properties. Various excerpts from that report (external drainage area plans, design sheets and report discussion) are provided in ***Appendix C*** for reference.

The proposed invert for the 375 mm sanitary sewer at the southern property limit of The Meadows has been established based on preliminary design for the future Drummond development, as illustrated in the attached '*Drummond Pond – Sanitary Constraints Figure'* in ***Appendix C***. The design of the Drummond sanitary sewer system is based on constraints associated with:

a) crossing under the future Drummond storm sewer, resulting in a maximum sanitary sewer obvert elevation of 94.94 m at the southern boundary of The Meadows; and
b) providing minimum cover (2.5 m) over the future Drummond sanitary sewer at the eastern boundary of the Drummond drainage area identified in the BSUEA MSS, adjacent to future Greenbank Rd, resulting in a minimum sanitary sewer obvert elevation of 94.33 m at the southern boundary of The Meadows.

Based on the above constraints, and factoring in an additional 0.35 m factor of safety to account for the preliminary nature of the future Drummond development servicing design, a minimum sewer invert of 93.60 m is required at the southern boundary of The Meadows in order to provide a gravity service outlet for the future Drummond Lands development as per the BSUEA MSS. The proposed 375 mm diameter sanitary sewer within Delphinus Avenue has been designed with an invert of 93.60 m at the southern boundary of The Meadows. This invert could also service the Brazeau Lands.

- The excerpted Wastewater portion of the DSEL ***Meadows*** report, along with appendix exhibits, demonstrate the available capacity in the downstream system(s);
- The ***Meadows*** *Sanitary Drainage Plan No. 43* illustrates the external drainage areas accounted for in the design of the sewers and profile plan *No. 14* shows the connection;
- The ***Meadows*** Sanitary Design Sheet (August 2019) demonstrates the system residual capacity with external Brazeau Land areas incorporated.

The submitted Meadows report summarizes that the proposed routing can accommodate the Brazeau Lands development area.

4.2.3 Wastewater Design Criteria

The following Table summarizes the City design guidelines and criteria applied in the preliminary sanitary design information above and detailed in ***Appendix C***.

Table 2: Wastewater Design Criteria

Design Parameter	Value
Current Design Guidelines	
Residential - Single Family / Townhome	3.4 p/unit & 2.7 p/unit respectively
Residential – Apartment	1.8 p/unit
Average Daily Demand	280 L/d/person

Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Commercial / Institutional Flows	28,000 L/ha/day
Commercial / Institutional Peak Factor	1.5
Infiltration and Inflow Allowance	0.33 L/s/ha
Park Flows	28,000 L/ha/d
Park Peaking Factor	1.0
Sanitary sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} AR^{2/3} S^{1/2}$
Minimum Sewer Size	200mm diameter
Minimum Manning's 'n'	0.013
Minimum Depth of Cover	2.5m from crown of sewer to grade
Minimum Full Flowing Velocity	0.6m/s
Maximum Full Flowing Velocity	3.0m/s
Extracted from Sections 4 and 6 of the City of Ottawa Sewer Design Guidelines, October 2012, and recent residential subdivisions in City of Ottawa.	

4.3 Wastewater Servicing Conclusion

The subject property will be serviced by local sanitary sewers which will outlet northward to future sanitary sewers within the Drummond Lands and Tamarack ***Meadows*** development areas. The sewers connect to existing sewers along Cambrian Road as demonstrated in the ***BSUEA MSS***. There is residual capacity in the downstream sewers providing sufficient capacity for the peak sanitary flows for the subject property.

5.0 STORMWATER CONVEYANCE

5.1 Existing Stormwater Drainage

The BSUEA is tributary to three sub-watersheds as depicted in the 'Figure 3-1' excerpt from the ***BSUEA MSS*** provided in ***Appendix D***. The Brazeau Lands are within the Jock River Subwatershed.

Due to the current land use for mineral extraction the majority of the land area is lower than the surrounding topography. As identified in the ***BSUEA MSS***, the BSUEA *Existing Condition Report* identified that the original drainage pattern for the development area was northwards via overland flow paths with no defined channels. Per the existing topography characterized within available City of Ottawa base mapping, flows from the subject property will now be ultimately conveyed to the Jock River by storm systems (pipes and ditches as required) along Borrisokane Road.

5.2 Proposed Stormwater Management Strategy

The future flows from the land area are planned to meet the following criteria per the ***BSUEA MSS***:

- Meet the existing flow in the downstream system;
- Meet the quality control target of 80% TSS removal as per the Jock River Reach One Subwatershed Study (Stantec, 2007); and,
- Preserve pre-infiltration condition levels (Section 5.3.4 of ***BSUEA MSS***)

In order to provide drainage conveyance to a Borrisokane Road storm outlet, the site grading will be adjusted to convey flows westward. As noted in the ***BSUEA MSS***, the *Existing Conditions Report* for the BSUEA identified that the culvert downstream of the aggregate properties receives a pre-development flow of 1,300 L/s during the 1:100 year event (see Figure 3-1, and Tables 5-2 and 5-5 in ***Appendix D*** from the ECR noting the constrained culvert CVR-C1). During detailed design, servicing of both properties will be developed such that the downstream pre-development flow is not exceeded. Any downstream systems should have sufficient capacity for the pre-development flow.

The ***BSUEA MSS*** conceptualized the following requirements for the development areas:

- The design of the storm drainage system has been undertaken using the dual-drainage approach. The ***BSUEA MSS*** sets out the design criteria for future draft plan and site plan applications for the BSUEA.
- Two (2) separate storm servicing solutions were developed; one conventional servicing strategy and one that incorporates the Etobicoke Exfiltration System

(EES) or alternative, which was recommended (see ***BSUEA MSS*** Drawing MST-2 for details and Section 5.2.1 of this report for discussion).

- The downstream boundary conditions or flow criteria to achieve are developed in the ***BSUEA MSS*** and are used in the design constraints.
- Allowable minor system release rates were set at the required storm event and future design should maintain the same release rate criteria.
- Stormwater management facilities have been identified in the stormwater management solution for the aggregate extraction areas.

The stormwater management designs will consist of:

- A storm sewer system designed to capture at least the minimum design capture events required under PIETB-2016-01;
- One Stormwater Management (SWM) Pond designed to provide Enhanced Level of Protection (80% total suspended solids (TSS) removal) per MECP guidelines, via treatment of the stormwater captured by the storm sewer network. The SWM pond will provide controls to levels which respect any downstream pre-development levels;
- An on-site road network designed to maximize the available storage in the on-site road network for the 100-year design event, where possible, with controlled release of stormwater to the minor storm system; and
- An overland flow route designed to safely convey stormwater runoff flows in excess of the on-site road storage.

5.2.1 Infiltration

Within the ***BSUEA MSS***, Section 5.4.4 discussed the recommendation of distributed infiltration for development areas. An analysis was carried out and summarized in the *Existing Conditions Report* which determined the various contributions of the water budget based on long-term simulation.

The section also notes that the overall pre-development infiltration from the ***BSUEA MSS*** area was determined but that the aggregate extraction areas were excluded in that determination. Ongoing investigations for both the Brazeau and Drummond properties have been completed and are summarized in the attached "*Groundwater Infiltration Review*" memorandum completed by Paterson Group (see ***Appendix D*** for reference). The memorandum summarizes the estimate infiltration rates that could be anticipated throughout the sites for various soil type conditions that were found during their investigations. These values will be used during the detailed design determinations.

Section 5.5 of the ***BSUEA MSS*** discusses the various storm servicing strategies for the development areas. The section went through the various options to achieve the required infiltration targets with the preferred arrangement being the Etobicoke

Exfiltration System (EES) Infiltration Strategy. Other alternatives were reviewed, however the EES system is the most suitable for the site.

A key point of note, as required by the ***MSS***, is that capture of stormwater by the exfiltration system is to be strategically considered insofar as the system is to be installed on local roads where the surface runoff is less impacted by the City's winter road salting program. Therefore collector and arterial roads will have conventional storm sewer installations that will convey flows to the proposed downstream OGS unit and end-of-line facility.

5.3 Stormwater Pond Location

The ***BSUEA MSS*** currently shows a stormwater pond servicing scenario on each of the Drummond and Brazeau Lands outside of the urban development area (Refer to attached 'Barrhaven South Urban Expansion Area – Master Storm Drainage Plan EES') drawing from the ***BSUEA MSS*** for illustration). However, this concept was proposed in the ***BSUEA MSS*** due to the desire at that time to not have the two properties 'linked' and dependent upon one another in order to advance development.

As noted in prior sections of this report, the two properties are now coordinating servicing strategies to the benefit of both landowners, and the City, as follows (refer to the Drawing 1 – Storm Servicing Plan in ***Appendix D***):

- The single pond option will be a dry facility with an oil-grit separator unit to treat any stormwater requiring treatment. This is in line with the ***MSS***;
- If a pond was proposed within the Brazeau Lands location shown in the ***MSS***, it would have required a large box culvert outlet in order to convey emergency flow out to Borrisokane Road due to topography constraints. Based on an increase in elevation downstream of that outlet, the emergency flows could not be conveyed overland. With the single pond concept on the Drummond Lands, a box culvert would no longer be required due to the more suitable topography at the Drummond outlet and the associated availability of emergency relief;
- A single pond option keeps more infrastructure within the new development areas and minimizes infrastructure proposed within the Borrisokane Road right-of-way (ROW);
- In accordance with the City's typical preference, there will be a reduction in maintenance costs with one less facility to manage.

Similar to the changes associated with the sanitary outlet revision, the only impacted properties are those proponents that are directly benefitting from the changes and would be considered a Minor Change per Section 11.1.1 of the ***BSUEA MSS***.

5.4 Post-Development Stormwater Management Targets

Stormwater management requirements for the proposed alternative Stormwater management scheme have been adopted from the ***Jock River SWS***, ***City Standards***, and the ***MECP SWMP Manual***.

Given the general criteria mentioned above, the following specific standards are expected to be required for stormwater management within the subject property:

- Enhanced quality treatment will be provided for stormwater runoff from the subject property, corresponding to a long-term average TSS removal efficiency of 80%, as defined by the MECP prescribed treatment levels;
- Downstream receiving drainage features, culverts, and sewers will be assessed for responses to planned stormwater management outflows, and infrastructure rehabilitation or capacity improvement measures will be planned, as required;
- Storm sewers on local roads are to be designed to provide at least a 2-year level of service without any ponding per the City's latest Technical Bulletin PIEDTB-2016-01;
- Storm sewers on collector roads are to be designed to provide at least a 5-year level of service without any ponding per the City's latest Technical Bulletin PIEDTB-2016-01;
- For less frequent storms (i.e. larger than 2-year or 5-year), the minor system sewer capture will be restricted with the use of inlet control devices to prevent excessive hydraulic surcharges;
- Under full flow conditions, the allowable velocity in storm sewers is to be no less than 0.80 m/s and no greater than 6.0 m/s;
- For the 100-year storm and for all roads, the maximum depth of water (static and/or dynamic) on streets, rearyards, public space and parking areas shall not exceed 0.35 m at the gutter;
- The major system shall be designed with sufficient capacity to allow the excess runoff of a 100-year storm to be conveyed within the public right-of-way ROW, or adjacent to the ROW, provided the water level does not touch any part of the building envelope; must remain below all building openings during the stress test event (100-year + 20%); and must maintain 15 cm vertical clearance between spill elevation on the street and the ground elevation at the nearest building envelope;
- Flow across road intersections shall not be permitted for minor storms (generally 5-year or less);
- When catchbasins are installed in rear yards, safe overland flow routes are to be provided to allow the release of excess flows from such areas. A minimum of 30

cm of vertical clearance is required between the rear yard spill elevation and the ground elevation at the adjacent building envelope; and

- The product of the maximum flow depths on streets and maximum flow velocity must be less than 0.60 m^2/s on all roads.

5.4.1 Quality Control

Per the ***Jock River SWS,*** Enhanced quality treatment will be provided for stormwater runoff from the subject property, corresponding to a long-term average Total Suspended Solid removal efficiency of 80%, as described by the MECP prescribed treatment levels. This will be achieved via the proposed EES system installations and oil-grit separator unit(s).

5.4.2 Quantity Control

As noted in the ***Jock River SWS***, quantity control is not required for the Jock River; however, based on past reports (***BSUEA MSS*** and Existing Condition Report), the limited capacity of the infrastructure along Borrisokane Road will require that the stormwater management facilities provide a storage volume for quantity control. Any infrastructure upgrades or adjustments relating to the Borrisokane Road ROW will require appropriate permits and approvals from the Ministry of Transportation.

5.5 Stormwater Management Design

As shown on ***Drawing 1***, the proposed stormwater management design consists of a proposed stormwater management (SWM) pond to treat stormwater prior to discharge along Borrisokane Road. The pond will be located within the portion of the quarry land that is between the residential area to be developed (within the urban boundary) and Borrisokane Road. The facility will be sized to meet the MECP Enhanced Level of Protection criteria with 80% total suspended solids removal.

The SWM pond will outlet to the Borrisokane Road roadside ditch. It is proposed that there will be a new 900mm/1200mm storm sewer installation along Borrisokane Road which extends north of Cambrian Road where it discharges to the western roadside ditch.

5.5.1 Borrisokane Road – Ministry of Transportation Requirements

Borrisokane Road, along the frontage of the Brazeau Lands development area and northwards to Cambrian Road, is owned by, and under the jurisdiction of, the Ministry of Transportation. As such, any proposed underground stormwater infrastructure or grading/landscaping will require permits to facilitate the design and implementation of those works. At detailed design the appropriate permit applications will be submitted along with the required level of detail after further pre-consultation is held with appropriate staff within the Corridor Management Section.

Culverts:
For any stormwater flows outletting to any existing, or new, Borrisokane Road ROW culverts the stormwater management reporting will evaluate peak flow rates, velocities and headwater levels at pre- and post-development conditions for design and regulatory storms.

Ditches:
For any stormwater flows outletting to existing Borrisokane Road ROW ditches, the stormwater management reporting will evaluate peak flow rates, velocities and depth of flow at pre- and post-development conditions for design and regulatory storms.

Inlet Control Devices:
Insofar as the Ministry has indicated that they do not recognize any benefit from the attenuation of storm water runoff from inlet control devices, the SWM reporting will review conditions in the circumstance where on-site SWM measures do not operate as intended in order to evaluate potential impacts and summarize design contingencies as required.

5.6 Proposed Minor System

The subject property is expected to be serviced by an internal gravity storm sewer system that is to generally follow the local road network and servicing easements as required. The drainage will be conveyed within the underground piped sewer system to the proposed SWM pond with select areas of local streets that will have the EES installed to achieve infiltration targets.

Street catchbasins will collect drainage from the streets and front yards, while rear yard catchbasins will capture drainage from backyards. Perforated catch basin leads will be provided in rear yards, except the last segment where it connects to the right-of-way which will be solid pipe, per City standards.

The preliminary rational method design of the minor system captures drainage for storm events up to and including the 2-year (local) and 5-year (collector) event assuming the use of inlet control devices (ICD) for all catchbasins within the subject property. The peak design flows are calculated based on an average predicted runoff coefficient (C-value) of 0.72 for the development areas and 0.25 for the grassed areas. As detailed design progresses, the runoff coefficients will be refined to reflect the proposed building envelopes, driveways and other details.

The following Table summarizes the standards that will be employed in the detailed design of the storm sewer network. The preliminary drainage area information can be found in ***Drawing 1*** and rational method design sheets are provided in ***Appendix D***.

Table 3: Storm Sewer Design Criteria

Design Parameter	Value
Minor System Design Return Period	1:2 yr (PIEDTB-2016-01) for local roads, without ponding 1:5 yr for collector roads, without ponding
Major System Design Return Period	1:100 year
Intensity Duration Frequency Curve (IDF) 2-year storm event: A=732.951 | B=6.199 | C=0.810 5-year storm event: A = 998.071 | B = 6.053 | C = 0.814	$i = \frac{A}{(t_c + B)^C}$
Minimum Time of Concentration	10 minutes
Rational Method	$Q = CiA$
Storm sewers are to be sized employing the Manning's Equation	$Q = \frac{1}{n} A R^{2/3} S^{1/2}$
Runoff coefficient for paved and roof areas	0.9
Runoff coefficient for landscaped areas	0.2
Minimum Sewer Size	250 mm diameter
Minimum Manning's 'n' for pipe flow	0.013
Minimum Depth of Cover	1.5 m from crown of sewer to grade
Minimum Full Flowing Velocity	0.8 m/s
Maximum Full Flowing Velocity	6.0 m/s
Clearance from 100-Year Hydraulic Grade Line to Building Opening	0.30 m
Max. Allowable Flow Depth on Municipal Roads	35 cm above gutter (PIEDTB-2016-01)
Extent of Major System	Contained within the ROW, or adjacent to the ROW, provided that the water level not touch any part of the building envelope and remains below the lowest building opening during the stress test event (100-year + 20%) and 15cm vertical clearance is maintained between spill elevation on the street and the ground elevation at the building envelope (PIEDTB-2016-01)
Stormwater Management Model	DDSWMM (release 2.1), SWMHYMO (v. 5.02) and XPSWMM (v. 10)
Design Parameter	**Value**
Model Parameters	Fo = 76.2 mm/hr, Fc = 13.2 mm/hr, DCAY = 4.14/hr, D.Stor.Imp. = 1.57 mm, D.Stor.Per. = 4.67 mm
Imperviousness	Based on runoff coefficient (C) where Percent Imperviousness = (C - 0.2) / 0.7 x 100%.
Design Storms	Chicago 3-hour Design Storms and 24-hour SCS Type II Design Storms. Max. Intensity averaged over 10 minutes.
Historical Events	July 1st, 1979, August 4th, 1988 and August 8th, 1996
Climate Change Street Test	20% increase in the 100-year, 3-hour Chicago storm
Extracted from City of Ottawa Sewer Design Guidelines, October 2012, and ISSU,	

5.7 Hydraulic Grade Line Analysis

A detailed hydraulic grade line (HGL) modelling analysis will be completed for the proposed system at the detailed design level, based on the 100-year 3-hour Chicago, 12-hour SCS, and 24-hour SCS design storms, including historical design storms and climate change stress test as required. Detailed grading design and storm sewer design will be modified as required to achieve the freeboard requirements set out in Section 5.3 (per PIEDTB-2016-01).

5.8 Proposed Major System

Major system conveyance, or overland flow (OLF), will be provided to accommodate flows in excess of the minor system capacity. OLF is accommodated by generally storing stormwater up to the 100-year design event in road sags then routing additional surface flow along the road network and service easements towards the proposed drainage features to the Jock River, as shown in ***Drawing 1***. Stormwater discharges to the Borrisokane Road ROW which will require appropriate permits and approvals from the Ministry of Transportation.

5.9 Proposed Grading

The grading design described in Section 5.9, and shown in ***Drawing 2 (Appendix E),*** includes a saw-toothed-road design with 0.15% minimum grade from highpoint to highpoint in order to maximize available surface storage for management of flows up to the 100-year design event where possible.

The proposed site grading has been developed to optimize earthworks and provide major system conveyance to the end-of-line facility, which eventually outlets to the Borrisokane Road ROW and then to the Jock River. Roadway connections to the future New Greenbank Road will be coordinated with that future design based on the EA profile for that roadway. The proposed grading plan can be seen in ***Drawing 2*** and will conform to City of Ottawa guidelines.

The geotechnical review of the site will provide additional information about the suitability of the site for the proposed services and grading scheme. At the time of detailed design, detailed review and signoff by a licensed Geotechnical Engineer will be required. Any grading onto adjacent properties will be coordinated with adjacent landowners for permissions and retaining walls will be implemented where required.

5.10 Stormwater Servicing Conclusions

The stormwater runoff is designed to be captured by an internal gravity sewer system that is to convey flows to an end-of-line dry SWM pond facility and OGS unit for quality control treatment. An Enhanced Level of Protection will be provided for stormwater runoff from the subject property before being discharged to the Jock River. Quantity

control is not required for the Jock River. Notwithstanding, some quantity control by on-site and SWM pond storage will be provided due to downstream infrastructure constraints.

Infiltration targets noted in the MSS will be achieved via the installation of the EES system within local ROWs.

6.0 CONCLUSION AND RECOMMENDATIONS

This report provides details on the planned on-site municipal services for the subject property and demonstrates that adequate municipal infrastructure capacity is expected to be available for the planned development of the subject property:

- The subject lands have been reviewed by the ***BSUEA MSS*** and has shown that water supply to the property can be provided. The water supply network will be expanded through neighboring properties to meet the water demands of the proposed concept plan via the trunk watermain network and local watermains identified. Detailed modelling will confirm the phasing of the extensions of trunk watermains and sizing of the local watermain network to meet the required level of service. Any interim connection points to the system will be evaluated in the model.

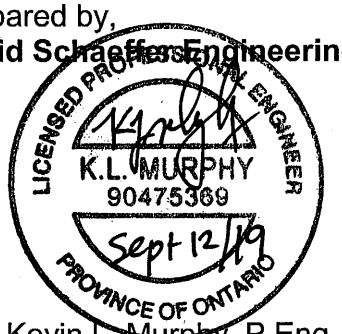
- Sanitary service is to be provided to the subject property via connection to the sanitary sewer located along Cambrian Road through the Drummond and Tamarack lands north of the Brazeau Lands development area. With the inclusion of the subject property, the existing downstream sewers have sufficient capacity to accommodate the subject property's proposed sanitary flows.

- Stormwater service is to be provided by capturing stormwater runoff via an internal gravity sewer system that is to convey flows to a proposed end-of-line dry SWM pond facility for quantity control and OGS unit for quality control treatment. An Enhanced Level of Protection (80% TSS removal) will be provided for stormwater runoff from the subject property before being discharged to the Jock River. Quantity control is not required for the Jock River, however, some quantity control by on-site and SWM pond storage will be provided due to downstream infrastructure constraints. As suggested in the ***BSUEA MSS*** the infiltration will be achieved via use of the preferred EES system. The ultimate extents of the system is contingent upon site conditions and the composition of fill material used within the site. Paterson has provided guidance with respect to anticipated infiltration rates (based on site investigations) that will be used for guidance in establishing the system extents.

- A detailed Hydraulic Grade Line (HGL) modelling analysis will be completed for the proposed system at the detailed design level.

- Prior to detailed design of the infrastructure presented in this report, this report will require approval under the Planning Act as supporting information for the Plan of Subdivision application. Future project-specific approvals are also expected to be required for the infrastructure presented in this report from the City of Ottawa, MTO, MECP, and Rideau Valley Conservation Authority, among other agencies.

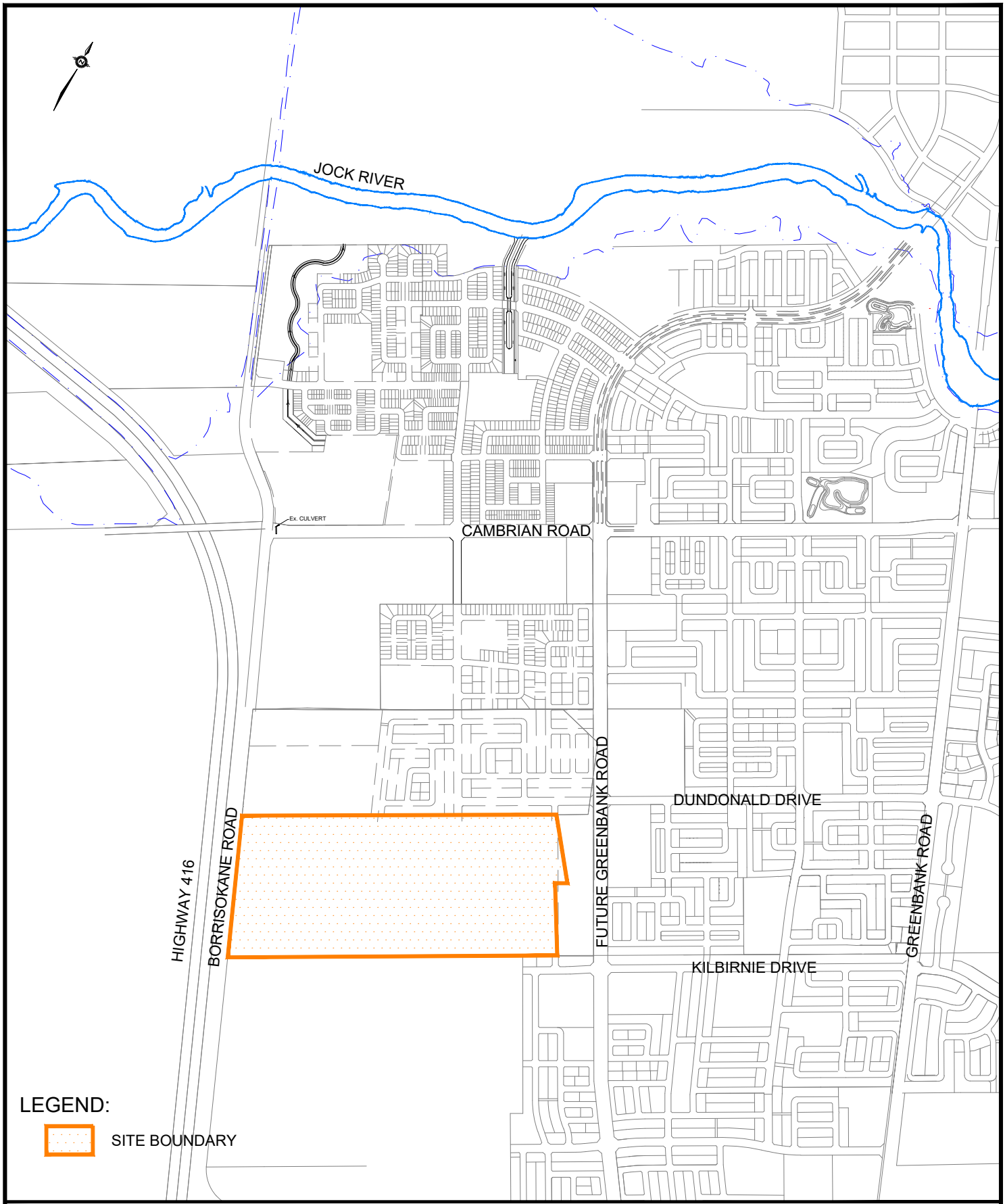
Prepared by,
David Schaeffer Engineering Ltd.



Per: Kevin L. Murphy, P.Eng.

2019-09-11_FSR_3rd_Submission.doc

APPENDIX A



DSEL
david schaeffer engineering ltd

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Stittsville, ON K2S 1E9
TEL: (613) 836-0856
FAX: (613) 836-7183
www.DSEL.ca

CAIVAN - BRAZEAU

KEY PLAN

CITY OF OTTAWA

DATE:	SEPT 2019
SCALE:	1:15,000
PROJECT No.:	18-1030
FIGURE:	1

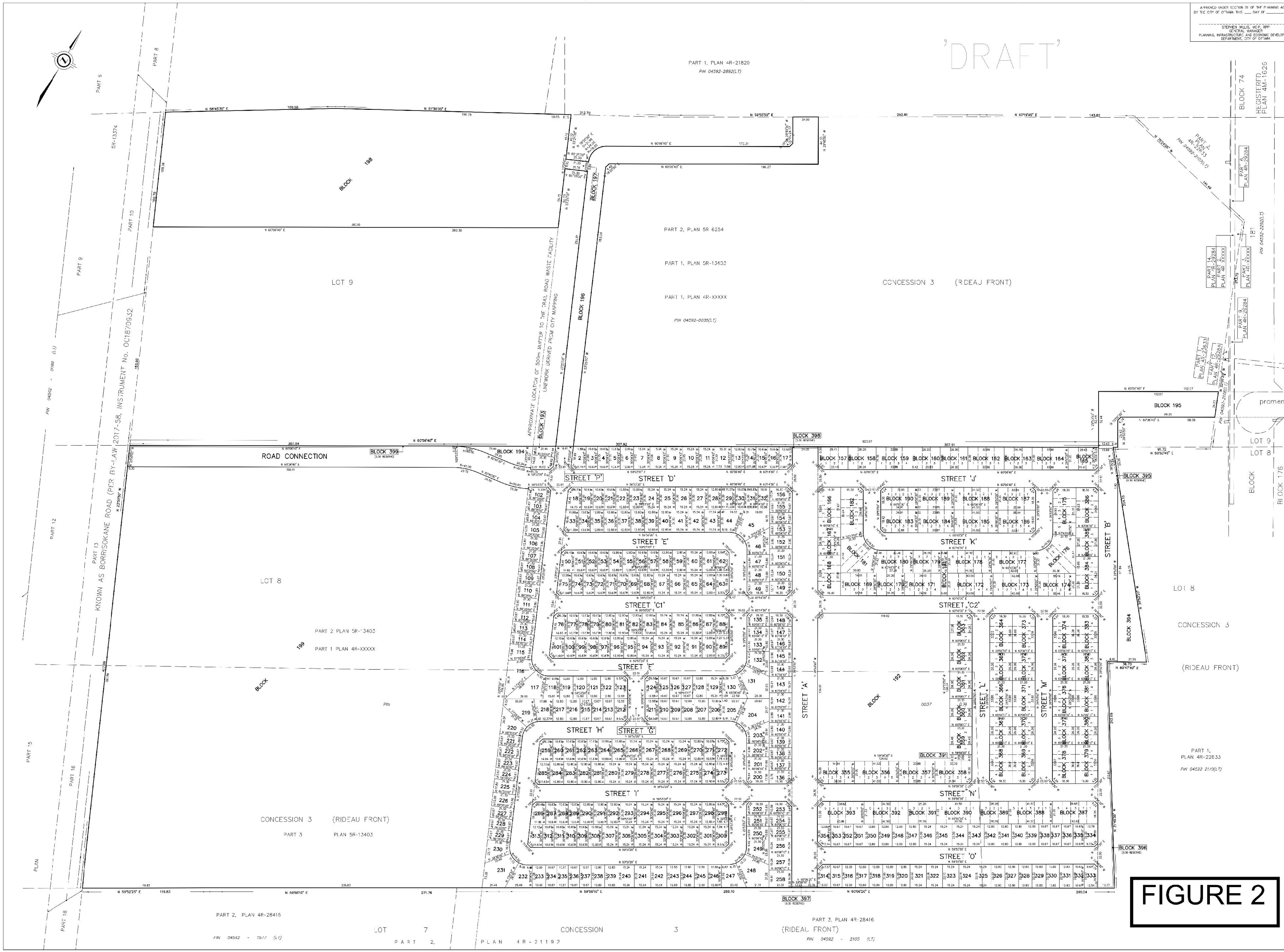


FIGURE 2

APPROVED UNDER SECTION 51 OF THE PLANNING ACT BY THE CITY OF OTTAWA THIS ____ DAY OF ________, 2019

STEPHEN WILLIS, MCIP, RPP
GENERAL MANAGER
PLANNING, INFRASTRUCTURE AND ECONOMIC DEVELOPMENT DEPARTMENT, CITY OF OTTAWA

PLAN 4M-

I CERTIFY THAT THIS PLAN IS REGISTERED IN THE LAND REGISTRY OFFICE FOR THE LAND TITLES DIVISION OF OTTAWA-CARLETON (No. 4) AT________ O'CLOCK ON THE_____ DAY OF___________, 2019 AND ENTERED IN THE PARCEL REGISTER FOR PROPERTY IDENTIFIER ______________ AND THE REQUIRED CONSENTS ARE REGISTERED AS PLAN DOCUMENT No.______________

____
LAND REGISTRAR

PLAN OF SUBDIVISION OF
PART OF LOT 8 AND PART OF LOT 9 CONCESSION 3 (RIDEAU FRONT)
GEOGRAPHIC TOWNSHIP OF NEPEAN
NOW IN THE
CITY OF OTTAWA

SCALE 1 : 1000

J.D. BARNES LIMITED

METRIC DISTANCES AND/OR COORDINATES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048.

CURVE TABLE

LOT/BLOCK	RADIUS	ARC	CHORD	BEARING
1	61.75	3.81	3.81	N 61°39'30" E
44	16.50	5.84	5.81	N 70°02'00" E
45	16.50	11.78	11.53	N 79°22'30" W
46	16.50	8.36	8.27	N 44°24'40" W
102	78.25	5.74	5.74	N 61°59'30" E
115	16.50	2.73	2.73	N 28°09'40" W
116	16.50	11.33	11.11	N 52°34'30" W
117	16.50	11.32	11.09	N 88°06'30" E
118	16.50	2.47	2.47	N 64°10'30" E
130	16.50	7.07	7.01	N 47°37'20" E
131	16.50	11.75	11.51	N 14°57'00" E
132	16.50	7.04	6.98	N 17°40'30" W
175	16.50	1.04	1.04	N 28°05'50" W
176	16.50	24.25	22.13	N 15°48'40" E
177	16.50	0.90	0.90	N 59°28'30" E
180	16.50	2.99	2.99	N 65°22'00" E
181	16.50	20.06	18.85	N 74°36'20" W
182	16.50	2.84	2.84	N 34°50'00" W
194	60.00	31.62	31.42	N 71°26'00" E
194	60.00	20.34	20.24	N 73°02'50" E
196	16.50	24.05	21.98	N 18°20'50" E
199	60.00	25.99	25.87	N 73°27'10" E
199	60.00	23.72	23.56	N 71°26'00" E
203	16.50	6.83	6.78	N 41°45'20" W
204	16.50	12.07	11.80	N 74°34'00" W
205	16.50	7.08	7.03	N 72°11'10" E
218	16.50	2.43	2.43	N 55°40'10" E
219	16.50	11.21	11.00	N 31°58'50" E
220	16.50	9.53	9.40	N 4°02'20" W
221	16.50	0.81	0.81	N 22°00'20" W
230	16.50	7.76	7.69	N 36°53'10" W
231	16.50	11.73	11.49	N 70°42'50" W
232	16.50	8.36	8.27	N 74°24'30" E
247	16.50	6.75	6.70	N 48°10'00" E
248	16.50	12.22	11.94	N 15°13'50" E
249	16.50	6.89	6.84	N 17°56'20" W

NOTES

BEARINGS ARE MTM GRID, DERIVED FROM OBSERVED REFERENCE POINTS A AND B, BY REAL TIME NETWORK (RTN) OBSERVATIONS, MTM ZONE 9, NAD83 (CSRS) (2010.0).

DISTANCES ARE GROUND AND CAN BE CONVERTED TO GRID BY MULTIPLYING BY THE COMBINED SCALE FACTOR OF 0.999934.

INTEGRATION DATA

OBSERVED REFERENCE POINTS (ORPs): MTM ZONE 9, NAD83 (CSRS) (2010.0).

COORDINATES TO URBAN ACCURACY PER SECTION 14 (2) OF O.REG 216/10.

POINT ID	EASTING	NORTHING
ORP (A)	363 233.75	5 013 711.83
ORP (B)	363 636.22	5 013 943.52

COORDINATES CANNOT, IN THEMSELVES, BE USED TO RE-ESTABLISH CORNERS OR BOUNDARIES SHOWN ON THIS PLAN.

LEGEND

■	DENOTES	SURVEY MONUMENT FOUND
□	DENOTES	SURVEY MONUMENT SET
SIB	DENOTES	STANDARD IRON BAR
SSIB	DENOTES	SHORT STANDARD IRON BAR
IB	DENOTES	IRON BAR
PB	DENOTES	PLASTIC BAR
WIT	DENOTES	WITNESS
MEAS	DENOTES	MEASURED
JDB	DENOTES	J.D. BARNES LIMITED

OWNER'S CERTIFICATE - PLAN OF SUBDIVISION

THIS IS TO CERTIFY THAT:

1. LOTS 1 TO 156 BOTH INCLUSIVE, BLOCKS 157 TO 199 BOTH INCLUSIVE, LOTS 200 TO 354 BOTH INCLUSIVE, BLOCKS 355 TO 394 BOTH INCLUSIVE, THE STREETS NAMELY: STREET 'A', STREET 'B', STREET 'C1', STREET 'C2', STREET 'D', STREET 'E', STREET 'F', STREET 'G', STREET 'H', STREET 'I', STREET 'J', STREET 'K', STREET 'L', STREET 'M', STREET 'N', STREET 'O', STREET 'P', ROAD CONNECTION, AND THE 0.3m RESERVE NAMELY: BLOCKS 395 TO 399 BOTH INCLUSIVE, HAVE BEEN LAID OUT IN ACCORDANCE WITH OUR INSTRUCTIONS.
2. THE STREETS AND LANES ARE HEREBY DEDICATED TO THE CORPORATION OF THE CITY OF OTTAWA.

DATED THIS __________ DAY OF __________ 2019

BRAZEAU DEVELOPMENT CORPORATION

____
FRANK CAIRO
President

"I HAVE THE AUTHORITY TO BIND THE CORPORATION"

SURVEYOR'S CERTIFICATE

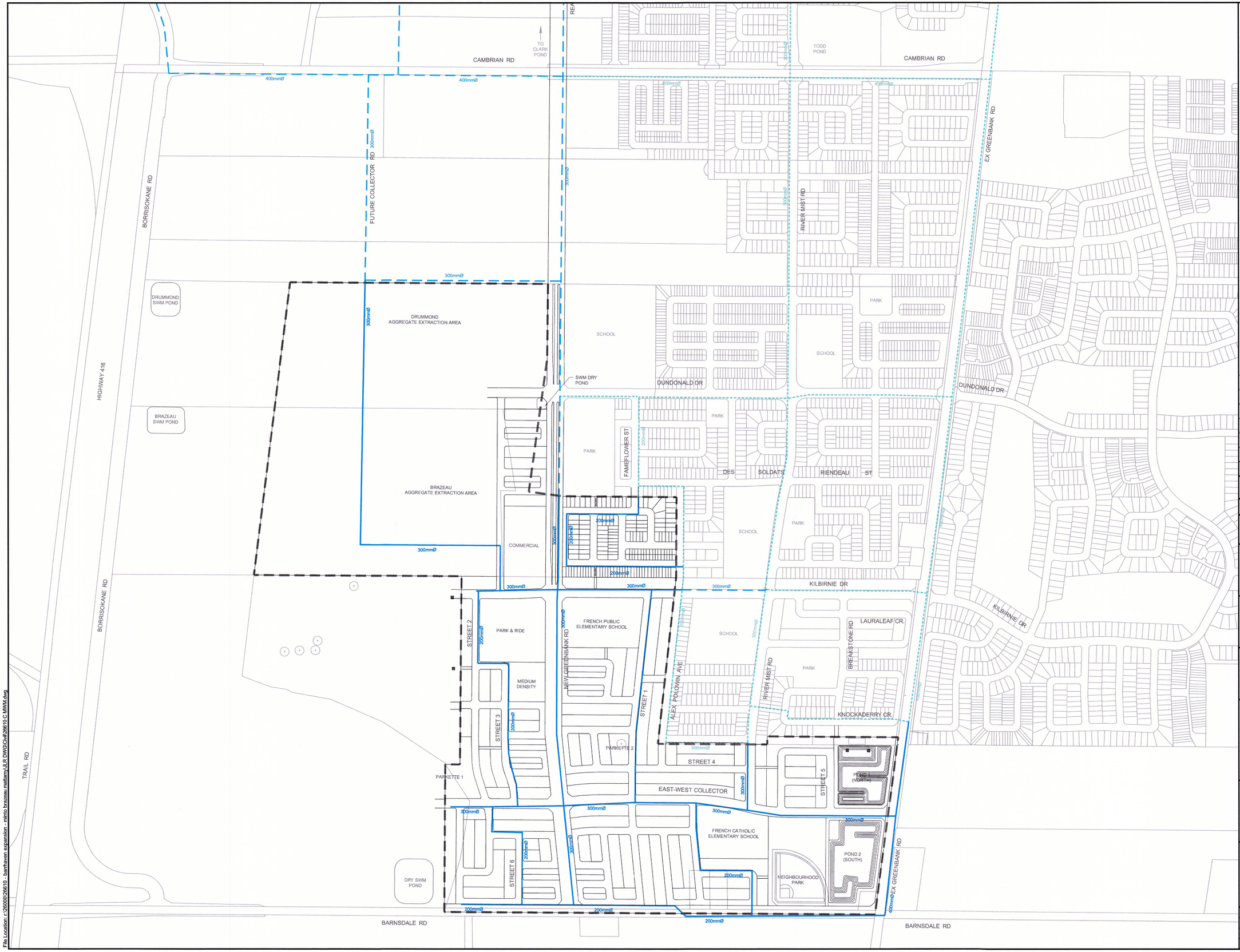
I HEREBY CERTIFY THAT THE BOUNDARIES OF THE LAND TO BE SUBDIVIDED ARE CORRECTLY SHOWN.

____
DATE

PRELIMINARY
____
C.M. FOX
ONTARIO LAND SURVEYOR

J.D. BARNES LIMITED
SURVEYING MAPPING GIS
LAND INFORMATION SPECIALISTS

APPENDIX B



LEGEND

- PROPOSED WATERMAIN, PER 2018 BSUEA MSS
- FUTURE WATERMAIN PER 2014 BS MSS
- EXISTING WATERMAIN
- LIMIT OF STUDY AREA FOR BSUEA

No.	ISSUE / REVISION	DD/MM/YY
4	ISSUED FOR PLANNING COMMITTEE APPROVAL	04/05/18
3	ADDRESS COMMENTS, RE-ISSUE BSUEA MSS 2ND SUBMISSION	26/02/18
2	ISSUED AS PART OF DRAFT MSS	20/09/17
1	ISSUED FOR PRE-TAC WORKING MEETING	31/08/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:4000

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

LICENCED PROFESSIONAL ENGINEER
M. N. L. DALRYMPLE
May 4/18
PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT:

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

-

DRAWING:

MASTER WATERMAIN

DESIGN: JW	
DRAWN: CJM	DRAWING #: MWM
CHECKED: LD	
JLR #: 26610	

PLOT DATE: May 4, 2018 8:43:40 AM

File Location: r:\26000\26610 - barrhaven expansion - minto brazeau mattamy\JLR DWG\Civil\26610 C MWM.dwg

BRAZEAU
AGGREGATE EXTRACTION AREA

FUTURE DEVELOPMENT
(BY OTHERS)

COMMERCIAL

FAME

DES SOLDATS

RIENDEAU ST

SCHOOL

PARK

EXISTING RESIDENTIAL

KILBIRNIE DR

EXISTING RESIDENTIAL
QUINN'S POINTE STAGE 1

SCHOOL

LAURALEAF CR.

BREAKSTONE RD

PARK

RIVER MIST RD

KNOCKADERRY CR.

ALEX POLOWIN AVE

STREET 23

PARK & RIDE

MEDIUM
DENSITY

NEW GREENBANK RD

FRENCH PUBLIC
ELEMENTARY SCHOOL

STREET 3

LIMIT OF DRAFT
PLAN APPLICATION

STREET 26

PARKETTE 2

STREET 9

PARKETTE 1

EAST-WEST COLLECTOR

STREET 12

POND 1
(NORTH)

LIMIT OF DRAFT
PLAN APPLICATION

STREET 20

DRY SWM
POND

FRENCH CATHOLIC
ELEMENTARY SCHOOL

NEIGHBOURHOOD
PARK

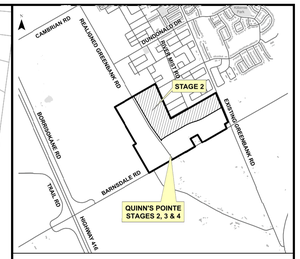
POND 2
(SOUTH)

EX GREENBANK RD

BARNSDALE RD

BARNSDALE RD

300mmØ
200mmØ
400mmØ



KEY PLAN

LEGEND

- PROPOSED WATERMAIN, PER 2018 BSUEA MSS
- FUTURE WATERMAIN PER 2014 BS MSS
- EXISTING WATERMAIN
- LIMIT OF STUDY AREA FOR BSUEA

No.	ISSUE / REVISION	DD/MM/YY
2	ISSUED FOR SERVICING BRIEF - 2nd SUBMISSION	12/09/18
1	ISSUED WITH SERVICING BRIEF - 1st SUBMISSION	07/08/18

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:2000

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP

PROJECT NORTH

PROJECT:

MINTO COMMUNITIES INC.
QUINN'S POINTE STAGES 2, 3 & 4

DRAWING:

BSUEA
CONCEPTUAL WATERMAIN

DESIGN:	AT
DRAWN:	CJM
CHECKED:	LD
JLR #:	26610-001.1

DRAWING #: CWM

File Location: V:\26600\26610 - Barrhaven Expansion - Minto Brazeau Mattamy\26610-001.1 Quinn's Pointe Phase 2\3-JLR DWG\1-Civil\Conceptual\26610-001 C MWM.dwg

PLOT DATE: September 13, 2018 9:22:03 AM

- Feedermains, which have been provided primarily for the purpose of redundancy, shall meet, at a minimum, the basic day plus fire flow demand.

In addition to the above targets, servicing should be carried out to minimize dead-ends.

7.2.2 Domestic Water Demand

The water demands presented in this section are based on the same unit and population estimates as per the wastewater servicing flows described in Section 6.2.1, which reflects the CDP unit count. The zone/system level criteria for water demands are based on land use type and are in Table 7-1 below. The water demand criteria are consistent with those used in Stantec's Revised Potable Water Servicing Analysis (October 19, 2016). Calculations are summarized below.

Basic Day (BSDY) demands are calculated from the system level water demands for residential, commercial and institutional land uses. Maximum Day (MXDY) demands are calculated by adding an Outdoor Water Demand (OWD) also shown in Table 7-1 below. Peak hour demands result from applying the 72-hour diurnal patterns developed by the City to each type of MXDY demand. The 72-hour diurnal patterns are unique to each type of land use to reflect the different use patterns. The maximum hourly demand observed within the 72-hour patterns is the Peak Hour (PKHR) demand.

The review of the Demonstration Plan (Figure 4-2) has revealed that the number of units and associated densities will result in an overall population that will exceed 3,000. As a result, the water supply analysis presented herein is to be conducted using system level water demands as developed by the City. These system level demands are summarized in Table 7-2.

Table 7-1: Theoretical Water Consumption Rate

Land Use Type	Consumption Rate	Units
Single Family Residential	180	L/cap/day
Multi-unit Residential (Townhouse / Back to Back)	198	
Apartment Residential	219	
Commercial	50,000	L/ha/day
Institutional	50,000	
Outside Water Demand	1,049	L/SFH/day

The above system level demands were applied to each of the blocks depicted on the Demonstration Plan. As previously noted, the Brazeau and Drummond aggregate properties have now been accounted as residential usage. It was assumed that residential densities for both properties would be consistent with those for the BSUEA. Based on this exercise, overall water demands of 18.66 L/s and 31.48 L/s were calculated for the basic day (BSDY) and maximum day

(MXDY), respectively. It should be noted that MXDY of 31.48 L/s includes an outside water usage of 10.15 L/s.

Table 7-2: Estimated Water Demands

Land Use	Area (ha)	Units	Pop.	ADD SFH[4]	ADD MLT[5]	ADD APT[6]	ADD COM[7]	ADD INS[8]	Total BSDY	OWD[9]	Total MXDY
Minto and Mattamy Lands											
Schools	4.55							2.63	2.63		2.63
Commercial	2.13						1.23		1.23		1.23
Medium-Low Density Residential	32.90	1080	3378	4.68	2.60				7.27	8.01	15.29
High Density Residential	0.90	120	216			0.55			0.55		0.55
Total	**40.48**	**1200**	**3594**	**4.68**	**2.60**	**0.55**	**1.23**	**2.63**	**11.69**	**8.01**	**19.71**
Brazeau Aggregate Extraction Area											
Schools	1.47							0.85	0.85		0.85
Commercial	0.67						0.39		0.39		0.39
Medium-Low Density Residential	10.30	360	1126	1.56	0.87				2.42	2.67	5.10
High Density Residential	0.28	38	68			0.17			0.17		0.17
Total	**12.72**	**398**	**1194**	**1.56**	**0.87**	**0.17**	**0.39**	**0.85**	**3.84**		**6.51**
Drummond Aggregate Extraction Area											
Schools	1.25							0.72	0.72		0.72
Commercial	0.57						0.33		0.33		0.33

[4] Daily Demand, Single Family Homes, L/s
[5] Average Daily Demand, Multi-Units (Townhouses and Back to Back Unit) L/s
[6] Average Daily Demand, Apartment Units, L/s
[7] Average Daily Demand, Commercial, L/s
[8] Average Daily Demand, Institutional, L/s

Medium-Low Density Residential	8.72	288	900	1.25	0.69				1.94	2.14	4.07
High Density Residential	0.24	32	58			0.15			0.15		0.15
Total	**10.78**	**320**	**958**	**1.25**	**0.69**	**0.15**	**0.33**	**0.72**	**3.14**	**2.14**	**5.28**
Barrhaven South Urban Expansion Area Totals											
Total	**63.98**	**1918**	**5746**	**7.48**	**4.16**	**0.87**	**1.95**	**4.21**	**18.66**	**10.15**	**31.48**

7.2.3 Watermain Sizing and Roughness

The overall watermain layout for the BSUEA is shown on Drawing MWM. Watermain roughness coefficients were determined using the friction factors presented in Section 4.2.12 of the Design Guidelines and summarized in Table 7-3 below. The internal pipe diameters were modelled based on Section 4.3.5 of the Design Guidelines, as summarized in Table 7-4 below.

Table 7-3: Watermain Roughness Coefficients

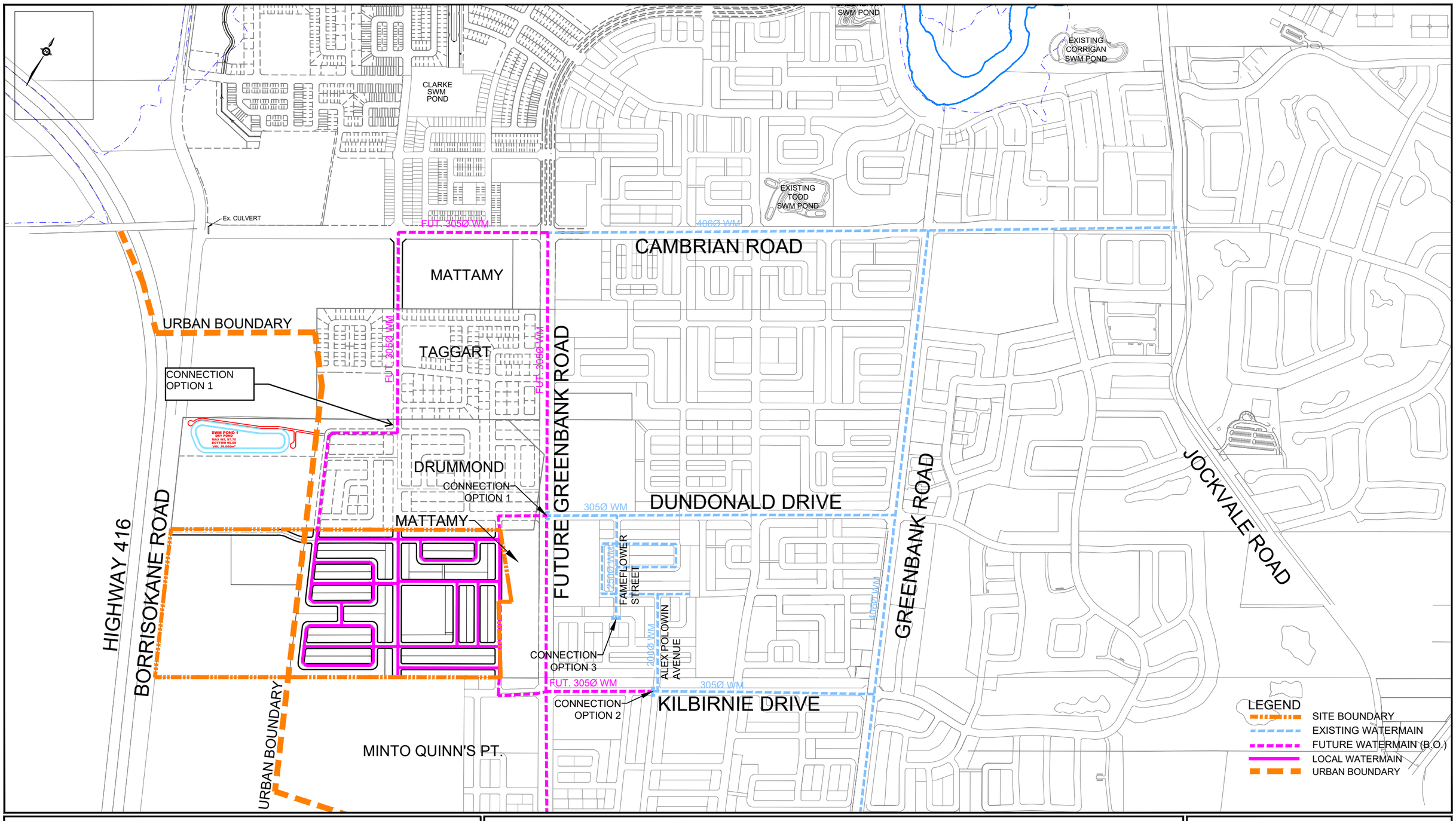
Watermain Diameter	C-Factor
150 mm	100
200 to 250 mm	110
300 to 600 mm	120
Over 600 mm	130

Table 7-4: PVC Watermain Internal Diameters

Nominal Diameter	Inside Diameter
150 mm	155 mm
200 mm	204 mm
300 mm	297 mm
400 mm	393 mm

7.2.4 Fire Flow

The City standard in regard to fire protection is the Fire Underwriters Survey and Technical Bulletin ISDTB-2014-02. To evaluate the proposed water distribution system, a fire flow of 13,000 L/min (217 L/s) was used in this system level analysis in accordance with the recommendations of the 2013 Water Master Plan.



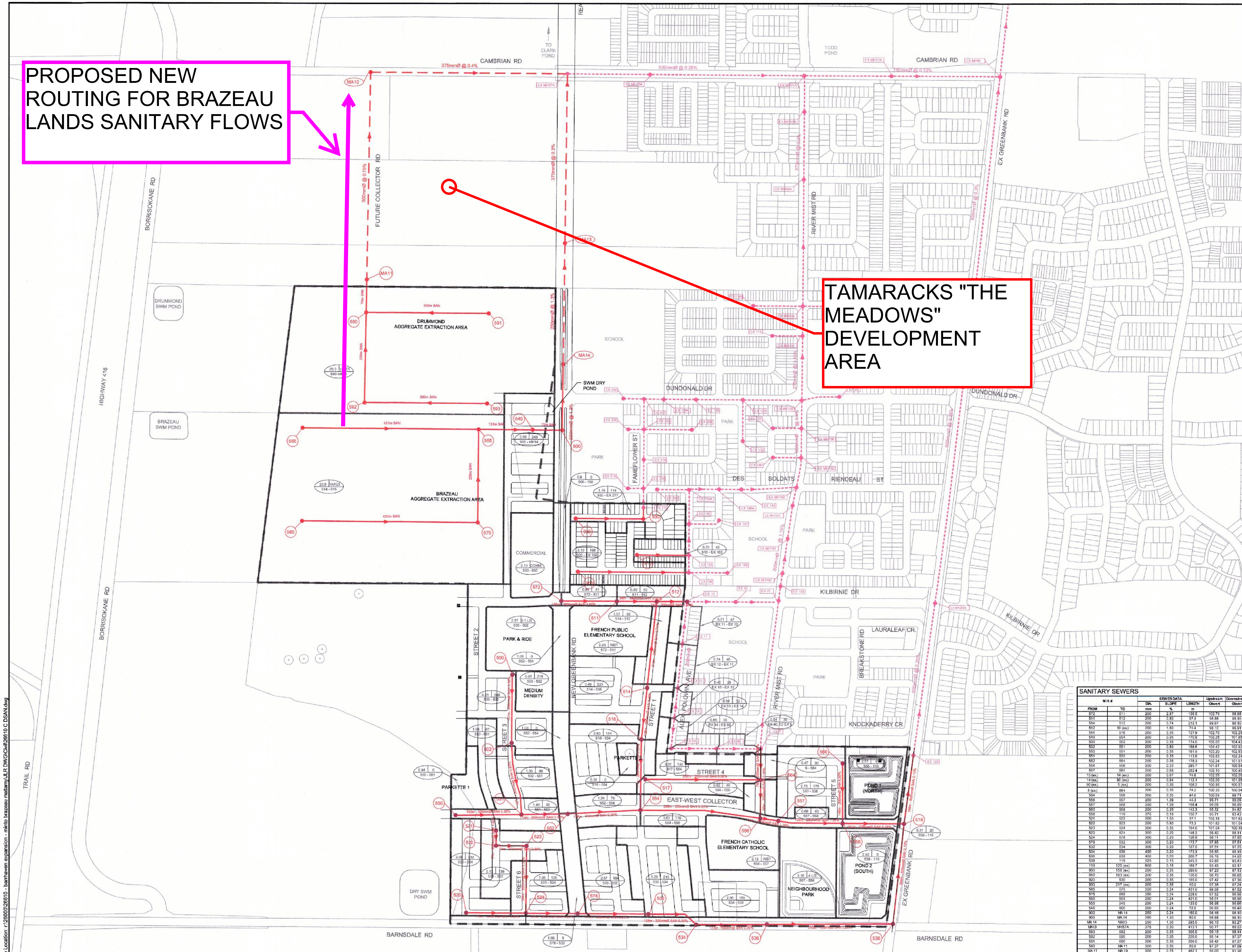
DSEL
david schaeffer engineering ltd

120 Iber Road, Unit 103
Stittsville, ON K2S 1E9
TEL: (613) 836-0856
FAX: (613) 836-7183
www.DSEL.ca

CAIVAN - BRAZEAU
WATERMAIN SERVICING PLAN
CITY OF OTTAWA

PROJECT No.:	18-1030
SCALE:	1:10,000
DATE:	AUGUST 2019
FIGURE:	3

APPENDIX C



SANITARY SEWERS

M.H. # FROM	M.H. # TO	SEWER DATA DIA. (mm)	SLOPE (%)	LENGTH (m)	Upstream Obvert	Downstream Obvert
572	511	200	2.87	136.5	102.79	98.88
511	512	200	0.80	97.5	98.88	98.10
514	512	200	0.74	212.1	99.67	98.10
512	10 (ex.)	200	1.60	74.4	98.10	96.91
514	516	200	0.35	127.9	102.70	102.25
516	564	200	0.35	170.9	102.25	101.65
500	502	200	0.35	174.0	105.03	104.42
502	551	200	0.89	168.6	104.42	102.92
550	551	200	0.35	161.5	103.20	102.63
551	552	200	0.35	113.6	102.63	102.24
552	554	200	0.35	178.3	102.24	101.61
554	556	250	0.33	295.7	101.61	100.64
517	564	200	0.58	282.4	102.10	100.45
13 (ex.)	14 (ex.)	200	0.67	74.6	102.55	102.05
14 (ex.)	90 (ex.)	200	0.94	112.1	102.00	101.95
90 (ex.)	5 (ex.)	200	0.35	108.2	100.95	100.57
5 (ex.)	564	200	0.35	74.2	100.30	100.04
564	556	200	0.35	94.6	100.04	99.71
556	557	250	1.39	44.3	99.71	99.09
557	558	250	1.39	158.4	99.09	96.89
560	558	200	0.35	142.3	95.32	94.82
558	119	375	0.18	150.7	93.71	93.43
521	522	200	1.50	37.1	102.18	101.62
522	523	200	0.80	73.3	101.62	101.04
523	524	200	0.35	164.0	101.04	100.46
520	524	300	0.20	146.3	98.40	98.11
524	578	300	0.20	126.9	98.11	97.85
578	532	300	0.20	173.7	97.85	97.51
532	534	300	0.20	127.5	97.51	97.25
534	536	450	0.20	173.3	95.50	95.15
536	538	450	0.20	308.7	95.15	94.53
538	119	525	0.15	245.3	93.80	93.43
119	120 (ex)	600	0.15	168.7	93.43	93.17
900	158 (ex)	200	0.35	280.0	97.23	97.13
910	153 (ex)	200	0.35	130.0	96.70	96.65
920	930	200	0.35	165.0	97.42	97.36
930	217 (ex)	200	0.35	40.0	97.36	97.24
585	575	250	0.24	431.0	98.56	97.52
575	555	250	0.24	228.0	97.52	96.98
565	555	250	0.24	431.0	98.01	96.98
555	545	250	0.24	133.0	96.98	96.66
545	900	250	0.24	72.0	96.66	96.48
900	MA 14	250	0.24	160.0	96.48	96.10
900	MA 14	250	1.30	60.0	96.88	96.10
MA 14	MA13	250	1.30	295.0	96.10	92.27
MA13	MH57A	375	0.30	413.1	90.77	89.53
593	592	200	0.35	300.0	99.19	98.14
592	590	200	0.35	220.0	98.14	97.37
591	590	200	0.35	300.0	98.42	97.37
590	MA 11	300	0.35	80.0	97.37	97.09
MA 11	MA 10	300	0.75	482.1	95.00	91.38
MA 10	MH57A	375	0.41	449.7	91.38	89.53

LEGEND

PROPOSED SANITARY, PER 2018 BSUEA MSS
FUTURE SANITARY, PER 2014 BS MSS
EXISTING SANITARY
DRAINAGE BOUNDARY
LIMIT OF STUDY AREA FOR BSUEA
AREA IN HECTARES
POPULATION
PIPE REACH UPSTREAM MAINTENANCE HOLE TO DOWNSTREAM MAINTENANCE HOLE
COMM — COMMERCIAL
INST — INSTITUTIONAL
VARIES — SEE DESIGN SHEET FOR CONTRIBUTING FLOWS

No.	ISSUE / REVISION	DD/MM/YY
4	ISSUED FOR PLANNING COMMITTEE APPROVAL	04/05/18
3	ADDRESS COMMENTS, RE-ISSUE BSUEA MSS 2ND SUBMISSION	26/02/18
2	ISSUED AS PART OF DRAFT MSS	20/09/17
1	ISSUED FOR PRE-TAC WORKING MEETING	31/08/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:4000

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP: LICENSED PROFESSIONAL ENGINEER M. H. L. DALRYMPLE PROVINCE OF ONTARIO

PROJECT NORTH

PROJECT: BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

DRAWING: MASTER SANITARY DRAINAGE AREA

DESIGN: JW
DRAWN: CJM
CHECKED: LD
JLR #: 26610

DRAWING #: MSAN

PLOT DATE: May 3, 2018 4:34:47 PM

File Location: r:\26000\26610 - barrhaven expansion - minto brazeau mattamy\JLR DWG\Civil\26610 C DSAN.dwg

was assumed to have 4 washbasins that deliver 375 L/d and four (4) water closets that generate 150 L/hr for 10 hr/day resulting in a total flow of 7500 L/day.

Table 6-3: Land Use and Theoretical Wastewater Flows

Land Use	Flow Rate	Area (ha)	Units	Pop.	Average Flow (L/S)	Peak Factor	Infiltration	Total Flows (L/s)
Minto and Mattamy Lands								
Schools	28,000 L/ha/d	4.55			1.50	1.5	1.50	3.8
Park Block	4 L/s	4.39			4.0	1	1.45	5.5
Commercial	28,000 L/ha/d	2.13			0.70	1.5	0.70	1.8
Low-Medium density Residential	280 l/c/d	35.26	1080	3378	11.0	2.92	11.64	43.6
High Density Residential	280 l/c/d	0.90	120	216	0.7	3.51	0.30	2.8
Roads	-	27.00				1	8.91	8.9
Park and Ride		2.57			0.1	1	0.85	1.0
Total		**76.8**	**1200**	**3594**	**17.95**		**25.35**	**67.4**
Brazeau Aggregate Extraction Area								
Schools	28,000 L/ha/d	1.47			0.48	1.5	0.49	1.2
Commercial	28,000 L/ha/d	0.67			0.22	1.5	0.22	0.6
Low-Medium Density Residential	280 l/c/d	10.27	360	1126	3.65	3.21	3.39	15.1
High Density Residential	280 l/c/d	0.28	38	68	0.22	3.63	0.09	0.9
Roads	-	7.95				1	2.62	2.6
Park Block	-	1.48				1	0.49	0.5
Pond Blocks	-	1.78				1	0.59	0.6
Total		**23.9**		**1194**	**4.57**		**7.89**	**21.5**
Drummond Aggregate Extraction Area								
Schools	28,000 L/ha/d	1.25			0.41	1.5	0.41	1.0
Commercial	28,000 L/ha/d	0.57			0.18	1.5	0.19	0.5
Low-Medium Density Residential	280 l/c/d	8.72	288	900	2.92	3.26	2.88	12.4
High Density Residential	280 l/c/d	0.24	32	58	0.19	3.64	0.08	0.8
Roads	-	6.75				1	2.23	2.2

Land Use	Flow Rate	Area (ha)	Units	Pop.	Average Flow (L/S)	Peak Factor	Infiltration	Total Flows (L/s)
Park Blocks	-	1.26				1	0.42	0.4
Pond Blocks	-	1.51				1	0.50	0.5
Total		**20.3**		**958**	**3.70**		**6.71**	**17.8**
Barrhaven South Urban Expansion Area Totals								
Total		**121.0**		**5746**	**26.22**		**40.0**	**106.7**

Based on the land uses presented on the Demonstration Plan (Figure 4-2), the BSUEA would generate a peak wastewater flow of approximately 106.7 L/s.

6.3 Wastewater Collection System Strategy

6.3.1 Proposed Sewer System Layout and Sizing

A trunk sanitary sewer system layout was developed based on the ROW corridors identified on the BSUEA Demonstration Plan for the purposes of demonstrating the feasibility of providing wastewater servicing for the BSUEA lands, refer to the Key Servicing Plans. Proposed trunk sanitary sewers were sized based on the aforementioned design criteria and the drainage areas depicted on the Master Sanitary Drainage Area Drawing MSAN, refer to the BSUEA Sanitary Sewer Design Sheet (Appendix J) for detailed calculations. Final configuration and sizing of the wastewater collection system will be confirmed at detailed design of each subdivision stage. At such time, refinements may be implemented.

The proposed BSUEA trunk sanitary sewers will discharge to existing/planned sanitary sewers at the following six (6) locations, as shown on Figure 6-2:

1. The Future Collector Road
2. New Greenbank Road
3. Flameflower Street
4. Alex Polowin Avenue
5. Kilbirnie Drive
6. Greenbank Road

It is noted that the residual capacity in the River Mist Road trunk sanitary sewer has in fact increased with the addition of the BSUEA peak flows. This is the result of adding a relatively small tributary area while reducing the average daily residential flow from 350 L/cap to 280 L/cap combined with diverting some existing drainage areas, located in Quinn's Pointe, away from the outlet.

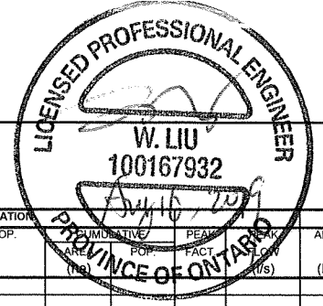
Table 6-4: Residual Capacity Comparison in the BSC Trunk Sanitary Sewers

Existing Trunk Sanitary Sewer	Limiting Pipe reach	Current Minimum Residual Capacity	Proposed BSUEA Tributary Lands	Proposed BSUEA Tributary Area	Revised Minimum Residual Capacity with inclusion of BSUEA Peak Flow
Cambrian Road	MH 13A to MH15A	51.4 L/s	Drummond, Brazeau, Mattamy West (Residential only)	48 ha	52.9 L/s
River Mist Road	MH 102A to MH 17A	14.4 L/s	Mattamy East, Mattamy West (Commercial only), Northwest corner of Minto	12 ha	30.5 L/s
River Mist Road	MH 1 to MH 163	5.58 L/s	Minto	5 ha	4.63 L/s
Greenbank Road	MH 45 to MH 435A	295.4 L/s	Minto	60 ha	283.2 L/s

With the addition of the BSUEA lands, a total theoretical peak wastewater flow of 403.7 L/s was calculated at the most downstream maintenance hole in the BSC (MH 501A on Greenbank Road), as indicated in the Sanitary Sewer Design Sheet in Appendix J. This calculated theoretical peak flow is less than the 590 L/s allocated for all of the BSC in Stantec's City-wide 2013 Wastewater Collection System Assessment. In this assessment, Stantec created a hydrodynamic model of trunk sanitary sewers (450 mm in diameter and greater) which demonstrated that the existing downstream trunk system could accommodate the theoretical flow of 590 L/s generated by the BSC with no risk of surcharging or basement flooding. Consequently, Stantec concluded that system upgrades were not required to accommodate the anticipated growth in the BSC. Since the Stantec assessment considered a peak flow that was 186 L/s greater than that calculated for the BSC and the BSUEA combined, it is understood that the existing trunk sanitary sewers located downstream of the BSC can accommodate the additional flows generated by the BSUEA.

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	UNITS Singles	UNITS Townhouse	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)
ruelle Echinacea Lane																													
	817A	818A	0.71	12	12		41	0.71	41	3.67	0.49		0.00		0.00		0.00	0.00	0.71	0.71	0.23	0.72	87.0	200	3.40	60.48	0.01	1.93	0.64
	818A	819A	0.34	6	6		21	1.05	62	3.64	0.73		0.00		0.00		0.00	0.00	0.34	1.05	0.35	1.08	48.0	200	1.45	39.49	0.03	1.26	0.54
To rue Cressida Street, Pipe 819A - 820A								1.05	62				0.00		0.00		0.00			1.05									
voie Crested Lark Way																													
	808A	809A	0.24	7		7	19	0.24	19	3.71	0.23		0.00		0.00		0.00	0.00	0.24	0.24	0.08	0.31	49.0	200	1.80	44.00	0.01	1.40	0.38
To croissant Amarnath Crescent, Pipe 809A - 815A								0.24	19				0.00		0.00		0.00			0.24									
	805A	806A	0.33	5	5		17	0.33	17	3.71	0.20		0.00		0.00		0.00	0.00	0.33	0.33	0.11	0.31	51.0	200	1.60	41.49	0.01	1.32	0.38
	806A	807A	0.13	1	1		4	0.46	21	3.70	0.25		0.00		0.00		0.00	0.00	0.13	0.46	0.15	0.40	11.5	200	1.55	40.83	0.01	1.30	0.42
	807A	809A	0.57	11	11		38	1.03	59	3.64	0.70		0.00		0.00		0.00	0.00	0.57	1.03	0.34	1.04	72.0	200	0.35	19.40	0.05	0.62	0.33
To croissant Amarnath Crescent, Pipe 809A - 815A								1.03	59				0.00		0.00		0.00			1.03									
croissant Amarnath Crescent																													
Contribution From voie Crested Lark Way, Pipe 808A - 809A								0.24	19				0.00		0.00		0.00		0.24	0.24									
Contribution From voie Crested Lark Way, Pipe 807A - 809A								1.03	59				0.00		0.00		0.00		1.03	1.27									
	809A	815A	0.22	9		9	25	1.49	87	3.61	1.02		0.00		0.00		0.00	0.00	0.22	1.49	0.49	1.51	77.5	200	0.35	19.40	0.08	0.62	0.36
To rue Cressida Street, Pipe 815A - 816A								1.49	87				0.00		0.00		0.00			1.49									
	810A	811A	0.27	12		12	33	0.27	33	3.68	0.39		0.00		0.00		0.00	0.00	0.27	0.27	0.09	0.48	90.0	200	0.65	26.44	0.02	0.84	0.32
	811A	812A	0.02				0	0.29	33	3.68	0.39		0.00		0.00		0.00	0.00	0.02	0.29	0.10	0.49	11.0	200	0.35	19.40	0.03	0.62	0.26
	812A	813A	0.04				0	0.33	33	3.68	0.39		0.00		0.00		0.00	0.00	0.04	0.33	0.11	0.50	30.5	200	0.35	19.40	0.03	0.62	0.26
	813A	814A	0.02				0	0.35	33	3.68	0.39		0.00		0.00		0.00	0.00	0.02	0.35	0.12	0.51	11.0	200	0.35	19.40	0.03	0.62	0.26
	814A	815A	0.07	3		3	9	0.42	42	3.66	0.50		0.00		0.00		0.00	0.00	0.07	0.42	0.14	0.64	26.5	200	1.25	36.67	0.02	1.17	0.44
To rue Cressida Street, Pipe 815A - 816A								0.42	42				0.00		0.00		0.00			0.42									
rue Cressida Street																													
Contribution From croissant Amarnath Crescent, Pipe 809A - 815A								1.49	87				0.00		0.00		0.00		1.49	1.49									
Contribution From croissant Amarnath Crescent, Pipe 814A - 815A								0.42	42				0.00		0.00		0.00		0.42	1.91									
	815A	816A	0.57	12	12		41	2.48	170	3.54	1.95		0.00		0.00		0.00	0.00	0.57	2.48	0.82	2.77	79.5	200	0.35	19.40	0.14	0.62	0.44
	816A	819A	0.48	9	9		31	2.96	201	3.52	2.29		0.00		0.00		0.00	0.00	0.48	2.96	0.98	3.27	79.5	200	0.35	19.40	0.17	0.62	0.46
Contribution From ruelle Echinacea Lane, Pipe 818A - 819A								1.05	62				0.00		0.00		0.00		1.05	4.01									
	819A	820A	0.60	10	10		34	4.61	297	3.46	3.33		0.00		0.00		0.00	0.00	0.60	4.61	1.52	4.86	120.0	200	0.35	19.40	0.25	0.62	0.51
PARK	CTRL MH 830A	820A														1.19	1.19	0.13	1.19	1.19	0.39	0.52	10.5	200	1.00	32.80	0.02	1.04	0.38
	820A	720A	0.27	4	4		14	4.88	311	3.46	3.48		0.00		0.00		1.19	0.13	0.27	6.07	2.00	5.62	65.5	200	0.35	19.40	0.29	0.62	0.53
To avenue Delphinus Avenue, Pipe 720A - 721A								4.88	311				0.00		0.00		1.19			6.07									
croissant Sonmarg Crescent																													
	709A	713A	0.21	2	2		7	0.21	7	3.74	0.08		0.00		0.00		0.00	0.00	0.21	0.21	0.07	0.15	12.5	200	0.75	28.40	0.01	0.90	0.23
	713A	714A	0.57	10	10		34	0.78	41	3.67	0.49		0.00		0.00		0.00	0.00	0.57	0.78	0.26	0.74	61.0	200	2.90	55.85	0.01	1.78	0.62
	714A	716A	0.42	8	8		28	1.20	69	3.63	0.81		0.00		0.00		0.00	0.00	0.42	1.20	0.40	1.21	60.5	200	2.15	48.09	0.03	1.53	0.63
To avenue Jackdaw Avenue, Pipe 716A - 717A								1.20	69				0.00		0.00		0.00			1.20									
	709A	710A	0.48	8	8		28	0.48	28	3.69	0.33		0.00		0.00		0.00	0.00	0.48	0.48	0.16	0.49	86.5	200	3.25	59.13	0.01	1.88	0.54
	710A	711A	0.19	2	2		7	0.67	35	3.67	0.42		0.00		0.00		0.00	0.00	0.19	0.67	0.22	0.64	12.5	200	2.20	48.65	0.01	1.55	0.54
	711A	712A	0.37	7	7		24	1.04	59	3.64	0.70		0.00		0.00		0.00	0.00	0.37	1.04	0.34	1.04	42.5	200	0.85	30.24	0.03	0.96	0.44
	712A	717A	0.65	12	12		41	1.69	100	3.59	1.17		0.00		0.00		0.00	0.00	0.65	1.69	0.56	1.72	80.5	200	0.65	26.44	0.07	0.84	0.47
To avenue Jackdaw Avenue, Pipe 717A - 718A								1.69	100				0.00		0.00		0.00			1.69									
voie Pine Warbler Way																													
	801A	802A	0.44	14		14	38	0.44	38	3.67	0.45		0.00		0.00		0.00	0.00	0.44	0.44	0.15	0.60	75.5	200	2.25	49.20	0.01	1.57	0.52
	802A	803A	0.74	25		25	68	1.18	106	3.59	1.23		0.00		0.00		0.00	0.00	0.74	1.18	0.39	1.62	101.5	200	0.35	19.40	0.08	0.62	0.37

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: A.M.

Checked: W.L.

Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 43,44

PROJECT: **THE MEDDOWS IN HALF MOON BAY PH7 AND 8**

LOCATION: **City of Ottawa**

File Ref: 19-1089 | Date: **Aug 2019** | Sheet No. 1 of 4

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	UNITS Singles	UNITS Townhouse	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)
	803A	804A	0.18	3		3	9	1.36	115	3.58	1.33		0.00		0.00		0.00	0.00	0.18	1.36	0.45	1.78	12.5	200	0.35	19.40	0.09	0.62	0.38
	804A	706A	0.56	18		18	49	1.92	164	3.54	1.88		0.00		0.00		0.00	0.00	0.56	1.92	0.63	2.52	75.0	200	0.35	19.40	0.13	0.62	0.42
To avenue Jackdaw Avenue, Pipe 706A - 707A								1.92	164				0.00		0.00		0.00			1.92									
cercle Lapwing Circle																													
	700A	7002A	0.18	6		6	17	0.18	17	3.71	0.20		0.00		0.00		0.00	0.00	0.18	0.18	0.06	0.26	45.0	200	0.65	26.44	0.01	0.84	0.27
	7002A	701A	0.09	4		4	11	0.27	28	3.69	0.33		0.00		0.00		0.00	0.00	0.09	0.27	0.09	0.42	35.5	200	0.35	19.40	0.02	0.62	0.25
	701A	7010A	0.06					0.33	28	3.69	0.33		0.00		0.00		0.00	0.00	0.06	0.33	0.11	0.44	46.0	200	0.35	19.40	0.02	0.62	0.25
To avenue Jackdaw Avenue, Pipe 7010A - 703A								0.33	28				0.00		0.00		0.00			0.33									
	702A	7020A	0.40	13		13	36	0.40	36	3.67	0.43		0.00		0.00		0.00	0.00	0.40	0.40	0.13	0.56	45.0	200	0.65	26.44	0.02	0.84	0.34
	7020A	703A	0.21	9		9	25	0.61	61	3.64	0.72		0.00		0.00		0.00	0.00	0.21	0.61	0.20	0.92	36.5	200	0.35	19.40	0.05	0.62	0.31
To avenue Jackdaw Avenue, Pipe 7010A - 703A								0.61	61				0.00		0.00		0.00			0.61									
ruelle Pipit Lane																													
	704A	705A	0.87	27		27	73	0.87	73	3.62	0.86		0.00		0.00		0.00	0.00	0.87	0.87	0.29	1.14	114.5	200	0.95	31.97	0.04	1.02	0.47
To avenue Jackdaw Avenue, Pipe 705A - 706A								0.87	73				0.00		0.00		0.00			0.87									
avenue Jackdaw Avenue																													
								0.00	0				0.00		0.00		0.00		0.00	0.00									
	715A	716A	0.07				0	0.07	0				0.00		0.00		0.00	0.00	0.07	0.07	0.02	0.02	38.0	250	0.25	29.73	0.00	0.61	0.09
Contribution From croissant Sonmarg Crescent, Pipe 714A - 716A								1.20	69				0.00		0.00		0.00		1.20	1.27									
	716A	717A	0.27	2	2		7	1.54	76	3.62	0.89		0.00		0.00		0.00	0.00	0.27	1.54	0.51	1.40	103.5	250	0.25	29.73	0.05	0.61	0.31
Contribution From croissant Sonmarg Crescent, Pipe 712A - 717A								1.69	100				0.00		0.00		0.00		1.69	3.23									
SCHOOL	CTRL MH 840A	717A												2.80	2.80			0.91	2.80	2.80	0.92	1.83	11.0	200	1.00	32.80	0.06	1.04	0.56
	717A	718A	0.13				0	3.36	176	3.53	2.02		0.00		2.80		0.00	0.91	0.13	6.16	2.03	4.96	85.5	250	1.20	65.14	0.08	1.33	0.78
To avenue Delphinus Avenue, Pipe 718A - 719A								3.36	176				0.00		2.80		0.00			6.16									
Contribution From cercle Lapwing Circle, Pipe 701A - 7010A								0.33	28				0.00		0.00		0.00		0.00	0.33									
Contribution From cercle Lapwing Circle, Pipe 7002A - 7010A								0.61	61				0.00		0.00		0.00		0.00	0.61									
	7010A	703A	0.04	1		1	3	0.98	92	3.60	1.07		0.00		0.00		0.00	0.00	0.04	0.98	0.32	1.40	17.0	200	0.35	19.40	0.07	0.62	0.36
	703A	705A	0.35	10		10	27	1.33	119	3.58	1.38		0.00		0.00		0.00	0.00	0.35	1.33	0.44	1.82	80.5	200	0.35	19.40	0.09	0.62	0.39
Contribution From ruelle Pipit Lane, Pipe 704A - 705A								0.87	73				0.00		0.00		0.00		0.87	2.20									
	705A	706A	0.13				0	2.33	192	3.52	2.19		0.00		0.00		0.00	0.00	0.13	2.33	0.77	2.96	79.0	200	0.35	19.40	0.15	0.62	0.44
Contribution From voie Pine Warbler Way, Pipe 804A - 706A								1.92	164				0.00		0.00		0.00		1.92	4.25									
			0.18	3	3		11	4.43	367				0.00		0.00		0.00		0.18	4.43									
	706A	707A	0.20	5		5	14	4.63	381	3.43	4.23		0.00		0.00		0.00	0.00	0.20	4.63	1.53	5.76	77.5	200	0.35	19.40	0.30	0.62	0.54
			0.35	7	7		24	4.98	405				0.00		0.00		0.00		0.35	4.98									
	707A	708A	0.37	10		10	27	5.35	432	3.40	4.77		0.00		0.00		0.00	0.00	0.37	5.35	1.77	6.53	79.5	200	0.35	19.40	0.34	0.62	0.55
	708A	718A	0.08	1	1		4	5.43	436	3.40	4.81		0.00		0.00		0.00	0.00	0.08	5.43	1.79	6.60	30.0	200	0.35	19.40	0.34	0.62	0.56
To avenue Delphinus Avenue, Pipe 718A - 719A								5.43	436				0.00		0.00		0.00			5.43									
	703A	902A	0.25	7		7	19	0.25	19	3.71	0.23		0.00		0.00		0.00	0.00	0.25	0.25	0.08	0.31	72.0	200	4.20	67.22	0.00	2.14	0.51
To Future Greenbank Road, Pipe 902A - 903A								0.25	19				0.00		0.00		0.00			0.25									

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

LICENSED PROFESSIONAL ENGINEER
W. LIU
100167932
Aug 16, 2019
PROVINCE OF ONTARIO

Designed: A.M.
Checked: W.L.
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 43,44

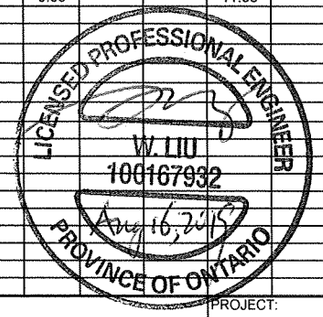
PROJECT: **THE MEDDOWS IN HALF MOON BAY PH7 AND 8**
LOCATION: **City of Ottawa**
File Ref: 19-1089
Date: **Aug 2019**
Sheet No. 2 of 4

1089_San2_Match_MSS.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	UNITS Singles	UNITS Townhouse	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)
avenue Delphinus Avenue																													
							0	0.00	0				0.00		0.00		0.00		0.00	0.00									
Contribution From Drummond Lands (BSUEA)			15.98				1019	15.98	1019			0.58	0.58	0.40	0.40		0.00		16.96	16.96									
Contribution From Brazeau Lands (BSUEA)			21.77				1309	37.75	2328			0.68	1.26	1.45	1.85		0.00		23.90	40.86									
								37.75	2328				1.26		1.85		0.00		0.00	40.86									
		800A	801A	0.09			0	37.84	2328	3.03	22.84		1.26		1.85		0.00	1.01	0.09	40.95	13.51	37.36	38.0	375	0.25	87.67	0.43	0.79	0.76
	Local Pipe	801A	8011A	0.34	8		8	22	0.34	22	3.70	0.26								0.34	0.34	0.11	0.38	62.0	200	3.70	63.09	0.01	2.01	0.55
		801A	8011A						38.18	2350	3.02	23.03		1.26		1.85		0.00	1.01	0.00	41.29	13.63	37.67	62.0	375	0.25	87.67	0.43	0.79	0.76
		8011A	718A	0.15	3		3	9	38.33	2359	3.02	23.11		1.26		1.85		0.00	1.01	0.15	41.44	13.68	37.79	36.5	375	0.25	87.67	0.43	0.79	0.76
Contribution From avenue Jackdaw Avenue, Pipe 708A - 718A									5.43	436				0.00		0.00		0.00		5.43	46.87									
Contribution From avenue Jackdaw Avenue, Pipe 717A - 718A									3.36	176				0.00		2.80		0.00		6.16	53.03									
	Local Pipe	718A	719A	0.34	8		8	22	0.34	22	3.70	0.26								0.34	0.34	0.11	0.38	67.0	200	0.65	26.44	0.01	0.84	0.29
		718A	719A						47.46	2993	2.95	28.66		1.26		4.65		0.00	1.92	0.00	53.37	17.61	48.19	67.0	375	0.25	87.67	0.55	0.79	0.81
	Local Pipe	719A	720A	0.35	9		9	25	0.35	25	3.69	0.30								0.35	0.35	0.12	0.41	65.0	200	2.20	48.65	0.01	1.55	0.47
		719A	720A						47.81	3018	2.95	28.87		1.26		4.65		0.00	1.92	0.00	53.72	17.73	48.52	65.0	375	0.90	166.33	0.29	1.51	1.30
Contribution From rue Cressida Street, Pipe 820A - 720A									4.88	311				0.00		0.00		1.19		6.07	59.79									
	Local Pipe	720A	7210A	0.22	6		6	17	0.22	17	3.71	0.20								0.22	0.22	0.07	0.28	38.5	200	0.65	26.44	0.01	0.84	0.27
		720A	7210A						52.91	3346	2.92	31.68		1.26		4.65		1.19	2.04	0.00	60.01	19.80	53.52	38.5	375	0.30	96.03	0.56	0.87	0.89
		7210A	721A	0.19					53.10	3346	2.92	31.68		1.26		4.65		1.19	2.04	0.19	60.20	19.87	53.59	81.5	375	0.30	96.03	0.56	0.87	0.89
		721A	722A	0.28				0	53.38	3346	2.92	31.68		1.26		4.65		1.19	2.04	0.28	60.48	19.96	53.68	109.0	375	0.30	96.03	0.56	0.87	0.89
		722A	Ex, 501A						53.38	3346	2.92	31.68		1.26		4.65		1.19	2.04	0.00	60.48	19.96	53.68	20.5	375	0.25	87.67	0.61	0.79	0.83
Future Greenbank Road																													
Contribution From Future School													6.06						6.06	6.06									
Contribution From Drummond Lands (BSUEA)			2.50				160	2.50	160										2.50	8.56									
Contribution From ravenue Delphinus Avenue, Pipe 703A - 902A								0.25	19				0.00		0.00		0.00		0.00	0.25									
								2.75	179				0.00		6.06		0.00	1.96	0.00	8.81									
				0.61					3.36	179				0.00		6.06		0.00	1.96	0.61	9.42									
		902A	903A	0.26					3.62	179	3.53	2.05		0.00		6.06		0.00	1.96	0.26	9.68	3.19	7.21	61.5	250	0.25	29.73	0.24	0.61	0.50
		903A	904A	0.61					4.23	179	3.53	2.05		0.00		6.06		0.00	1.96	0.61	10.29	3.40	7.41	145.0	250	0.25	29.73	0.25	0.61	0.50
		904A	905A	0.61					4.84	179	3.53	2.05		0.00		6.06		0.00	1.96	0.61	10.90	3.60	7.61	145.0	250	0.25	29.73	0.26	0.61	0.51
		905A	Ex. Plug	0.18					5.02	179	3.53	2.05		0.00		6.06		0.00	1.96	0.18	11.08	3.66	7.67	38.0	250	0.50	42.05	0.18	0.86	0.65
		Ex. Plug	Ex. MH 57A	0.00					5.02	179	3.53	2.05		0.00		6.06		0.00	1.96	0.00	11.08	3.66	7.67	15.0	250	0.50	42.05	0.18	0.86	0.65
To Cambrian Road, Pipe Ex. 57A - 83A									5.02	179				0.00		6.06		0.00			11.08									



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

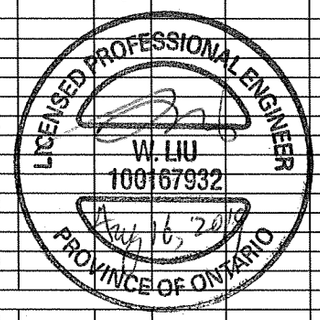
Designed: A.M.
Checked: W.L.
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 43,44

PROJECT: THE MEDDOWS IN HALF MOON BAY PH7 AND 8
LOCATION: City of Ottawa
File Ref: 19-1089
Date: Aug 2019
Sheet No. 3 of 4

SANITARY SEWER CALCULATION SHEET

Manning's n=0.013

LOCATION			RESIDENTIAL AREA AND POPULATION					CUMULATIVE		PEAK	PEAK	COMM		INSTIT		PARK		C+I+I	INFILTRATION			TOTAL	PIPE						
STREET	FROM M.H.	TO M.H.	AREA (ha)	UNITS	UNITS Singles	UNITS Townhouse	POP.	AREA (ha)	POP.	FACT.	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)
Cambrian Road																													
Contribution From avenue Delphius Avenue, Pipe 772A - Ex 501A								53.38	3346				1.26		4.65		1.19		60.48	60.48									
Contribution From rue Apolune Street, Pipe 128A - 500A (From 888)								4.21	417								3.19		7.40	67.88									
	500A	501A						57.59	3763	2.89	35.19		1.26		4.65		4.38	2.39	0.00	67.88	22.40	59.98	6.5	500	0.12	130.80	0.46	0.67	0.65
Contribution From rue Apolune Street, Pipe 132A - 501A (From 888)								1.29	91										1.29	69.17									
	501A	5010A	0.95					59.83	3854	2.88	35.95		1.26		4.65		4.38	2.39	0.95	70.12	23.14	61.47	124.0	500	0.12	130.80	0.47	0.67	0.65
	5010A	502A						59.83	3854	2.88	35.95		1.26		4.65		4.38	2.39	0.00	70.12	23.14	61.47	124.0	500	0.12	130.80	0.47	0.67	0.65
Contribution From croissant Aphelion Crescent, Pipe 121A - 502A (From 888)								11.06	1144								0.24		11.30	81.42									
School (From 888)														6.05	6.05			1.96	6.05	6.05	2.00	3.96	16.5	200	1.00	32.80	0.12	1.04	0.70
	502A	503A	0.42					71.31	4998	2.80	45.29		1.26		10.70		4.62	4.37	0.42	87.89	29.00	78.67	111.5	500	0.15	146.24	0.54	0.74	0.76
Future Commercial Block												1.36	1.36					0.44	1.36	1.36	0.45	0.89	25.5	200	1.00	32.80	0.03	1.04	0.44
Future Commercial Block												1.50	1.50					0.49	1.50	1.50	0.50	0.98	17.0	200	1.00	32.80	0.03	1.04	0.46
	503A	504A	0.20					71.51	4998	2.80	45.29		4.12		10.70		4.62	5.30	0.20	90.95	30.01	80.60	29.5	500	0.15	146.24	0.55	0.74	0.76
	504A	*Ex. 57A*						71.51	4998	2.80	45.29		4.12		10.70		4.62	5.30	0.00	90.95	30.01	80.60	26.0	500	0.61	294.91	0.27	1.50	1.28
Contribution from fut. Greenbank Road, Ex. plug - Ex. 57A								5.02	179				0.00		6.06		0.00		11.08	102.03									
	Ex. 57A	*Ex. 83A*	1.63					78.16	5177	2.78	46.72	3.30	7.42		16.76		4.62	8.33	4.93	106.96	35.30	90.35	96.3	500	0.24	184.98	0.49	0.94	0.93
	Ex. 83A	*Ex. 13A*	0.50					78.66	5177	2.78	46.72		7.42		16.76		4.62	8.33	0.50	107.46	35.46	90.52	120.2	500	0.25	188.80	0.48	0.96	0.95
Contribution from STM & SAN EASEMENT 1, Pipe 813A - 13A								1.34	181										1.34	108.80									
	Ex. 13A	Ex. 14A	0.43	0			0	80.43	5358	2.77	48.16		7.42		16.76		4.62	8.33	0.43	109.23	36.046	92.54	120.0	500	0.19	164.59	0.56	0.84	0.86
Contribution From Block 529, Pipe 203A - 14A								0.62	64										0.62	109.85									
	Ex. 14A	Ex. 15A	0.13	0			0	81.18	5422	2.77	48.67		7.42		16.76		4.62	8.33	0.13	109.98	36.293	93.30	44.3	500	0.21	173.04	0.54	0.88	0.90
Contribution From GRAND CANAL STREET, Pipe Ex. 12A - 15A								11.07	1361										11.07	121.05									
Contribution From GRAND CANAL STREET, Ex. Pipe 819A - 15A								5.86	546									0.00	5.86	126.91									
	Ex. 15A	Ex. 150A	0.24	0			0	98.35	7329	2.67	63.41		7.42		16.76		4.62	8.33	0.24	127.15	41.960	113.71	77.9	500	0.27	196.20	0.58	1.00	1.03
	Ex. 150A	Ex. 16A	0.29	0			0	98.64	7329	2.67	63.41		7.42		16.76		4.62	8.33	0.29	127.44	42.055	113.80	89.9	600	0.11	203.64	0.56	0.72	0.74
Contribution From Block 530, Pipe Ex. 206A - 16A								0.45	41										0.45	127.89									
Contribution From Block 525, Pipe Ex. 209A - 16A								0.47	42										0.47	128.36									
	Ex. 16A	Ex. 17A	0.10	0			0	99.66	7412	2.67	64.04		7.42		16.76		4.62	8.33	0.10	128.46	42.392	114.76	34.7	600	0.16	245.60	0.47	0.87	0.85
Contribution From RIVER MIST ROAD, Pipe Ex. 58A - 17A								17.86	1224				3.00						20.86	149.32									
Contribution From RIVER MIST ROAD, Pipe Ex. 102A - 17A								60.70	4447				4.90				2.50		68.10	217.42									
	Ex. 17A	Ex. 18A	0.27	0			0	178.49	13083	2.47	104.74		15.32		16.76		7.12	11.16	0.27	217.69	71.838	187.74	89.2	750	0.15	431.17	0.44	0.98	0.94
	Ex. 18A	Ex. 19A	0.31	0			0	178.80	13083	2.47	104.74		15.32		16.76		7.12	11.16	0.31	218.00	71.940	187.84	88.1	750	0.14	416.55	0.45	0.94	0.92
Contribution From Block 526, Pipe Ex. 212A - 19A								0.47	42										0.47	218.47									
	Ex. 19A	Ex. 21A	0.10	0			0	179.37	13125	2.47	105.03		15.32		16.76		7.12	11.16	0.10	218.57	72.128	188.32	28.6	750	0.16	445.31	0.42	1.01	0.96
Contribution From REGATTA AVENUE, Ex. Pipe 77A - 21A								5.58	349										5.58	224.15									
	Ex. 21A	Ex. 20A	0.17	0			0	185.12	13474	2.46	107.42		15.32		16.76		7.12	11.16	0.17	224.32	74.026	192.61	50.3	750	0.13	401.40	0.48	0.91	0.90
Contribution From Block 527, Pipe Ex. 213A - 20A								0.77	59										0.77	225.09									
	Ex. 20A	Ex. 222A	0.29	0			0	186.18	13533	2.46	107.83		15.32		16.76		7.12	11.16	0.29	225.38	74.375	193.36	80.2	750	0.14	416.55	0.46	0.94	0.92
	Ex. 222A	Ex. 22A	0.22	0			0	186.40	13533	2.46	107.83		15.32		16.76	2.89	10.01	11.47	3.11	228.49	75.402	194.70	50.6	750	0.14	416.55	0.47	0.94	0.93
	Ex. 22A	Ex. 45A	0.33	0			0	186.73	13533	2.46	107.83		15.32		16.76		10.01	11.47	0.33	228.82	75.511	194.81	95.7	750	0.13	401.40	0.49	0.91	0.90
To GREENBANK ROAD , Pipe Ex. 45A - Ex. 433A								186.73	13533				15.32		16.76		10.01			228.82									



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

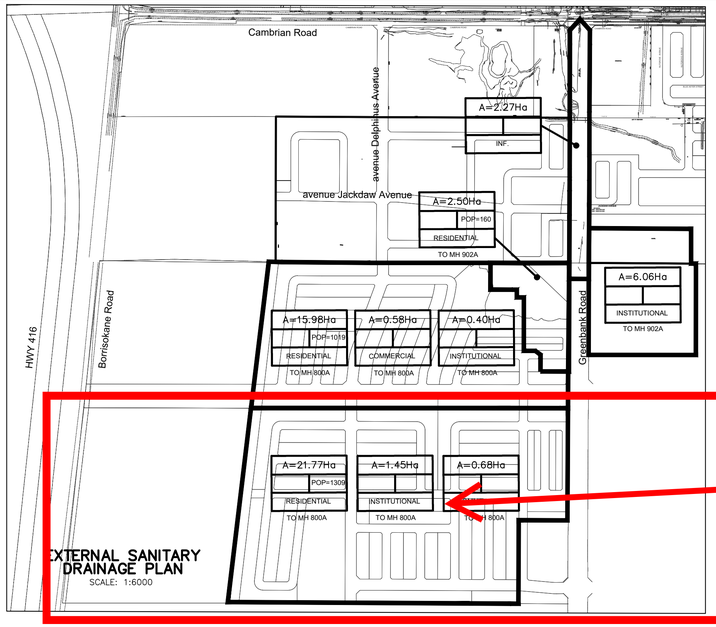
Designed: A.M.
Checked: W.L.
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No. 43,44

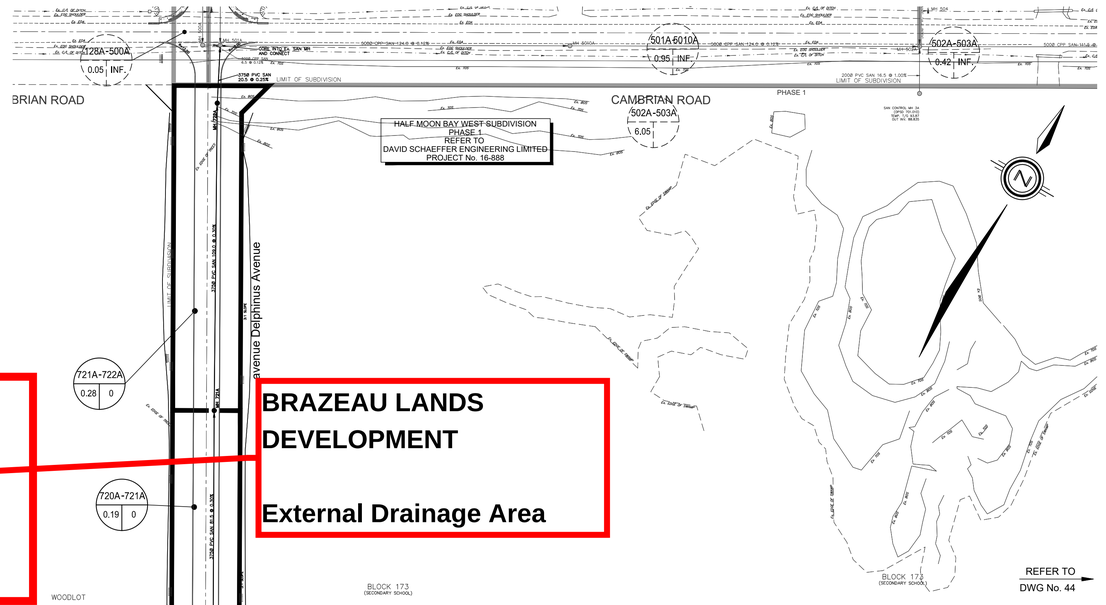
PROJECT: **THE MEDDOWS IN HALF MOON BAY PH7 AND 8**
LOCATION: **City of Ottawa**
File Ref: 19-1089
Date: **Aug 2019**
Sheet No. 4 of 4

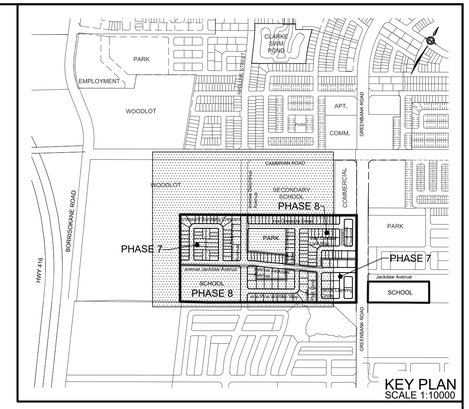
EXTERNAL SANITARY DRAINAGE PLAN
SCALE: 1:6000

BRAZEAU LANDS DEVELOPMENT

External Drainage Area







LEGEND

- SANITARY DRAINAGE BOUNDARY
- SANITARY SUB-DRAINAGE BOUNDARY
- SANITARY DRAINAGE BOUNDARY (OTHER PHASES)
- UPSTREAM MH TO DOWNSTREAM MH — 43A - 44A
- AREA IN HECTARES — 0.78
- POPULATION — 61
- UPSTREAM MH TO DOWNSTREAM MH — 43A–44A
- AREA IN OTHER PHASES IN HECTARES — 0.78
- POPULATION — 61
- EXTERNAL AREA IN HECTARES — A=53.63
- EXTERNAL POPULATION — 107
- DENSITY (PERSONS/HECTARE) — POP=5739
- EXTERNAL LAND USE — RESIDENTIAL
- MAINTENANCE HOLE — 200mm ø SAN — MH202A
- CAP

TOPOGRAPHIC INFORMATION
CITY OF OTTAWA 1K MAPPING, RECEIVED ON FEBRUARY 7, 2017
AND DECEMBER 21, 2018.

LEGAL INFORMATION
CALCULATED M-PLAN PROVIDED BY STANTEC, PROJECT No. 161613817-132, RECEIVED ON AUGUST 12, 2019.

2nd SUBMISSION 19-08-16

BENCH MARK No. 00820010126
POINT IS LOCATED 1.65km NORTH OF BARNSDALE ROAD AND 5km SOUTH OF FALLOWFIELD ROAD ON HIGHWAY 416 NORTH OF KEMPTVILLE. THE POINT IS SET EAST OF THE NORTHBOUND LANE IN THE GRASSY SHOULDER.
ELEVATION = 96.923 m

No.	BY	DATE	DESCRIPTION	BY
2	W.L.	19-08-16	2nd SUBMISSION	
1	W.L.	19-04-16	1st SUBMISSION	

CITY OF OTTAWA

PROJECT No. 19-1089

LICENSED PROFESSIONAL ENGINEER — W. LIU — 100167932 — 19-08-16 — PROVINCE OF ONTARIO

SANITARY DRAINAGE PLAN

TAMARACK (NEPEAN) CORPORATION

THE MEADOWS IN HALF MOON BAY
PHASES 7 & 8 (3640 Greenbank Road)

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

DRAWN BY: R.A./M.M.	CHECKED BY: C.M.K.	DRAWING NO.	SHEET NO.
DESIGNED BY: W.L.	CHECKED BY: P.P.		43
SCALE: 1:1000	DATE: APRIL 2019		

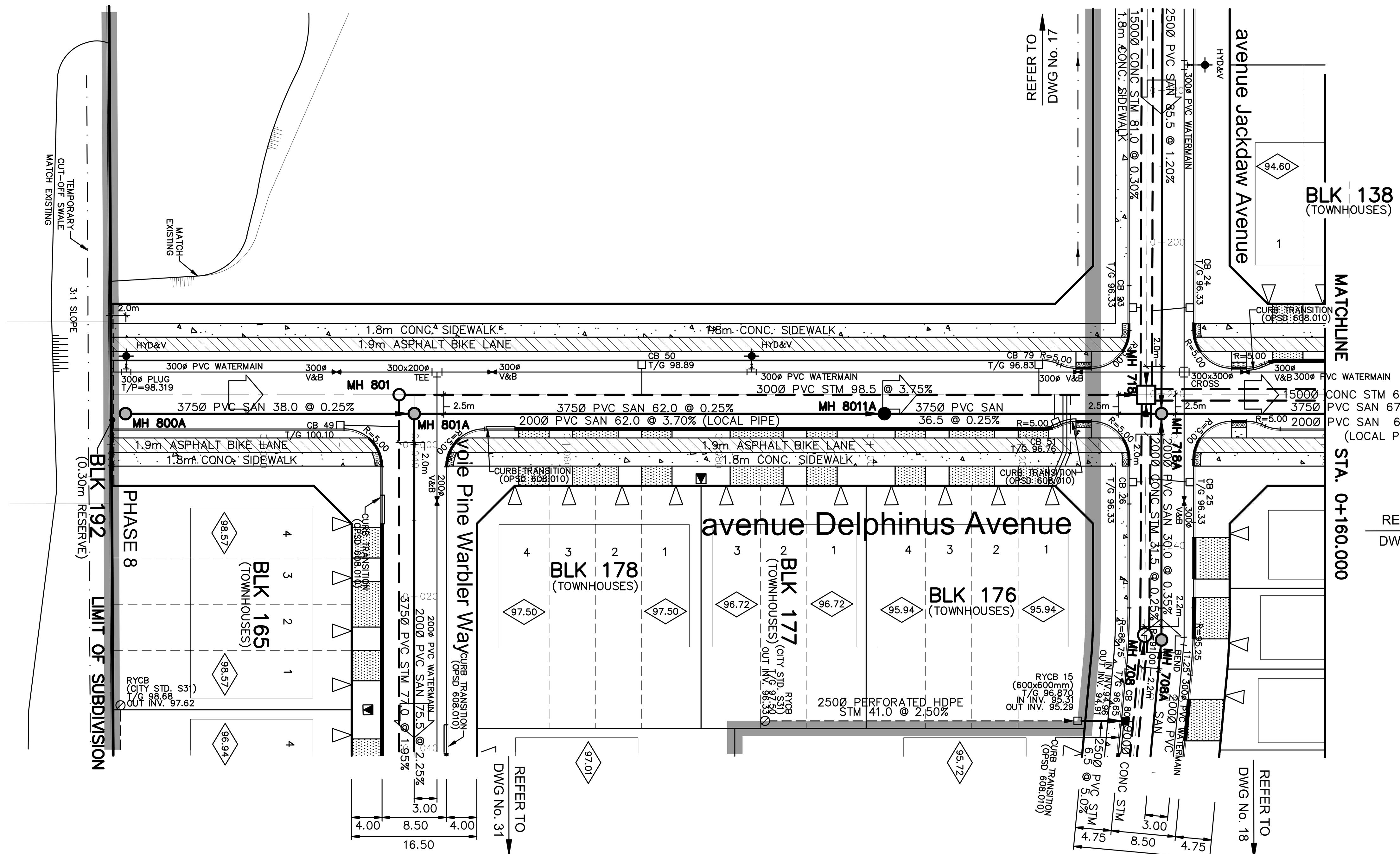
CITY FILE No. D07-16-18-0011 CITY PLAN No. XXXX

PAVEMENT DESIGN

40mm SUPERPAVE 12.5 ASPHALTIC CONCRETE
100mm SUPERPAVE 19.0 ASPHALTIC CONCRETE BINDER COURSE
150mm OPSS GRANULAR A CRUSHED STONE
600mm OPSS GRANULAR B TYPE II

NOTE RE: TEST PIT/BOREHOLE EXCAVATIONS
ANY DISTURBED MATERIAL ENCOUNTERED BELOW THE SUBGRADE LEVEL WITHIN A BUILDING FOOTPRINT TO BE SUB-EXCAVATED AND BACKFILLED WITH COMPACTED ENGINEERED FILL AS PER GEOTECHNICAL ENGINEERS RECOMMENDATION.

NOTE RE: DEEP SERVICE CONNECTION
FOR DEEP SANITARY SERVICE CONNECTIONS, REFER TO THE DETAIL ON DWG. 3



NOTE:
ALL EXISTING TREES, SHRUBS ETC. WITHIN LOTS, BLOCKS AND ROADS TO BE REMOVED, UNLESS OTHERWISE NOTED

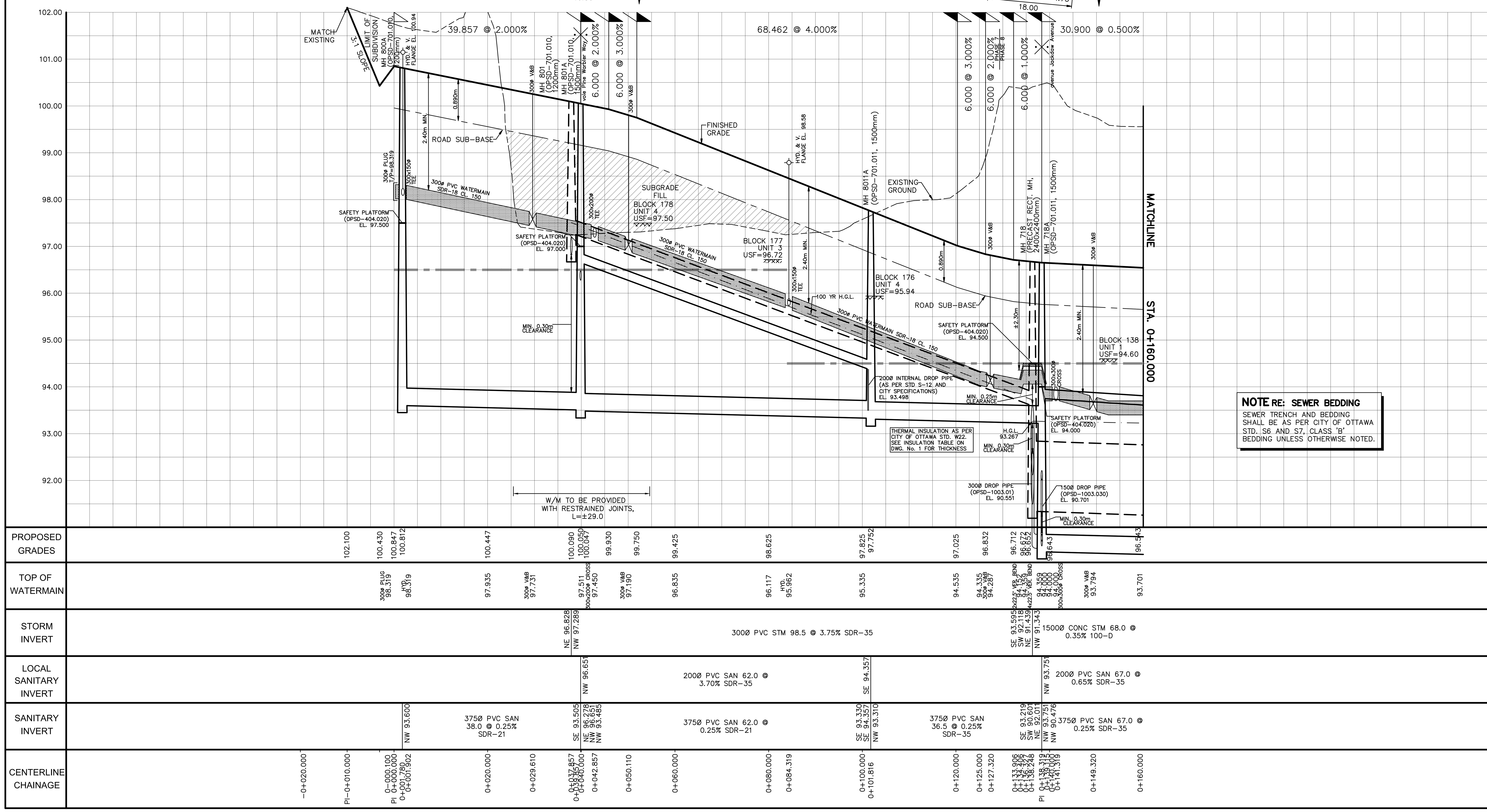
NOTE: ICD
FOR ICD APPLICATION, REFER TO DRAWING No. 3 FOR DETAIL.

NOTE
FOR WATERMAIN STUBS, 2.4m MIN. COVER TO BE PROVIDED

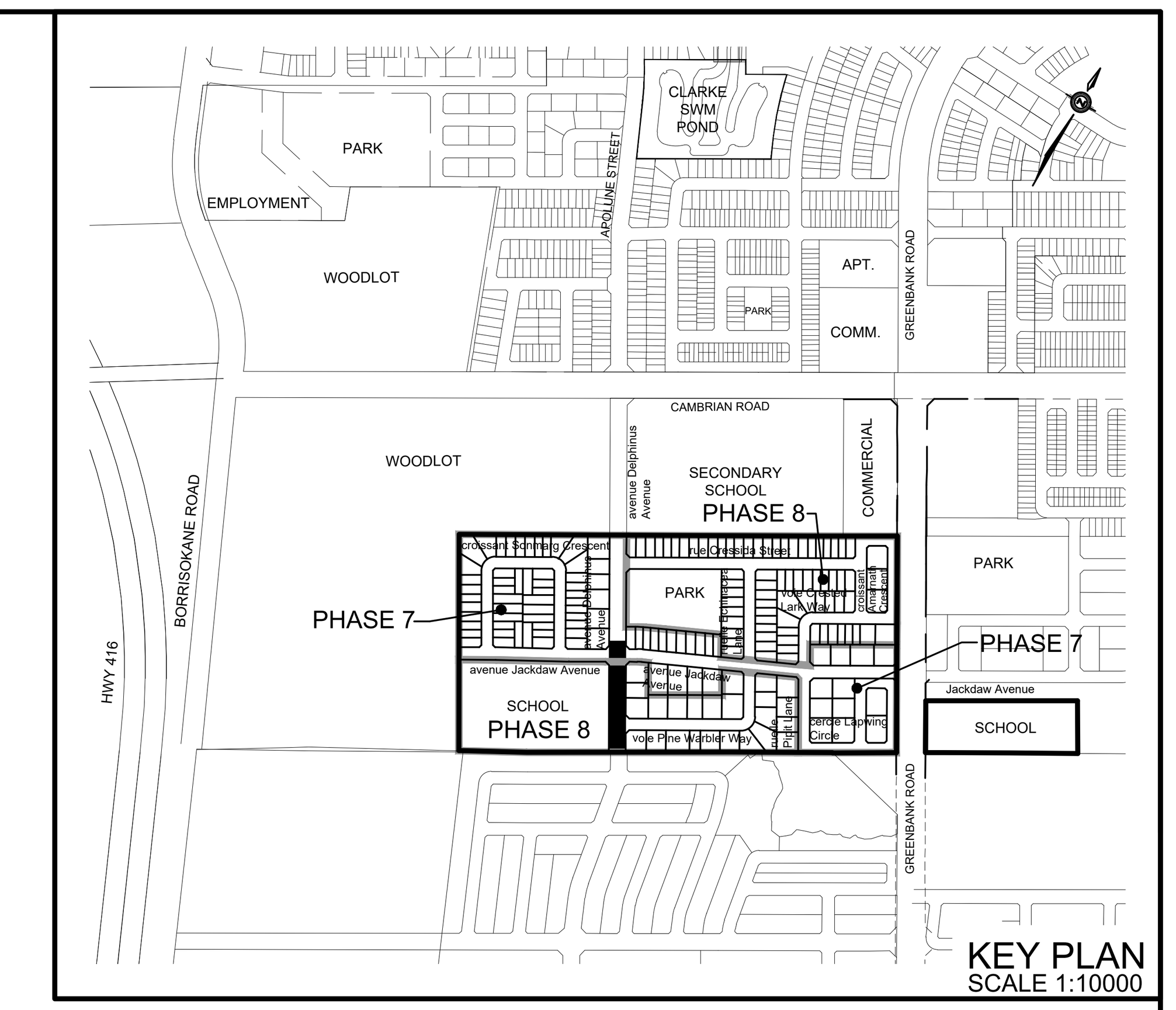
PERMISSION REQUIRED FOR WORK ON ADJACENT LANDS

CONTRACTOR TO VERIFY THE PRECISE LOCATIONS AND INVERT ELEVATIONS OF Ex. UNDERGROUND SERVICES AND Ex. UTILITIES PRIOR TO STARTING CONSTRUCTION

ANY DISTURBED AREA DURING CONSTRUCTION TO BE RESTORED TO THE ORIGINAL CONDITION OR BETTER TO THE SATISFACTION OF THE AUTHORITIES HAVING JURISDICTION



NOTE RE: SEWER BEDDING
SEWER TRENCH AND BEDDING SHALL BE AS PER CITY OF OTTAWA STD. S6 AND S7, CLASS 'B' BEDDING UNLESS OTHERWISE NOTED.



LEGEND

CROSS
45° BEND
LATERAL
HYDRANT, VALVE & VB
TEE
VALVE & VC
VALVE & VB
22.5° BEND
11.25° BEND
REDUCER
CAP
SANITARY MAINTENANCE HOLE
CAP
STREET CATCHBASIN & LEAD
STREET CATCHBASIN WITH CLOSED LID & LEAD
STORM MAINTENANCE HOLE
CURB INLET CATCHBASIN & LEAD
CATCHBASIN/ MAINTENANCE HOLE
INTERCONNECTED CATCH BASIN & LEADS
CAP
SINGLE SERVICE LOCATION (ST, SAN & WM)
SINGLE SERVICE LOCATION (SAN & WM)
SINGLE SERVICE LOCATION (ST, SAN & WM)
TEE CATCHBASIN
PERFORATED PIPE
ELBOW CATCHBASIN
DITCH AND CULVERT
HYDRO TRANSFORMER
STREET LIGHT STANDARD
CONCRETE SIDEWALK
CURB & DEPRESSED CURB
ASPHALT SIDEWALK
CHAINLINK FENCE (1.5m UNLESS OTHERWISE NOTED)
NOISE BARRIER (2.5m UNLESS OTHERWISE NOTED)
DECORATIVE FENCE (SEE LANDSCAPE DWGS FOR DETAIL)
CONSTRUCTION FENCE
POST AND RAIL FENCE
PHASING LIMITS
PROPERTY BOUNDARY
BOREHOLE (BH)
TEST PIT (TP)
AUGER HOLE (AH)
MONITORING WELL LOCATION
CONCEPTUAL WELL LOCATION
(AS PER GEOTECHNICAL REPORT)
TOP OF FOUNDATION ELEVATION
FINISHED FLOOR ELEVATION
UNDERSIDE OF FOOTING ELEVATION
NUMBER OF RISERS
UNITS REQUIRING PRESSURE REDUCING VALVES
WALKOUT UNITS
SLAB ON GRADE
OVERLAND FLOW DIRECTION
EXTERNAL OVERLAND FLOW DIRECTION
EMERGENCY OVERLAND FLOW DIRECTION
TACTILE WALKING SURFACE INDICATOR (AS PER CITY OF OTTAWA STD. SC6, SC7, SC7.1, SC7.2, SC7.3)
PREVIOUS PHASES
CLAY SEAL (REFER TO GENERAL NOTES. No.18. ON DWG. No. 1, AND GEOTECHNICAL CONSULTANT'S SPECIFICATIONS)
MIN. USF AS PER GEOTECHNICAL CONSULTANT'S RECOMMENDATION

TOPOGRAPHIC INFORMATION

CITY OF OTTAWA 1K MAPPING, RECEIVED ON FEBRUARY 7, 2017 AND DECEMBER 21, 2018.

LEGAL INFORMATION

CALCULATED M-PLAN PROVIDED BY STANTEC, PROJECT No. 161613817-132, RECEIVED ON AUGUST 12, 2019.

2nd SUBMISSION 19-08-16

BENCH MARK No. 00820010126

POINT IS LOCATED 1.65km NORTH OF BARNSDALE ROAD AND 5km SOUTH OF FALLOWFIELD ROAD ON HIGHWAY 416 NORTH OF KEMPTVILLE. THE POINT IS SET EAST OF THE NORTHBOUND LANE IN THE GRASSY SHOULDER.
ELEVATION = 96.923 m

No.	BY	DATE	DESCRIPTION	BY
2	W.L.	19-08-16	2nd SUBMISSION	
1	W.L.	19-04-16	1st SUBMISSION	

Ottawa CITY OF OTTAWA

PROJECT No. 19-1089

LICENSED PROFESSIONAL ENGINEER W. LIU 100167932 19-08-16 PROVINCE OF ONTARIO

PLAN AND PROFILE OF
avenue Delphinus Avenue
(STA. 0+000.000 TO STA. 0+160.000)

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TAMARACK (NEPEAN) CORPORATION

THE MEADOWS IN HALF MOON BAY
PHASES 7 & 8 (3640 Greenbank Road)

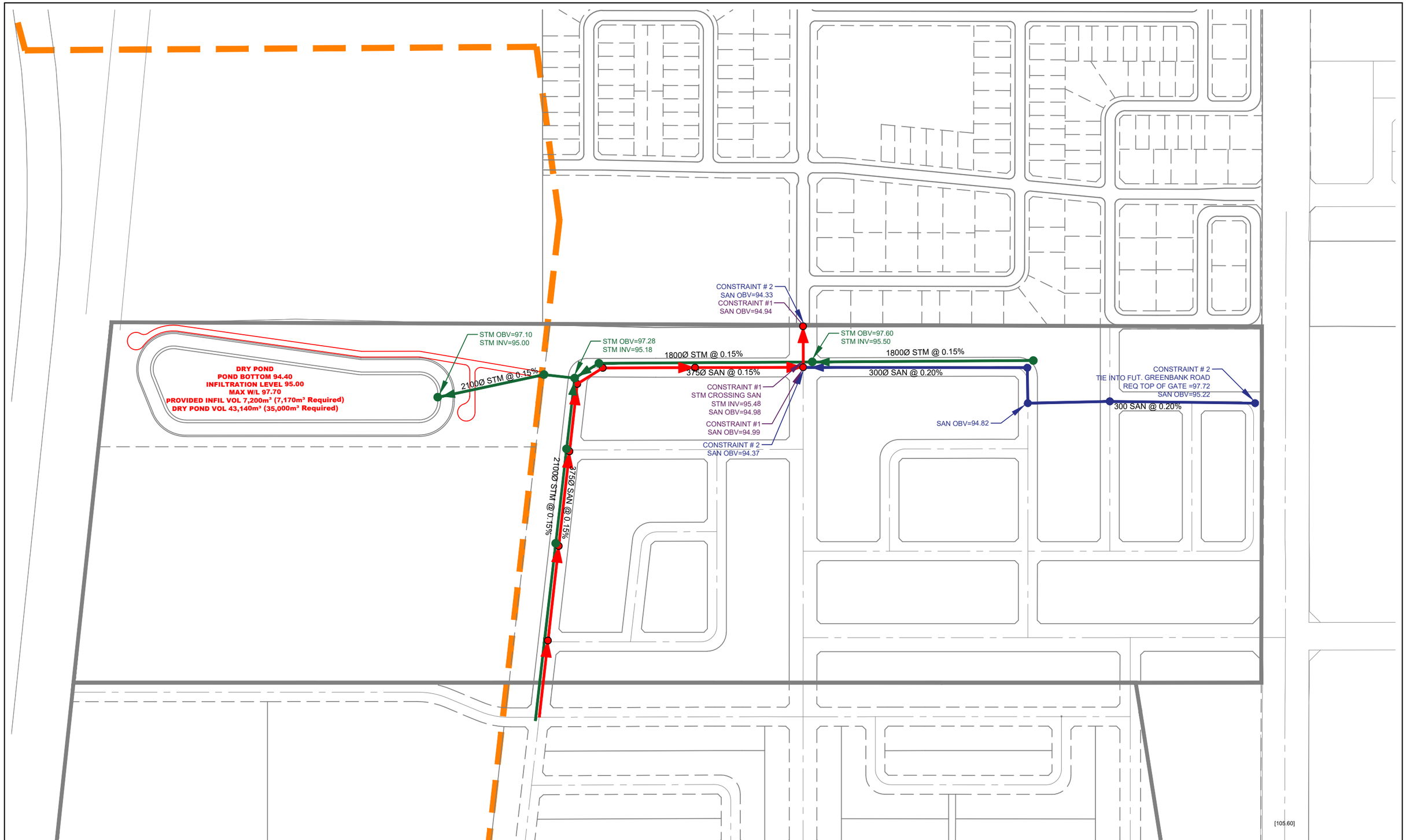
DSEL
david schaeffer engineering ltd

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

DRAWN BY:	R.A./M.M.	CHECKED BY:	C.M.K.	DRAWING NO.	SHEET NO.
DESIGNED BY:	W.L.	CHECKED BY:	P.P.		14
SCALE:	H 1:500, V 1:50	DATE:	APRIL 2019		

CITY PLAN No. XXXX

CITY FILE No. D07-16-18-0011



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DRUMMOND POND - SANITARY CONSTRAINTS FIGURE

PROJ NO.:	19–1123
DRAWN BY:	SLM
DATE:	2019–08–22
SCALE:	1: 3000
FIGURE NO.:	FIG-1

w:\design\191123_caivan_drummond\preliminary\02_aug2219_san-constraints\1123_grad_aug0119.dwg

LEGEND

- SUBJECT LANDS
- SANITARY TRUNK
- LOCAL SANITARY SEWER
- EXISTING SANITARY SEWER
- SANITARY SEWER BY OTHERS
- SANITARY DRAINAGE AREA
- EXTERNAL SANITARY DRAINAGE AREA

4.70m
92.44TG
87.74OBV

SANITARY SEWER COVER
PROPOSED SANITARY MANHOLE
TOP OF GRADE

PROPOSED SANITARY OBVERT

7.50Ha
85
638
MH UP
MH DOWN
Detached

SANITARY DRAINAGE AREA
POPULATION PER HECTARE
TOTAL POPULATION
UPSTREAM MANHOLE
DOWNSTREAM MANHOLE
TRIB TYPE

SANITARY MANHOLE

CLARKE SWM POND

APARTMENT

PARKETTE

COMMERCIAL

Ex. CULVERT

PROPOSED CULVERT

CAMBRIAN ROAD

300Ø SAN

375Ø SAN

500Ø SAN

PROTECTED WOODLOT

SCHOOL

COMMERCIAL

IBI SANMH 400
INV=91.78

200Ø SAN

SWM POND 1
DRY POND
MAX W/L 97.70
BOTTOM 95.00
VOL 35,000m³

HIGHWAY 417

HIGHWAY 416

BORRISOKANE ROAD

URBAN BOUNDARY

FUTURE GREENBANK ROAD

BLOCK 1 BLOCK 2 BLOCK 3 BLOCK 4 BLOCK 5 BLOCK 6 BLOCK 7 BLOCK 8 BLOCK 9 BLOCK 10 BLOCK 11 BLOCK 12 BLOCK 13 BLOCK 14 BLOCK 15 BLOCK 16 BLOCK 17 BLOCK 18 BLOCK 19 BLOCK 20 BLOCK 21 BLOCK 22 BLOCK 23 BLOCK 24 BLOCK 25 BLOCK 26 BLOCK 27 BLOCK 28 BLOCK 29 BLOCK 30 BLOCK 31 BLOCK 32 BLOCK 33 BLOCK 34 BLOCK 35 BLOCK 36 BLOCK 37 BLOCK 38 BLOCK 39 BLOCK 40 BLOCK 41 BLOCK 42 BLOCK 43 BLOCK 44 BLOCK 45 BLOCK 46 BLOCK 47 BLOCK 49 BLOCK 50

MH 168A MH 169A MH 170A MH 171A MH 150A MH 151A MH 132A MH 133A MH 134A MH 120A MH 121A

375Ø SAN 94.00 @ 0.15%
300Ø SAN 114.50 @ 0.20%
300Ø SAN 63.00 @ 0.20%
300Ø SAN 118.00 @ 0.55%
375Ø SAN 83.00 @ 0.15%
300Ø SAN 82.00 @ 0.20%
250Ø SAN 83.00 @ 1.00%
375Ø SAN 10.50 @ 0.15%
300Ø SAN 50.00 @ 2.65%
375Ø SAN 8.00 @ 0.15%
300Ø SAN 16.50 @ 0.20%
300Ø SAN 7.00 @ 0.20%

4.38Ha 85 573 168K Detached
7.50Ha 85 638 171K Detached
7.79Ha 165A 166K Commercial
0.13Ha 85 12 153A 156K Detached
0.67Ha 85 57 154A 165K Detached
0.57Ha 85 49 155A 156K Detached
1.40Ha 85.00 121.00 162A 165K Detached
0.72Ha 85 62 121A 155K Detached
1.53Ha 85.00 132.00 161A 165K Detached
0.19Ha 85 16 157A 165K Detached
0.16Ha 85 14 151A 162A Detached
15.65Ha 163A 166K Commercial
5.54Ha 85.00 478.00 161A 165K Detached
4.33Ha 85.00 374.00 113A 121K Detached
1.72Ha 0.00 0.00 125A 121K Park
4.86Ha 85.00 419.00 158A 165K Townhouse
3.41Ha 85.00 294.00 124A 121K Townhouse
0.42Ha 85 36 MH 132A MH 123A
1.55Ha 85 132 MH 132A MH 123A
7.86Ha 85 669 160A 165K Detached
2.77Ha 0.00 0.00 120A 121K Commercial

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CAIVAN - BRAZEAU
SANITARY SERVICING PLAN
CITY OF OTTAWA

PROJECT No. :	18-1030
SCALE:	1:2,500
DATE:	SEPTEMBER 2019
DRAWING No.	3

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)
Unknown Road1 - 01																											
	121A	133A	8.46		730	8.46	730	3.3	7.82	2.77	2.77		0.00	1.72	1.72	1.08	12.95	12.95	4.27	13.18	118.0	300	0.55	71.72	0.18	1.01	0.77
To Unknown Road6 - 06, Pipe 133A - 134A						8.46	730				2.77		0.00		1.72			12.95									
Unknown Road6 - 06																											
	132A	133A	4.86		419	4.86	419	3.4	4.63		0.00		0.00		0.00	0.00	4.86	4.86	1.60	6.23	63.0	300	0.20	43.25	0.14	0.61	0.43
Contribution From Unknown Road1 - 01, Pipe 121A - 133A						8.46	730				2.77		0.00		1.72		12.95	17.81									
	133A	134A	0.57		49	13.89	1198	3.2	12.42		2.77		0.00		1.72	1.08	0.57	18.38	6.07	19.57	114.5	300	0.20	43.25	0.45	0.61	0.60
	134A	163A	0.67		57	14.56	1255	3.2	12.96		2.77		0.00		1.72	1.08	0.67	19.05	6.29	20.33	114.5	375	0.15	67.91	0.30	0.61	0.54
To Unknown Road12 - 11, Pipe 163A - 164A						14.56	1255				2.77		0.00		1.72			19.05									
Unknown Road12 - 11																											
	150A	151A	5.54		478	5.54	478	3.4	5.25		0.00		0.00		0.00	0.00	5.54	5.54	1.83	7.08	82.0	300	0.20	43.25	0.16	0.61	0.45
	151A	152A	0.16		14	5.70	492	3.4	5.39		0.00		0.00		0.00	0.00	0.16	5.70	1.88	7.27	12.0	300	0.20	43.25	0.17	0.61	0.45
	152A	157A	0.19		17	5.89	509	3.4	5.57		0.00		0.00		0.00	0.00	0.19	5.89	1.94	7.51	50.5	300	0.20	43.25	0.17	0.61	0.46
	157A	162A	1.53		132	7.42	641	3.3	6.92		0.00		0.00		0.00	0.00	1.53	7.42	2.45	9.37	59.5	300	0.20	43.25	0.22	0.61	0.49
	162A	163A	1.40		121	8.82	762	3.3	8.15		0.00		0.00		0.00	0.00	1.40	8.82	2.91	11.06	59.5	300	1.85	131.53	0.08	1.86	1.13
Contribution From Unknown Road6 - 06, Pipe 134A - 163A						14.56	1255				2.77		0.00		1.72		19.05	27.87									
	163A	164A	0.13		12	23.51	2029	3.1	20.15	15.65	18.42		0.00		1.72	6.15	15.78	43.65	14.40	40.71	67.0	375	0.15	67.91	0.60	0.61	0.64
To Unknown Road14 - 13, Pipe 164A - 165A						23.51	2029				18.42		0.00		1.72			43.65									
Unknown Road14 - 13																											
Contribution From Unknown Road12 - 11, Pipe 163A - 164A						23.51	2029				18.42		0.00		1.72		43.65	43.65									
	164A	165A	7.86		669	31.37	2698	3.0	26.10		18.42		0.00		1.72	6.15	7.86	51.51	17.00	49.25	83.0	375	0.15	67.91	0.73	0.61	0.67
	165A	166A	4.38		373	35.75	3071	2.9	29.33	7.79	26.21		0.00		1.72	8.68	12.17	63.68	21.01	59.02	83.0	375	0.15	67.91	0.87	0.61	0.69
	166A	167A				35.75	3071	2.9	29.33		26.21		0.00		1.72	8.68	0.00	63.68	21.01	59.02	66.0	375	0.15	67.91	0.87	0.61	0.69
	167A	168A				35.75	3071	2.9	29.33		26.21		0.00		1.72	8.68	0.00	63.68	21.01	59.02	10.5	375	0.15	67.91	0.87	0.61	0.69
	168A	169A				35.75	3071	2.9	29.33		26.21		0.00		1.72	8.68	0.00	63.68	21.01	59.02	94.0	375	0.15	67.91	0.87	0.61	0.69
	169A	170A				35.75	3071	2.9	29.33		26.21		0.00		1.72	8.68	0.00	63.68	21.01	59.02	94.0	375	0.15	67.91	0.87	0.61	0.69
To Unknown Road15 - 14, Pipe 170A - 171A						35.75	3071				26.21		0.00		1.72			63.68									
Unknown Road15 - 14																											
Contribution From Unknown Road14 - 13, Pipe 169A - 170A						35.75	3071				26.21		0.00		1.72		63.68	63.68									
	170A	171A	7.50		638	43.25	3709	2.9	34.74		26.21		0.00		1.72	8.68	7.50	71.18	23.49	66.91	35.5	375	0.20	78.41	0.85	0.71	0.80

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: ADF	PROJECT: **Brazeau Lands**		
Checked:	LOCATION: **City of Ottawa**		
Dwg. Reference: Sanitary Drainage Plan, Dwgs. No.	File Ref: 1030.000	Date: **06 Aug 2019**	Sheet No. 1 of 1

J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS

BARRHAVEN SOUTH URBAN EXPANSION (BSUEA)

CITY OF OTTAWA
MINTO COMMUNITIES INC.
JLR NO. 26610

BSUEA SANITARY SEWER DESIGN SHEET

Designed by: A.T
Checked by: H.M
Date : February 2018

DESIGN PARAMETERS					
Single Family	3.4	pers/unit	q =	280	L/cap/day
Semi-Detached/Townhouse (row)	2.7	pers/unit	I =	0.330	L/s/ha
Apt Units	1.8	pers/unit	Inst. =	28000	L/ha/day
Manning's Coeff. N =	0.013		ICI Peaking Factor* =	1.0/1.5	

*ICI Peaking Factor = 1.5 if ICI in contributing area is >20%, 1.0 if ICI in contributing area is <20%

STREET	M.H. #		RESIDENTIAL								COMMERCIAL			INSTITUTIONAL			(Infiltration)			SEWER DATA					RESIDUAL	UPSTREAM				DOWNSTREAM				ICI Peaking Factor	
			NUMBER OF UNITS					CUMULATIVE		PEAKING	POPUL.						PEAK EXTR.	PLUG	PEAK DES.																
	FROM	TO	SING.	MULT.	APT.	AREA ha	POPUL. peop.	POPUL. peop.	AREA ha	FACTOR	FLOW l/s	AREA ha	CUMM. AREA ha	INST. FLOW l/s	AREA ha	CUMM. AREA ha	INST. FLOW l/s	FLOW l/s	FLOW l/s	FLOW l/s	DIA. mm	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	CAP. l/s	Center Line	Obvert	Invert	Cover	Center Line	Obvert	Invert	Cover	ICI/ TOTAL	P.F
MINTO LANDS WITHIN BSUEA (OUTLETS TO RIVER MIST.)																																		
Kilbirnie Dr.	572	511		10		0.64	27	27	0.64	3.69	0.32		0.00	0.00	2.43	2.43	1.18	1.01		2.52	200	2.87	57.9	1.79	136.50	55.40	107.40	102.79	102.59	4.61	103.50	98.88	98.68	4.62	0.79	1.50
Kilbirnie Dr.	511	512		27		0.82	73	100	1.46	3.59	1.16	0.00	0.00	0.00	0.00	2.43	0.79	1.28		3.24	200	0.80	30.6	0.94	97.52	27.37	103.50	98.88	98.68	4.62	103.40	98.10	97.90	5.30	0.00	1.00
Street 1	514	512	21			1.07	71	71	1.07	3.62	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.35		1.19	200	0.74	29.4	0.91	212.06	28.24	105.60	99.67	99.47	5.93	103.40	98.10	97.90	5.30	0.00	1.00
Kilbirnie Dr.	512	10 (ex.)					0	171	2.53	3.54	1.96	0.00	0.00	0.00	0.00	2.43	0.79	1.64		4.39	200	1.60	43.3	1.33	74.41	38.89	103.40	98.10	97.90	5.30	101.18	96.91	96.71	4.27	0.00	1.00
MINTO LANDS WITHIN BSUEA (OUTLETS TO EXISTING GREENBANK)																																		
Street 1	514	516	14	104		3.49	328	328	3.49	3.45	3.67		0.00	0.00		0.00	0.00	1.15		4.82	200	0.35	20.2	0.62	127.86	15.42	105.60	102.70	102.50	2.90	105.40	102.25	102.05	3.15	0.00	1.00
Street 1	516	554	20	54		3.18	214	542	6.67	3.36	5.91		0.00	0.00		0.00	0.00	2.20		8.11	200	0.35	20.2	0.62	170.90	12.13	105.40	102.25	102.05	3.15	105.20	101.65	101.45	3.55	0.00	1.00
Street 3	500	502	25	70	115	7.16	481	481	7.16	3.39	5.28		0.00	0.00		0.00	0.00	2.36	0.10	7.74	200	0.35	20.2	0.62	174.02	12.50	108.10	105.03	104.827	3.07	107.90	104.42	104.218	3.48	0.00	1.00
Street 3	502	551	8	44		1.55	146	627	8.71	3.34	6.78		0.00	0.00		0.00	0.00	2.87		9.76	200	0.89	32.3	1.00	168.60	22.52	107.90	104.42	104.218	3.48	105.90	102.92	102.717	2.98	0.00	1.00
East-West Collector	550	551	20			1.98	68	68	1.98	3.63	0.80		0.00	0.00		0.00	0.00	0.65		1.45	200	0.35	20.2	0.62	161.54	18.79	105.50	103.20	103.00	2.30	105.90	102.63	102.43	3.27	0.00	1.00
East-West Collector	551	552	22			1.49	75	770	12.18	3.30	8.23		0.00	0.00		0.00	0.00	4.02		12.34	200	0.35	20.2	0.62	113.56	7.90	105.90	102.63	102.43	3.27	106.15	102.24	102.03	3.91	0.00	1.00
East-West Collector	552	554	12	20		3.36	95	865	15.54	3.27	9.17		0.00	0.00		0.00	0.00	5.13		14.40	200	0.35	20.2	0.62	178.26	5.84	106.15	102.24	102.03	3.91	105.20	101.61	101.41	3.59	0.00	1.00
East-West Collector	554	556	11	34		1.81	129	1536	24.02	3.14	15.62		0.00	0.00		0.00	0.00	7.93		23.65	250	0.33	35.6	0.70	295.67	11.99	105.20	101.61	101.36	3.59	103.55	100.64	100.38	2.91	0.00	1.00
Street 4	517	564	20	35		2.07	163	163	2.07	3.54	1.87		0.00	0.00		0.00	0.00	0.68		2.55	200	0.58	26.2	0.81	282.43	23.60	105.30	102.10	101.90	3.20	103.65	100.45	100.25	3.20	0.00	1.00
Alex Polowin Ave.	13 (ex.)	14 (ex.)	12			0.54	41	41	0.54	3.67	0.49		0.00	0.00		0.00	0.00	0.18		0.67	200	0.67	28.0	0.86	74.56	27.34	105.00	102.55	102.35	2.45	105.52	102.05	101.85	3.47	0.00	1.00
Alex Polowin Ave.	14 (ex.)	90 (ex.)	13			0.65	44	85	1.19	3.61	0.99		0.00	0.00		0.00	0.00	0.39		1.39	200	0.94	33.2	1.02	112.06	31.79	105.00	102.00	101.80	3.00	103.96	101.95	101.75	2.01	0.00	1.00
Russet Terrace	90 (ex.)	5 (ex.)	6			0.54	20	105	1.73	3.59	1.22		0.00	0.00		0.00	0.00	0.57		1.79	200	0.35	20.2	0.62	108.16	18.45	103.93	100.95	100.75	2.98	103.80	100.57	100.37	3.23	0.00	1.00
River Mist Rd.	5 (ex.)	564	8			0.47	27	132	2.20	3.57	1.53		0.00	0.00		0.00	0.00	0.73		2.25	200	0.35	20.2	0.62	74.22	17.99	103.90	100.30	100.10	3.60	103.80	100.04	99.84	3.76	0.00	1.00
River Mist Rd.	564	556	7	9		0.64	48	343	4.91	3.44	3.83		0.00	0.00		0.00	0.00	1.62		5.55	200	0.35	20.2	0.62	94.59	14.70	103.65	100.04	99.84	3.61	103.55	99.71	99.51	3.84	0.00	1.00
East-West Collector	556	557					0	1879	28.93	3.09	18.79		0.00	0.00	2.20	2.20	0.71	10.27		29.87	250	1.39	73.1	1.44	44.25	43.27	103.55	99.71	99.46	3.84	102.78	99.09	98.84	3.69	0.07	1.00
East-West Collector	557	558	6			1.12	20	1899	30.05	3.08	18.97		0.00	0.00	2.86	5.06	1.64	11.59	4.00	36.30	250	1.39	73.1	1.44	158.35	36.85	102.78	99.09	98.84	3.69	99.90	96.89	96.64	3.01	0.09	1.00
Street 5	560	558	50			3.09	170	170	3.09	3.54	1.95		0.00	0.00		0.00	0.00	1.02		2.97	200	0.35	20.2	0.62	142.27	17.27	98.80	95.32	95.12	3.48	99.90	94.82	94.62	5.08	0.00	1.00
East-West Collector	558	119				5.74	0	2069	38.88	3.06	20.51		0.00	0.00		5.06	1.64	14.50		40.75	375	0.18	77.6	0.68	150.71	36.85	99.90	93.71	93.32	6.20	99.55	93.43	93.05	6.12	0.00	1.00
Street 6	521	522	24	33		2.17	171	171	2.17	3.54	1.96		0.00	0.00		0.00	0.00	0.72		2.68	200	1.50	41.9	1.29	37.09	39.23	105.18	102.18	101.98	3.00	104.50	101.62	101.42	2.88	0.00	1.00
	522	523					0	171	2.17	3.54	1.96		0.00	0.00		0.00	0.00	0.72		2.68	200	0.80	30.6	0.94	73.27	27.93	104.50	101.62	101.42	2.88	105.11	101.04	100.83	4.07	0.00	1.00
	523	524		71		1.95	192	363	4.12	3.43	4.04		0.00	0.00		0.00	0.00	1.36		5.40	200	0.35	20.2	0.62	164.00	14.84	105.11	101.04	100.83	4.07	103.50	100.46	100.26	3.04	0.00	1.00
Adjacent to Barnsdale Rd	520	524	41			2.06	139	139	2.06	3.56	1.60		0.00	0.00		0.00	0.00	0.68		2.28	300	0.20	45.1	0.62	146.25	42.83	102.80	98.40	98.10	4.40	103.50	98.11	97.80	5.39	0.00	1.00
Adjacent to Barnsdale Rd	524	578					0	502	6.18	3.38	5.50		0.00	0.00		0.00	0.00	2.04		7.54	300	0.20	45.1	0.62	126.92	37.58	103.50	98.11	97.80	5.39	104.92	97.85	97.55	7.07	0.00	1.00
Adjacent to Barnsdale Rd	578	532		87		3.63	235	737	9.81	3.31	7.89		0.00	0.00		0.00	0.00	3.24		11.13	300	0.20	45.1	0.62	173.72	33.98	104.92	97.85	97.55	7.07	103.80	97.51	97.20	6.29	0.00	1.00
Adjacent to Barnsdale Rd	532	534	50	26		3.29	240	977	13.10	3.25	10.27		0.00	0.00		0.00	0.00	4.32		14.60	300	0.20	45.1	0.62	127.45	30.52	103.80	97.51	97.20	6.29	103.00	97.25	96.95	5.75	0.00	1.00
Adjacent to Barnsdale Rd	534	536	55			2.96	187	1164	16.06	3.21	12.09		0.00	0.00		0.00	0.00	5.30		17.39	450	0.20	133.0	0.81	173.27	115.63	103.00	95.50	95.04	7.50	101.56	95.15	94.70	6.41	0.00	1.00
Easement (Barnsdale to E-W Collector)	536	538					0	1164	16.06	3.21	12.09		0.00	0.00		0.00	0.00	5.30		17.39	450	0.20	133.0	0.81	309.73	115.63	101.56	95.15	94.70	6.41	99.75	94.53	94.08	5.22	0.00	1.00
	538	119					0	1164	16.06	3.21	12.09		0.00	0.00		0.00	0.00	5.30		17.39	525	0.15	173.8	0.78	245.34	156.37	99.75	93.80	93.26	5.95	99.55	93.43	92.89	6.12	0.00	1.00
Ex. Greenbank Rd.	119	120 (ex.)					0	3233	54.94	2.93	30.72		0.00	0.00		5.06	1.64	19.80		56.26	600	0.15	248.1	0.85	168.66	191.83	99.55	93.43	92.82	6.12		93.17	92.57		0.00	1.00
																					600	0.25												
MATTAMY LANDS EAST OUTLETS TO DUNDONALD DR. & DES SOLDATS																																		
	900	158 (ex.)	31	51		3.10	243	243	3.10	3.49	2.75	0.00	0.00	0.00		0.00	0.00	1.02		3.77	200	0.35	20.2	0.62	280.00	16.47	106.62	97.23	97.02	9.39	101.03	97.13	97.13	3.90	0.00	1.00
	910	153 (ex.)		28		0.71	76	76	0.71	3.62	0.89	0.00	0.00	0.00		0.00	0.00	0.23		1.12	200	0.35	20.2	0.62	130.00	19.12	104.00	96.70	96.49	7.30	100.35	96.65	96.65	3.70	0.00	1.00
	920	930	36			1.81	122	122	1.81	3.57	1.42	2.13	2.13	1.04		0.00	0.00	1.30		3.75	200	0.35	20.2	0.62	165.00	16.49	106.07	97.42	97.21	8.65	101.70	97.36	97.16	4.34	0.54	1.50
	930	217 (ex.)						122	1.81	3.57	1.42	0.00	2.13	1.04		0.00	0.00	1.30		3.75	200	0.35	20.2	0.62	40.00	16.49	101.70	97.36	97.16	4.34	101.70	97.24	97.04	4.46	0.54	1.50
BRAZEAU AGGREGATE EXTRACTION AREA OUTLETS TO NEW GREENBANK ROAD*																																		
	585	575	178	236	37	21.77	1309	1309	21.77	3.18	13.48	0.68	0.68	0.22	1.45	1.45	0.47	7.89		22.06	250	0.24	30.4	0.60	431.00	8.34		98.56	98.30			97.52	97.27		0.09	1.00
	575	555					0	1309	21.77		0.00		0.68	0.22		1.45	0.47	7.89		8.58	250	0.24	30.4	0.60	228.00	21.82		97.52	97.27			96.98	96.72		0.03	1.00
	565	555					0	0	0.00		0.00		0.00	0.00		0.00	0.00	0.00		0.00	250	0.24	30.4	0.60	431.00	30.39		98.01	97.76			96.98	96.72		0.00	1.00
	555	545					0	1309	21.77		0.00		0.68	0.22		1.45	0.47	7.89		8.58	250	0.24	30.4	0.60	133.00	21.82		96.98	96.72			96.66	96.40		0.03	1.00
	545	900					0	1309	21.77		0.00		0.68	0.22		1.45	0.47	7.89		8.58	250	0.24	30.4	0.60	72.00	21.82	104.31	96.66	96.40	7.65	103.00	96.48	96.23	6.52	0.03	1.00
	900	MA 14																			250	0.24	30.4	0.60	160.00	30.39		96.48	96.23			96.10	95.85			
MATTAMY LANDS WEST OUTLETS TO NEW GREENBANK RD																																		
Realigned Greenbank Rd.	900	MA 14	8	102		3.89	303	1612	25.66	3.13	16.32	0.00	0.68	0.22	0.00	1.45	0.47	9.17		26.18	250	1.30	70.7	1.40	60.00	44.55	104.31	96.88	96.63	7.43	103.00	96.10	95.85	6.90	0.03	1.00
	MA 14	MA13				0.00	0	1612	25.66	3.13	16.32	0.00	0.68	0.22	0.00	1.45	0.47	9.17		26.18	250	1.30	70.7	1.40	295.00	44.50	103.00	96.10	95.85	6.90	95.20	92.27	92.02	2.93	0.03	1.00
	MA13	MH57A						1612	25.66	3.13	16.32		0.68	0.22		1.45	0.47	9.17		26.18	375	0.30	100.2	0.88	413.10	74.00	92.27	90.77	90.39	1.50	93.60	89.53	89.15	4.07	0.03	1.00
DRUMMOND AGGREGATE EXTRACTION AREA OUTLETS TO PROPOSED COLLECTOR RD.*																																		
	593	592																			200	0.35	20.2	0.62	300.00	20.24		99.19	98.99			98.14	97.94			1.00
	592	590																			200	0.35	20.2	0.62	220.00	20.24		98.14	97.94			97.37	97.17			1.00
	591	590																			200	0.35	20.2	0.62	300.00	20.24		98.42	98.22			97.37	97.17			1.00
	590	MA 11	151	226	31	18.48	1179	1179	18.48	3.20	12.24	0.58	0.58	0.19	0.40	0.40	0.13	6.42		18.98	300	0.35	59.7	0.82	80.00	40.70		97.37	97.07		100.00	97.09	96.79	2.91	0.05	1.00
	MA 11	MA 10					0	1179	18.48	3.20	12.24		0.58	0.19		0.40		6.42		18.85	300	0.75	87.4	1.20	482.10	68.52	100.00	95.00	94.69	5.00	93.50	91.38	91.08	2.12	0.03	1.00
	MA 10	MH57A					0	1179	18.48	3.20	12.24		0.58	0.19		0.40		6.42		18.85	375	0.41	117.3	1.03	449.70	98.47	93.50	91.38	91.00	2.12	93.60	89.53	89.15	4.07		1.00
							0																											

*ONLY FLOW CONTRIBUTIONS FROM BSUEA ARE SHOWN, FOR SANITARY FLOWS FROM OTHER CONTRIBUTING AREAS TRIBUTARY TO CAMBRIAN ROAD, SEE OVERALL SANITARY SPREADSHEET

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

CITY OF OTTAWA
MINTO COMMUNITIES INC.
JLR NO. 26610

BARRHAVEN SOUTH SANITARY SEWER DESIGN SHEET

Designed by: AT
Checked by:HM
Date: February 2018

PROPOSED AND BSUEA DESIGN PARAMETERS					
Single Family	3.4	pers/unit	q =	280	L/cap/day
Semi-Detached/Townhouse (row)	2.7	pers/unit	I =	0.330	L/s/ha
Apt Units	1.8	pers/unit	Inst./Comm. =	28000	L/ha/day
Manning's Coeff. N =	0.013		Commerial PF*=	1.0/1.5	

*1.5 if ICI in contributing area is >20%, 1.0 if ICI in contributing area is <20%

Sources:	
	Half Moon Bay South Subdivision - Phase 4 - Excluding Arterials- Sanitary sewer design sheet prepared by Stantec (2015)
	Quinn's Pointe - Excluding Arterials-Sanitary sewer design sheet prepared by J.L Richards (2015)
	Barrhaven South Master Servicing Study Addendum - Sanitary sewer design sheet prepared Stantec (2014)

Legend

	Proposed
	Proposed by Others
	Existing

TOTAL PEAK FLOW TO MH57A = 112.80 L/s
(USING CUMULATIVE AREAS, POPULATIONS AND PEAK FACTORS)

STREET	SOURCE	M.H. #		RESIDENTIAL								COMMERCIAL			INSTITUTIONAL			GREEN/UNUSED					SEWER DATA						RESIDUAL		ICI*
				NUMBER OF UNITS			AREA	POPULATION	CUMULATIVE		PEAKING FACTOR	POPUL. FLOW	AREA	CUMM. AREA	INST. FLOW	AREA	CUMM. AREA	INST. FLOW	AREA	CUMM. AREA	PEAK EXTR. FLOW	PLUG FLOW	PEAK DES. FLOW	DIA.	SLOPE	CAPAC.	VEL.	LENGTH	CAP.	ICI/ TOTAL	Peaking Factor
		FROM	TO	SING.	MULT.	APT.	TOTAL ha	TOTAL peop.	POPUL. peop.	AREA ha		l/s	ha	ha	l/s	ha	ha	l/s	ha	ha	l/s	l/s	l/s	mm	%	l/s	m/s	m	l/s		
CAMBRIAN ROAD OUTLET VIA FUTURE REALIGNED GREENBANK AND FUTURE COLLECTOR																															
Drummond Aggregate Extraction Area		545	MA11	151	226	31.00	18.48	1179	1179	18.48	3.20	12.24	0.58	0.58	0.19	1.23	1.23	0.40		0.00	6.70		19.5	300	0.75	87.4	1.20	300.00	67.85	0.09	1.00
Future Collector Road	Stantec (2014)	MA11	MA10				14.23	1523	2702	32.71	2.98	26.13		0.58	0.19	2.80	4.03	1.31	2.50	2.50	13.14		40.77	300	0.75	87.4	1.20	482.10	46.60	0.12	1.00
Cambrian Rd.	Stantec (2014)	MA10	MH57A				12.81	1371	4073	45.52	2.86	37.76		0.58	0.19	7.22	11.25	3.65	14.49	16.99	24.53		66.13	375	0.40	115.7	1.01	449.70	49.55	0.16	1.00
Brazeau Aggregate Extraction Area + Mattamy Lands		900	MA14	186	368	37.00	25.66	1693	1693	25.66	3.11	17.08	0.68	0.68	0.22	1.45	1.45	0.47		0.00	9.17		26.9	250	1.30	70.7	1.40	350.00	43.80	0.08	1.00
New Greenbank Road	Stantec (2014)	MA14	MA13				4.79	513	2206	30.45	3.04	21.75		0.68	0.33	7.45	8.90	4.33		0.00	13.21		39.61	250	1.30	70.7	1.40	295.00	31.12	0.24	1.50
New Greenbank Road	Stantec (2014)	MA13	MH57A				10.99	1176	3382	41.44	2.92	31.98		0.68	0.22		8.90	2.88	0.53	0.53	17.01		52.10	375	0.30	100.2	0.88	413.10	48.09	0.19	1.00
Cambrian Road	Stantec	MH57A	MH13A				4.29	458	7913	91.25	2.64	67.80	3.44	4.70	1.52	0.00	20.15	6.53		17.52	44.09		119.95	500	0.25	197.0	0.97	216.50	77.01	0.19	1.00
Cambrian Road	Stantec	MH13A	MH15A				6.21	634	8547	97.46	2.62	72.51		4.70	1.52	0.00	20.15	6.53		17.52	46.14		126.70	500	0.20	176.2	0.87	165.20	49.46	0.18	1.00
Cambrian Road	Stantec	MH15A	MH17A				5.61	870	9417	103.07	2.58	78.87		4.70	1.52	0.00	20.15	6.53		17.52	48.00		134.92	600	0.13	231.0	0.79	202.00	96.04	0.17	1.00
QUINN'S POINTE OUTLET TO MH163 RIVER MIST RD.							103.07		9417																						
Kilbirnie Drive		572	511		10		0.64	27	27	0.64	3.69	0.32		0.00	0.00	2.43	2.43	1.18		0.00	1.01		2.52	200	2.87	57.9	1.79	136.50	55.38	0.79	1.50
Kilbirnie Drive		511	512		27		0.82	73	100	1.46	3.59	1.17		0.00	0.00		2.43	1.18		0.00	1.28		3.63	200	0.80	30.6	0.94	97.50	26.97	0.62	1.50
Future Collector Road		514	512	21			1.07	71	71	1.07	3.63	0.83		0.00	0.00		0.00	0.00		0.00	0.35		1.19	200	0.74	29.4	0.91	212.10	28.25	0.00	1.00
Kilbirnie Drive		512	EX10				0.00	0	171	2.53	3.54	1.96		0.00	0.00		2.43	1.18		0.00	1.64		4.78	200	1.60	43.3	1.33	74.00	38.50	0.49	1.50
River Mist Road		EX5	EX4	12			0.55	41	41	0.55	3.67	0.49		0.00	0.00		0.00	0.00		0.00	0.18		0.67	200	0.33	19.8	0.61	74.90	19.10	0.00	1.00
Boddington Street		EX101	EX100	14			0.72	48	48	0.72	3.65	0.57		0.00	0.00		0.00	0.00		0.00	0.24		0.81	200	0.98	33.8	1.04	90.13	33.00	0.00	1.00
Boddington Street		EX100	EX4	8			0.44	27	75	1.16	3.62	0.88		0.00	0.00		0.00	0.00		0.00	0.38		1.26	200	0.91	32.6	1.01	91.40	31.34	0.00	1.00
River Mist Road		EX4	EX3	12			0.53	41	157	2.24	3.55	1.81		0.00	0.00		0.00	0.00		0.00	0.74		2.54	200	0.32	19.4	0.60	74.95	16.82	0.00	1.00
Clonfadda Terrace		EX111	EX110	13			0.62	44	44	0.62	3.66	0.52		0.00	0.00		0.00	0.00		0.00	0.20		0.73	200	1.04	34.8	1.07	76.25	34.10	0.00	1.00
Clonfadda Terrace		EX110	EX3	15			0.64	51	95	1.26	3.60	1.11		0.00	0.00		0.00	0.00		0.00	0.42		1.52	200	0.83	31.2	0.96	108.32	29.67	0.00	1.00
River Mist Road		EX3	EX2	3			0.32	10	262	3.82	3.48	2.96		0.00	0.00		0.00	0.00		0.00	1.26		4.22	200	0.35	20.2	0.62	100.22	16.00	0.00	1.00
River Mist Road		EX2	EX1		14		0.55	38	300	4.37	3.46	3.37		0.00	0.00		0.00	0.00		0.00	1.44		4.81	200	1.77	45.5	1.40	112.11	40.65	0.00	1.00
Alex Polowin Avenue		EX13	EX12	11			0.46	37	37	0.46	3.67	0.44		0.00	0.00		0.00	0.00		0.00	0.15		0.59	200	1.01	34.4	1.06	74.36	33.77	0.00	1.00
Alex Polowin Avenue		EX12	EX11	24			0.74	82	119	1.20	3.58	1.38		0.00	0.00		0.00	0.00		0.00	0.40		1.78	200	2.14	50.1	1.54	107.77	48.32	0.00	1.00
Alex Polowin Avenue		EX11	EX10	17			0.71	58	177	1.91	3.53	2.03		0.00	0.00		0.00	0.00		0.00	0.63		2.66	200	1.65	44.0	1.36	103.97	41.35	0.00	1.00
Kilbirnie Drive		EX10	EX20		14		0.57	38	386	5.01	3.42	4.28		0.00	0.00		2.43	1.18		0.00	2.46		7.92	200	0.32	19.3	0.60	118.98	11.42	0.33	1.50
Block 251 (School)		Stub	EX20				0.00	0	0	0.00	3.80	0.00		0.00	0.00	2.83	2.83	1.38		0.00	0.93		2.31	200	0.32	19.3	0.60	11.00	16.99	1.00	1.50
Kilbirnie Drive		EX20	EX1		15		0.54	41	427	5.55	3.41	4.71		0.00	0.00		5.26	2.56		0.00	3.57		10.84	200	0.32	19.4	0.60	106.01	8.52	0.49	1.50
River Mist Road		EX1	MH163				0.08	0	727	10.00	3.31	7.79		0.00	0.00		5.26	2.56		0.00	5.04		15.39	200	0.32	19.3	0.60	39.41	3.96	0.34	1.50
MH163 TO MH17A RIVERMIST ROAD OUTLETS VIA CAMBRIAN ROAD							10.00		727																						
River Mist Road	Stantec (2015)	MH163	EX162				0.08	0	727	10.08	3.31	7.79		0.00	0.00		5.26	2.56		0.00	5.06		15.41	250	0.85	57.2	1.13	36.30	41.78	0.34	1.50
River Mist Road		EX162	EX161				0.20	0	727	10.28	3.31	7.79		0.00	0.00		5.26	2.56		0.00	5.13		15.48	250	1.15	66.5	1.31	44.40	51.05	0.34	1.50
River Mist Road		EX161A	EX161				0.00	0	0	0.00	3.80	0.00		0.00	0.00		0.00	0.00	0.91	0.91	0.30		0.30	150	1.00	15.9	0.87	14.00	15.59	0.00	1.00
River Mist Road		EX161	151				0.19	0	727	10.47	3.31	7.79		0.00	0.00		5.26	2.56		0.91	5.49		15.84	250	1.15	66.5	1.31	57.70	50.69	0.32	1.50
River Mist Road		EX151A	151				0.00	0	0	0.00	3.80	0.00		0.00	0.00	2.77	2.77	1.35		0.00	0.91		2.26	150	1.00	15.9	0.87	12.70	13.63	1.00	1.50
River Mist Road		151	EX151				0.09	0	727	10.56	3.31	7.79		0.00	0.00		8.03	3.90		0.91	6.44		18.13	300	1.40	119.4	1.64	17.90	101.23	0.41	1.50
River Mist Road	↓	EX151	MH142				0.00	0	727	10.56	3.31	7.79		0.00	0.00		8.03	3.90		0.91	6.44		18.13	300	1.40	119.4	1.64	44.40	101.23	0.41	1.50
Buffalograss Cres.	Stantec (2015)	EX159	EX158		24		0.56	65	65	0.56	3.63	0.77		0.00	0.00		0.00	0.00		0.00	0.18		0.95	200	0.40	21.6	0.67	95.50	20.69	0.00	1.00
Mattamy Lands East		900	EX158	31	51		3.10	243	243	3.10	3.49	2.75		0.00	0.00		0.00	0.00		0.00	1.02		3.77	200	0.35	20.2	0.62	280.00	16.46	0.00	1.00
Alex Polowin ave.		EX158	EX153	0	0		0.13	0	308	3.79	3.46	3.45		0.00	0.00		0.00	0.00		0.00	1.25		4.70	200	0.40	21.6	0.67	45.00	16.94	0.00	1.00
Mattamy Lands East		910	EX153		28		0.71	76	76	0.71	3.62	0.89		0.00	0.00		0.00	0.00		0.00	0.23		1.13	200	0.35	20.2	0.62	130.00	19.12	0.00	1.00
Alex Polowin ave.		EX153	EX152				0.12	0	384	4.62	3.42	4.26		0.00	0.00		0.00	0.00		0.00	1.52		5.79	200	0.80	30.6	0.94	70.00	24.82	0.00	1.00
Alex Polowin ave.		EX152	EX150				0.00	0	384	4.62	3.42	4.26		0.00	0.00		0.00	0.00		0.00	1.52		5.79	200	0.80	30.6	0.94	85.70	24.82	0.00	1.00
Rue Des Soldats Riendeau St.		EX165	EX150	17			0.67	58	58	0.67	3.64	0.68		0.00	0.00		0.00	0.00		0.00	0.22		0.91	200	1.50	41.9	1.29	101.20	41.00	0.00	1.00
Rue Des Soldats Riendeau St.	Stantec (2015)	EX150	EX146	6			0.30	20	462	5.59	3.39	5.08		0.00	0.00		0.00	0.00		0.00	1.84		6.93	200	0.80	30.6	0.94	72.00	23.68	0.00	1.00

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

CITY OF OTTAWA
MINTO COMMUNITIES INC.
JLR NO. 26610

BARRHAVEN SOUTH SANITARY SEWER DESIGN SHEET

Designed by: AT
Checked by:HM

PROPOSED AND BSUEA DESIGN PARAMETERS					
Single Family	3.4	pers/unit	q =	280	L/cap/day
Semi-Detached/Townhouse (row)	2.7	pers/unit	I =	0.330	L/s/ha
Apt Units	1.8	pers/unit	Inst./Comm. =	28000	L/ha/day
Manning's Coeff. N =	0.013		Commerial PF*=	1.0/1.5	

*1.5 if ICI in contributing area is >20%, 1.0 if ICI in contributing area is <20%

Sources:	
	Half Moon Bay South Subdivision - Phase 4 - Excluding Arterials- Sanitary sewer design sheet prepared by Stantec (2015)
	Quinn's Pointe - Excluding Arterials-Sanitary sewer design sheet prepared by J.L Richards (2015)
	Barrhaven South Master Servicing Study Addendum - Sanitary sewer design sheet prepared Stantec (2014)

Legend	
	Proposed
	Proposed by Others
	Existing

Date: February 2018

STREET	SOURCE	M.H. #		RESIDENTIAL								COMMERCIAL			INSTITUTIONAL			GREEN/UNUSED		PEAK EXTR.	PLUG	PEAK DES.	SEWER DATA					RESIDUAL		ICI*
				NUMBER OF UNITS			AREA	POPULATION	CUMULATIVE		PEAKING	POPUL.	AREA	CUMM.	INST.	AREA	CUMM.	INST.	AREA	CUMM.										
		FROM	TO	SING.	MULT.	APT.	TOTAL ha	TOTAL peop.	POPUL. peop.	AREA ha	FACTOR	FLOW l/s	ha	AREA ha	FLOW l/s	ha	AREA ha	FLOW l/s	ha	AREA ha	FLOW l/s	FLOW l/s	FLOW l/s	DIA. mm	SLOPE %	CAPAC. l/s	VEL. m/s	LENGTH m	CAP. l/s	ICI/ TOTAL	Peaking Factor
Remora Way		EX147	EX146	20			0.94	68	68	0.94	3.63	0.80		0.00	0.00		0.00	0.00		0.00	0.31		1.11	200	1.00	34.2	1.06	78.20	33.11	0.00	1.00
Rue Des Soldats Riendeau St.		EX146	EX145	2			0.08	7	537	6.61	3.37	5.86		0.00	0.00		0.00	0.00		0.00	2.18		8.04	200	0.50	24.2	0.75	19.30	16.15	0.00	1.00
Rue Des Soldats Riendeau St.		EX145	EX144				0.07	0	537	6.68	3.37	5.86		0.00	0.00		0.00	0.00		0.00	2.20		8.06	200	0.50	24.2	0.75	35.90	16.13	0.00	1.00
Rue Des Soldats Riendeau St.		EX144	EX143	9			0.54	31	568	7.22	3.36	6.18		0.00	0.00		0.00	0.00		0.00	2.38		8.56	200	0.50	24.2	0.75	114.90	15.63	0.00	1.00
Rue Des Soldats Riendeau St.		EX143	MH142				0.00	0	568	7.22	3.36	6.18		0.00	0.00		0.00	0.00		0.00	2.38		8.56	200	0.40	21.6	0.67	21.50	13.08	0.00	1.00
River Mist Road		MH142	EX139	3			0.26	10	1305	18.04	3.18	13.44		0.00	0.00		8.03	3.90		0.91	8.90		26.25	300	0.40	63.8	0.87	74.80	37.56	0.30	1.50
		EX140	EX139	7			0.40	24	24	0.40	3.70	0.29		0.00	0.00		0.00	0.00		0.00	0.13		0.42	200	0.65	27.6	0.85	67.70	27.17	0.00	1.00
River Mist Road		EX139	EX136	10			0.47	34	1363	18.91	3.17	13.99		0.00	0.00		8.03	3.90		0.91	9.19		27.08	300	0.41	64.6	0.89	64.70	37.51	0.29	1.50
		EX137	EX136	15			0.84	51	51	0.84	3.65	0.60		0.00	0.00		0.00	0.00		0.00	0.28		0.88	200	0.65	27.6	0.85	67.80	26.71	0.00	1.00
River Mist Road		EX136	MH126	4			0.29	14	1428	20.04	3.16	14.60		0.00	0.00		8.03	3.90		0.91	9.56		28.07	300	0.41	64.6	0.89	78.90	36.52	0.28	1.50
Mattamy Lands East		920	930	36			1.83	122	122	1.83	3.58	1.41	2.13	2.13	1.04		0.00	0.00		0.00	1.31		3.76	200	0.35	20.2	0.62	165.00	15.50	0.54	1.50
Mattamy Lands East		930	EX217					0	122	1.83	3.58	1.41		2.13	1.04		0.00	0.00		0.00	1.31		3.76	200	0.36	20.5	0.63	40.00	15.50	0.54	1.50
Flameflower St.		EX217	EX215				0.05	0	122	1.88	3.58	1.41		2.13	1.04		0.00	0.00		0.00	1.32		3.77	200	2.00	48.4	1.49	34.50	44.62	0.53	1.50
Flameflower St.	Stantec (2015)	EX216	EX215		5		0.19	14	14	0.19	3.72	0.17		0.00	0.00		0.00	0.00		0.00	0.06		0.23	200	0.65	27.6	0.85	45.20	27.35	0.00	1.00
Flameflower St.		EX215	EX214		15		0.34	41	177	2.41	3.53	2.03		2.13	1.04		0.00	0.00		0.00	1.50		4.56	200	2.00	48.4	1.49	72.00	43.83	0.47	1.50
Flameflower St.		EX214	EX203		15		0.35	41	218	2.76	3.51	2.48		2.13	1.04		0.00	0.00		0.00	1.61		5.13	200	2.00	48.4	1.49	73.50	43.26	0.44	1.50
Devario Cres.		EX204	EX203				0.54	62	62	0.54	3.64	0.73		0.00	0.00		0.00	0.00	3.10	3.10	1.20		1.93	200	1.50	41.9	1.29	36.50	39.97	0.00	1.00
Devario Cres.		EX208	EX203				2.50	187	187	2.50	3.53	2.14		0.00	0.00		0.00	0.00		0.00	0.83		2.96	200	0.40	21.6	0.67	120.00	18.68	0.00	1.00
Flameflower St.		EX203	EX201				0.12	0	467	5.92	3.39	5.13		2.13	0.69		0.00	0.00		3.10	3.68		9.50	200	0.40	21.6	0.67	73.70	12.14	0.19	1.00
Dundonald Dr.		EX202	EX201	4			0.53	14	14	0.53	3.72	0.17		0.00	0.00		0.00	0.00		0.00	0.17		0.34	200	3.25	61.7	1.90	50.00	61.34	0.00	1.00
Dundonald Dr.		EX201	EX129A	3			0.21	10	491	6.66	3.38	5.38		2.13	0.69		0.00	0.00		3.10	3.92		10.00	200	0.40	21.6	0.67	47.80	11.64	0.18	1.00
Dundonald Dr.		EX129A	EX129	18			0.75	61	552	7.41	3.36	6.01		2.13	0.69		0.00	0.00		3.10	4.17		10.87	200	0.40	21.6	0.67	100.90	10.77	0.17	1.00
Dundonald Dr.		EX129	EX128	11			0.58	37	589	7.99	3.35	6.39		2.13	0.69		0.00	0.00		3.10	4.36		11.45	200	0.40	21.6	0.67	91.70	10.19	0.16	1.00
Lamprey St.		EX130	EX128				1.16	85	85	1.16	3.61	0.99		0.00	0.00		0.00	0.00	0.40	0.40	0.51		1.51	200	0.50	24.2	0.75	96.50	22.69	0.00	1.00
Dundonald Dr.		EX128	EX127	9			0.37	31	705	9.52	3.31	7.57		2.13	0.69		0.00	0.00		3.50	5.00		13.26	200	0.50	24.2	0.75	49.80	10.93	0.14	1.00
Dundonald Dr.		EX127	MH126	13			0.66	44	749	10.18	3.30	8.01		2.13	0.69		0.00	0.00		3.50	5.22		13.92	200	0.32	19.4	0.60	97.80	5.43	0.13	1.00
Dundonald Dr.		EX23	MH126				1.06	71	71	1.06	3.63	0.83		0.00	0.00		0.00	0.00		0.00	0.35		1.18	200	1.47	41.5	1.28	89.30	40.30	0.00	1.00
School		EX123A	EX123				0.00	0	0	0.00	3.80	0.00		0.00	0.00	2.06	2.06	1.00		0.00	0.68		1.68	250	0.89	58.5	1.16	15.80	56.85	1.00	1.50
River Mist. Dr.		MH126	EX123		5		0.29	14	2262	31.57	3.03	22.25		2.13	1.04		8.03	3.90		4.41	15.23		42.41	375	0.45	122.7	1.08	122.00	80.29	0.22	1.50
River Mist. Rd.		EX123	MH112		7		0.34	19	2281	31.91	3.03	22.42		2.13	1.04		10.09	4.90		4.41	16.02		44.38	375	0.42	118.5	1.04	90.30	74.16	0.25	1.50
White Arctic Ave.		EX111	MH112				3.39	378	378	3.39	3.43	4.20		0.00	0.00		0.00	0.00		0.00	1.12		5.32	200	0.32	19.4	0.60	74.80	14.04	0.00	1.00

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

CITY OF OTTAWA
MINTO COMMUNITIES INC.
JLR NO. 26610

BARRHAVEN SOUTH SANITARY SEWER DESIGN SHEET

Designed by: AT
Checked by:HM

PROPOSED AND BSUEA DESIGN PARAMETERS					
Single Family	3.4	pers/unit	q =	280	L/cap/day
Semi-Detached/Townhouse (row)	2.7	pers/unit	I =	0.330	L/s/ha
Apt Units	1.8	pers/unit	Inst./Comm. =	28000	L/ha/day
Manning's Coeff. N =	0.013		Commerial PF*=	1.0/1.5	

*1.5 if ICI in contributing area is >20%, 1.0 if ICI in contributing area is <20%

Sources:
- Half Moon Bay South Subdivision - Phase 4 - Excluding Arterials- Sanitary sewer design sheet prepared by Stantec (2015)
- Quinn's Pointe - Excluding Arterials-Sanitary sewer design sheet prepared by J.L Richards (2015)
- Barrhaven South Master Servicing Study Addendum - Sanitary sewer design sheet prepared Stantec (2014)

Legend
- Proposed
- Proposed by Others
- Existing

Date: February 2018

STREET	SOURCE	M.H. #		RESIDENTIAL NUMBER OF UNITS			RESIDENTIAL AREA	RESIDENTIAL POPULATION	RESIDENTIAL CUMULATIVE		PEAKING FACTOR	POPUL. FLOW	COMMERCIAL			INSTITUTIONAL			GREEN/UNUSED			PEAK EXTR. FLOW	PLUG FLOW	PEAK DES. FLOW	SEWER DATA					RESIDUAL	ICI	ICI*
													AREA	CUMM. AREA	INST. FLOW	AREA	CUMM. AREA	INST. FLOW	AREA	CUMM. AREA				DIA.	SLOPE	CAPAC.	VEL.	LENGTH	CAP.		Peaking
		FROM	TO	SING.	MULT.	APT.	TOTAL ha	TOTAL peop.	POPUL. peop.	AREA ha		l/s	ha	ha	l/s	ha	ha	l/s	ha	ha	l/s	l/s	l/s	mm	%	l/s	m/s	m	l/s	TOTAL	Factor
River Mist. Rd.		MH112	EX102				0.14	0	2659	35.44	2.99	25.76		2.13	1.04		10.09	4.90		4.41		17.18		48.88	375	0.31	101.8	0.89	68.00	52.96	0.23	1.50
Dutchmans Way		EX103	EX102	18			0.80	61	61	0.80	3.64	0.72		0.00	0.00		0.00	0.00		0.00		0.26		0.98	200	2.02	48.6	1.50	120.00	47.65	0.00	1.00
Song Sparrow St.		EX104	EX102				3.83	386	386	3.83	3.42	4.28		0.00	0.00		0.00	0.00		0.00		1.26		5.55	200	0.44	22.7	0.70	114.60	17.15	0.00	1.00
River Mist Road	Stantec (2015)	EX102	EX101				0.07	0	3106	40.14	2.94	29.63		2.13	1.04		10.09	4.90		4.41		18.73		54.30	375	0.29	98.5	0.86	34.00	44.20	0.22	1.50
	Stantec (2014)	EX101	MH43A				0.00	0	3106	40.14	2.94	29.63		2.13	1.04		10.09	4.90		4.41		18.73		54.30	375	0.30	100.2	0.88	38.00	45.88	0.22	1.50
		MH43A	MH44A				6.56	352	3458	46.70	2.91	32.63		2.13	0.69		10.09	3.27		4.41		20.90		57.49	375	0.30	100.2	0.88	81.00	42.70	0.19	1.00
		MH44A	MH45A				0.00	0	3458	46.70	2.91	32.63		2.13	0.69		10.09	3.27		4.41		20.90		57.49	375	0.30	100.2	0.88	64.00	42.70	0.19	1.00
		MH45A	MH46A				0.00	0	3458	46.70	2.91	32.63		2.13	0.69		10.09	3.27		4.41		20.90		57.49	375	0.30	100.2	0.88	85.00	42.70	0.19	1.00
		MH46A	MH47A				8.40	562	4020	55.10	2.87	37.33		2.13	0.69		10.09	3.27	1.60	6.01		24.20		65.49	375	0.30	100.2	0.88	41.00	34.70	0.17	1.00
		MH47A	MH101A				0.00	0	4020	55.10	2.87	37.33		2.13	0.69		10.09	3.27		6.01		24.20		65.49	375	0.30	100.2	0.88	64.00	34.70	0.17	1.00
		MH101A	MH102A				0.00	0	4020	55.10	2.87	37.33		2.13	0.69		10.09	3.27		6.01		24.20		65.49	375	0.30	100.2	0.88	64.00	34.70	0.17	1.00
River Mist Road	Stantec (2014)	MH102A	MH17A				5.24	420	4440	60.34	2.83	40.78		2.13	0.69		10.09	3.27		6.01		25.93		70.67	375	0.30	100.2	0.88	81.00	29.52	0.16	1.00
CAMBRIAN RD. FROM MH17A TO MH45A							60.34	4440																							
Cambrian Rd.	Stantec (2014)	MH17A	MH21A				26.01	1956	15813	189.42	2.76	141.19		6.83	2.21	2.96	33.20	10.76	5.10	28.63		75.72		229.88	750	0.13	419.5	0.92	204.30	189.62	0.16	1.00
Cambrian Rd.	Stantec (2014)	MH21A	MH45				7.04	408	16221	196.46	2.74	144.25		6.83	2.21		33.20	10.76	0.00	28.63		78.04		235.26	750	0.13	419.5	0.92	277.80	184.24	0.15	1.00
MINTO LANDS WITHIN BSUEA OUTLETS TO 120 (QUINN'S POINTE) EXISTING GREENBANK RD.							196.46																								
Future Collector		514	516	16	104		3.49	335	335	3.49	3.45	3.74		0.00	0.00	0.00	0.00	0.00		0.00		1.15		4.89	200	0.35	20.2	0.62	127.90	15.35	0.00	1.00
Future Collector		516	554	20	54		3.18	214	549	6.67	3.36	5.98		0.00	0.00	0.00	0.00	0.00		0.00		2.20		8.18	200	0.35	20.2	0.62	170.90	12.06	0.00	1.00
Future Collector																0.00															
Future Collector		500	502	25	70	115	7.16	481	481	7.16	3.39	5.28		0.00	0.00	0.00	0.00	0.00		0.00		2.36	0.10	7.74	200	0.35	20.2	0.62	174.00	11.41	0.00	1.00
Future Collector		502	551	8	44		1.55	146	627	8.71	3.34	6.78		0.00	0.00	0.00	0.00	0.00		0.00		2.87		9.76	200	0.88	32.1	0.99	171.30	20.22	0.00	1.00
East-West Collector		550	551	20			1.98	68	68	1.98	3.63	0.80		0.00	0.00	0.00	0.00	0.00		0.00		0.65		1.45	200	0.35	20.2	0.62	99.90	18.73	0.00	1.00
East-West Collector		551	552	22	0		1.49	75	770	12.18	3.30	8.23		0.00	0.00	0.00	0.00	0.00		0.00		4.02		12.34	200	0.35	20.2	0.62	175.00	7.90	0.00	1.00
East-West Collector		552	554	12	20		3.36	95	865	15.54	3.27	9.17		0.00	0.00	0.00	0.00	0.00		0.00		5.13		14.40	200	0.35	20.2	0.62	178.30	3.37	0.00	1.00
East-West Collector		554	556	11	34		1.81	129	1543	24.02	3.14	15.68		0.00	0.00	0.00	0.00	0.00		0.00		7.93		23.71	250	0.33	35.6	0.70	295.60	9.15	0.00	1.00
Future Collector		517	564	20	35		2.07	163	163	2.07	3.54	1.87		0.00	0.00	0.00	0.00	0.00		0.00		0.68		2.55	200	0.59	26.3	0.81	280.00	23.71	0.00	1.00
Alex Polowin Ave.		13	14	12	0		0.54	41	41	0.54	3.67	0.49		0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.49	200	0.67	28.0	0.86	74.56	27.53	0.00	1.00
Alex Polowin Ave.		14	90	13	0		0.65	44	85	1.19	3.61	0.99		0.00	0.00	0.00	0.00	0.00		0.00		0.00		0.99	200	0.94	33.1	1.02	112.06	32.13	0.00	1.00
Alex Polowin Ave.		90	5	11	0		0.54	37	122	1.73	3.58	1.41		0.00	0.00	0.00	0.00	0.00		0.00		0.00		1.41	200	0.35	20.3	0.63	108.16	18.87	0.00	1.00
River Mist Road		5	563	0			0.00	0	122	1.73	3.58	1.41		0.00	0.00	0.00	0.00	0.00		0.00		0.00		1.41	200	0.42	22.2	0.68	80.00	20.76	0.00	1.00
River Mist Road		563	564	8			0.47	27	149	2.20	3.55	1.72		0.00	0.00	0.00	0.00	0.00		0.00		0.73		2.44	200	0.42	22.2	0.68	50.00	19.73	0.00	1.00
River Mist Road		564	556	7	9		0.64	48	360	4.91	3.43	4.01		0.00	0.00		0.00	0.00		0.00		1.62		5.63	200	0.35	20.2	0.62	95.00	14.62	0.00	1.00
East-West Collector		556	557						1903	28.93	3.08	19.01		0.00	0.00	2.20	2.20	0.71		0.00		10.27		30.09	300	1.39	118.9	1.63	44.30	84.53	0.07	1.00
East-West Collector		557	558	6			1.12	20	1923	30.05	3.08	19.19		0.00	0.00	2.86	5.06	1.64		0.00		11.59	4.00	36.42	300	1.39	118.9	1.63	158.40	80.38	0.14	1.00
Future Collector		560	558	50	0		3.09	170	170	3.09	3.54	1.95		0.00	0.00		0.00	0.00		0.00		1.02		2.97	200	0.35	20.2	0.62	150.00	17.27	0.00	1.00
East-West Collector		558	119				5.74	0	2093	38.88	3.06	20.73		0.00	0.00		5.06	1.64		0.00		14.50		40.97	450	0.13	107.2	0.65	150.00	63.75	0.12	1.00
Future Collector		521	522	24	33		2.17	171	171	2.17	3.54	1.96		0.00	0.00		0.00	0.00		0.00		0.72		2.68	200	1.26	38.4	1.18	230.00	35.74	0.00	1.00
		522	523						171	2.17				0.00	0.00		0.00	0.00		0.00												
		523	524		71		1.95	192	363	4.12				0.00	0.00		0.00	0.00		0.00											0.00	1.00
Future Collector		520	524	41			2.06	139	139	2.06	3.56	1.60		0.00	0.00		0.00	0.00		0.00		0.68		2.28	200	0.26	17.4	0.54	72.20	15.16	0.00	1.00
Future Collector		524	578		0		0.00	0	502	6.18	3.38	5.50		0.00	0.00		0.00	0.00		0.00		2.04		7.54	300	0.20	45.1	0.62	200.90	37.58	0.00	1.00
Future Collector		578	532		87		3.63	235	737	9.81	3.31	7.89		0.00	0.00		0.00	0.00		0.00		3.24		11.13	300	0.20	45.1	0.62	173.70	33.98	0.00	1.00
Future Collector		532	534	50	26		3.29	240	977	13.10	3.25	10.27		0.00	0.00		0.00	0.00		0.00		4.32		14.60	300	0.20	45.1	0.62	127.45	30.52	0.00	1.00
Future Collector		534	536	55			2.96	187	1164	16.06	3.21	12.09		0.00	0.00		0.00	0.00		0.00		5.30		17.39	450	0.20	133.0	0.81	173.27	115.63	0.00	1.00
Future Collector		536	538				0.00	0	1164	16.06	3.21	12.09		0.00	0.00	0.00	0.00	0.00		0.00		5.30		17.39	450	0.20	133.0	0.81	309.73	115.63	0.00	1.00
		538	119	0			0.00	0	1164	16.06	3.21	12.09		0.00	0.00		0.00	0.00		0.00		5.30		17.39	525	0.15	173.8	0.78	245.34	156.37	0.00	1.00
Greenbank Rd.		119	EX120					0	3257	54.94	2.93	30.92		0.00	0.00		5.06	1.64		0.00		19.80		56.46	600	0.15	248.1	0.85	168.66	187.53	0.08	1.00
QUINN'S POINTE OUTLETS TO MH205A EXISTING GREENBANK RD.							54.94	3257																							
Greenbank Road		EX120	EX121				0.22	0	3257	55.16	2.93	30.92		0.00	0.00	0.00	5.06	1.64		0.00		19.87		56.53	600	0.16	259.0	0.89	58.09	202.51	0.08	1.00
Greenbank Road		EX121	EX122				0.28	0	3640	61.99	2.90	34.16		0.00	0.00	0.00	6.63	2.15		0.00		22.64		63.05	600	0.33	369.2	1.27	75.27	306.17	0.10	1.00

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

CITY OF OTTAWA
MINTO COMMUNITIES INC.
JLR NO. 26610

BARRHAVEN SOUTH SANITARY SEWER DESIGN SHEET

Designed by: AT
Checked by:HM

PROPOSED AND BSUEA DESIGN PARAMETERS					
Single Family	3.4	pers/unit	q =	280	L/cap/day
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Apt Units	1.8	pers/unit	Inst./Comm. =	28000	L/ha/day
Manning's Coeff. N =	0.013		Commerial PF*=	1.0/1.5	

*1.5 if ICI in contributing area is >20%, 1.0 if ICI in contributing area is <20%

Sources:	
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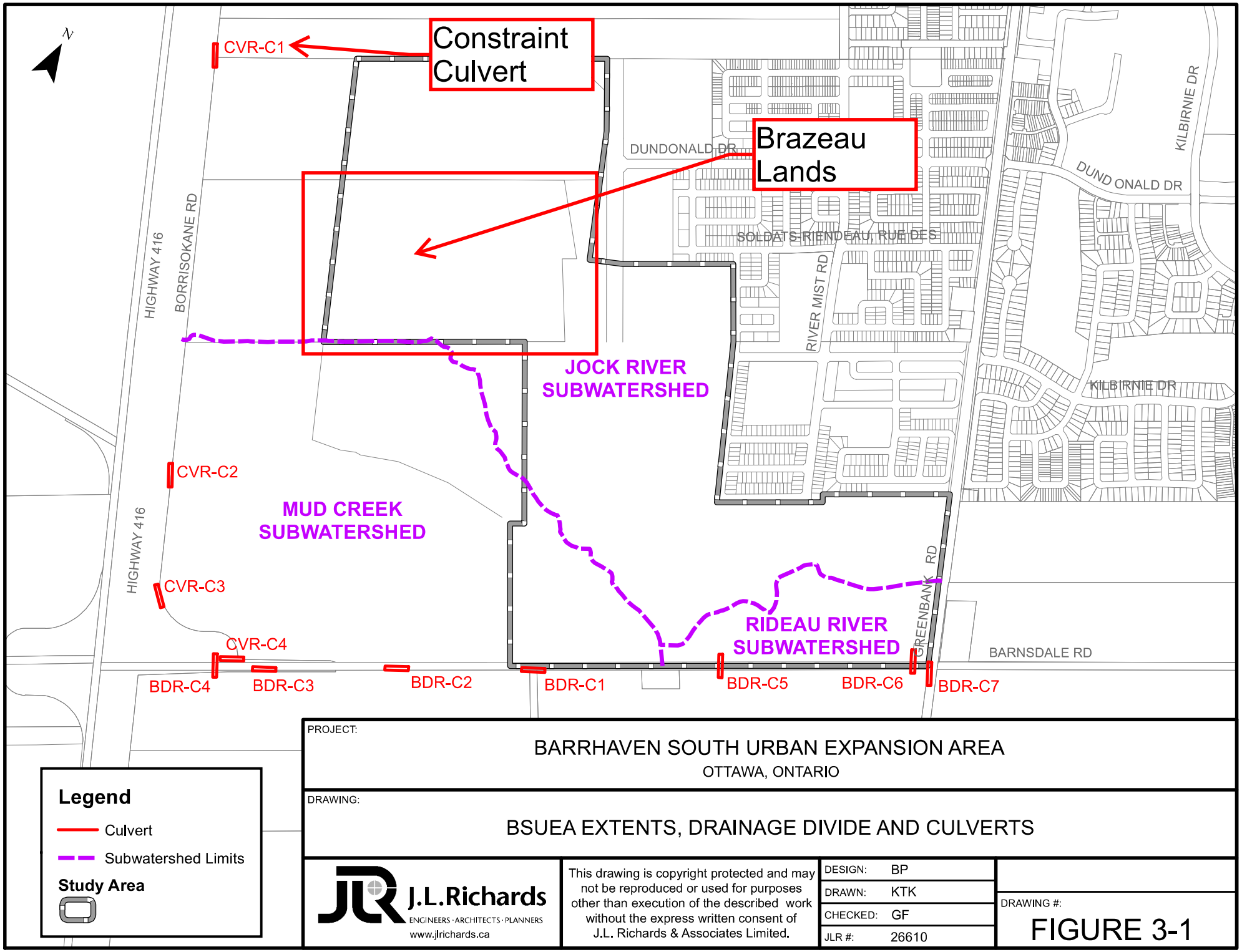
Legend	
	Proposed
	Proposed by Others
	Existing

Date: February 2018

STREET	SOURCE	M.H. #		RESIDENTIAL								COMMERCIAL			INSTITUTIONAL			GREEN/UNUSED						SEWER DATA					RESIDUAL		ICI*
				NUMBER OF UNITS			AREA	POPULATION	CUMULATIVE		PEAKING	POPUL.	AREA	CUMM.	INST.	AREA	CUMM.	INST.	AREA	CUMM.	PEAK EXTR.	PLUG	PEAK DES.	DIA.	SLOPE	CAPAC.	VEL.	LENGTH	CAP.	ICI/	Peaking
		FROM	TO	SING.	MULT.	APT.	TOTAL ha	TOTAL peop.	POPUL. peop.	AREA ha	FACTOR	FLOW l/s	ha	ha	l/s	ha	ha	l/s	ha	ha	FLOW l/s	FLOW l/s	FLOW l/s	mm	%	l/s	m/s	m	l/s	TOTAL	Factor
Greenbank Road		EX122	EX123R				0.45	0	3640	62.44	2.90	34.16		0.00	0.00	0.00	6.63	2.15		0.00	22.79		63.20	600	0.21	291.1	1.00	121.02	227.90	0.10	1.00
Easement		EX44	EX123R				0.00	0	259	2.62	3.48	2.93		0.00	0.00	0.00	0.00	0.00		0.00	0.86		3.79	300	0.35	59.9	0.82	19.00	56.12	0.00	1.00
Greenbank Road		EX123R	MH205A				0.43	0	3899	65.49	2.87	36.32		0.00	0.00	0.00	6.63	2.15		0.00	23.80		66.37	600	0.25	319.2	1.09	120.80	252.85	0.09	1.00
Kilbirnie Drive	JLR (2016)	EX24	MH205A		3		0.11	8	224	2.15	3.50	2.54		0.00	0.00	0.00	0.00	0.00		0.00	0.71		3.25	200	0.71	28.8	0.89	28.70	25.59	0.00	1.00
Existing Greenbank Road		MH205A	EX98A					0	4123	67.64	2.86	38.18		0.00	0.00	0.00	6.63	2.15		0.00	24.51		73.94	600	0.25	320.3	1.10	126.00	246.34	0.09	1.00
EXISTING GREENBANK RD. FROM MH 98A TO MH45A							6.15	484																						
Existing Greenbank Road	IBI	EX98A	MH99A				0.00	0	4123	67.64	2.86	38.18		0.00	0.00		6.63	2.15		0.00	24.51		73.94	600	0.25	320.3		125.00	246.34	0.09	1.00
Existing Greenbank Road	IBI	MH99A	MH100A				0.00	0	4123	67.64	2.86	38.18		0.00	0.00		6.63	2.15		0.00	24.51		73.94	600	0.25	320.3		108.00	246.34	0.09	1.00
Existing Greenbank Road	IBI	MH100A	MH204A				0.00	0	4123	67.64	2.86	38.18		0.00	0.00		6.63	2.15		0.00	24.51		73.94	600	0.25	320.3		105.00	246.34	0.09	1.00
Existing Greenbank Road	IBI	MH204A	MH206A				0.00	0	4123	67.64	2.86	38.18		0.00	0.00		6.63	2.15		0.00	24.51		73.94	600	0.25	320.3		103.00	246.34	0.09	1.00
Existing Greenbank Road	IBI	MH206A	MH97A				0.00	0	4123	67.64	2.86	38.18		0.00	0.00		6.63	2.15		0.00	24.51		73.94	600	0.25	320.3		125.00	246.34	0.09	1.00
Existing Greenbank Road	IBI	MH97A	MH96A				19.95	1631	5754	87.59	2.75	51.29		0.00	0.00		6.63	2.15	0.81	0.81	31.36		93.90	600	0.30	350.8		98.00	256.95	0.07	1.00
Existing Greenbank Road	IBI	MH96A	MH95A				0.00	0	5754	87.59	2.75	51.29		0.00	0.00		6.63	2.15		0.81	31.36		93.90	600	0.30	350.8		129.00	256.95	0.07	1.00
Existing Greenbank Road	IBI	MH95A	MH201A				0.00	0	5754	87.59	2.75	51.29		0.00	0.00		6.63	2.15		0.81	31.36		93.90	600	0.30	350.8		123.00	256.95	0.07	1.00
Existing Greenbank Road	IBI	MH201A	MH201B				12.13	787	6541	99.72	2.71	57.40		0.00	0.00		6.63	2.15		0.81	35.36		104.01	600	0.30	350.8		124.00	246.83	0.06	1.00
Existing Greenbank Road	IBI	MH201B	MH200A				0.00	0	6541	99.72	2.71	57.40		0.00	0.00		6.63	2.15		0.81	35.36		104.01	600	0.30	350.8		68.00	246.83	0.06	1.00
Existing Greenbank Road	IBI	MH200A	MH200C				0.00	0	6541	99.72	2.71	57.40		0.00	0.00		6.63	2.15		0.81	35.36		104.01	600	0.50	452.9		48.00	348.93	0.06	1.00
Existing Greenbank Road	IBI	MH200C	MH45				0.00	0	6541	99.72	2.71	57.40		0.00	0.00		6.63	2.15		0.81	35.36		104.01	600	0.12	221.9		26.00	117.88	0.06	1.00
Existing Greenbank Road North	Stantec (2014)	MH45	MH435A				5.12	548	23310	301.30	2.27	171.38		6.83	2.21		39.83	12.91	0.00	29.44	124.54		320.14	900	0.10	597.2		296.00	277.08	0.12	1.00
	↓	MA9	MA8				22.23	2378	2378	22.23	3.02	23.28	0.00	0.00	0.00	2.45	2.45	0.79	9.54	9.54	11.29		35.37	450	0.11	98.4		507.50	63.03	0.07	1.00
		MA8	MA7				2.88	308	2686	25.11	2.99	25.99	0.00	0.00	0.00	0.00	2.45	0.79	0.78	10.32	12.50		39.29	450	0.11	98.4		317.10	59.11	0.06	1.00
		MA7	MA6				18.50	1979	4665	43.61	2.82	42.61	0.00	0.00	0.00	0.00	2.45	0.79	0.00	10.32	18.61		62.01	450	0.11	98.4		573.10	36.39	0.04	1.00
Realigned Greenbank Road		MA6	MA5				21.68	2320	6985	65.29	2.69	60.80	0.00	0.00	0.00	0.00	2.45	0.79	0.00	10.32	25.76		87.36	525	0.10	140.5		473.90	53.14	0.03	1.00
Realigned Greenbank Road		MA5	MA4				9.53	1020	8005	74.82	2.64	68.49	0.00	0.00	0.00	0.00	2.45	0.79	0.00	10.32	28.90		98.19	525	0.10	140.5		439.40	42.31	0.03	1.00
Realigned Greenbank Road		MA4	MH521A				8.07	863	8868	82.89	2.61	74.87	0.00	0.00	0.00	0.00	2.45	0.79	2.42	12.74	32.37		108.03	525	0.10	140.5		530.70	32.47	0.02	1.00
		MH521A	MH522A				3.80	231	9099	86.69	2.60	76.56	0.00	0.00	0.00	0.00	2.45	0.79	0.02	12.76	33.63		110.98	600	0.10	201.5		49.90	90.52	0.02	1.00
	↓	MH522A	MH435A				0.00	0	9099	86.69	2.60	76.56	0.00	0.00	0.00	0.00	2.45	0.79	0.00	12.76	33.63		110.98	600	0.10	201.5		11.10	90.52	0.02	1.00
		MH435A	MH501A				0.00	0	32409	387.99	2.16	226.39	0.00	6.83	2.21	0.00	42.28	13.70	0.00	42.20	158.17		409.57	900	0.10	597.0		13.30	187.43	0.10	1.00

APPENDIX D


Constraint Culvert
Brazeau Lands
CVR-C1
CVR-C2
CVR-C3
CVR-C4
BDR-C1
BDR-C2
BDR-C3
BDR-C4
BDR-C5
BDR-C6
BDR-C7
JOCK RIVER SUBWATERSHED
MUD CREEK SUBWATERSHED
RIDEAU RIVER SUBWATERSHED
HIGHWAY 416
BORRISOKANE RD
DUNDONALD DR
SOLDATS-RIENDEAU, RUE DES
RIVER MIST RD
KILBIRNIE DR
DUND ONALD DR
GREENBANK RD
BARNSDALE RD
Legend
Culvert
Subwatershed Limits
Study Area
PROJECT:
BARRHAVEN SOUTH URBAN EXPANSION AREA
OTTAWA, ONTARIO
DRAWING:
BSUEA EXTENTS, DRAINAGE DIVIDE AND CULVERTS
J.L.Richards
ENGINEERS · ARCHITECTS · PLANNERS
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This drawing is copyright protected and may not be reproduced or used for purposes other than execution of the described work without the express written consent of J.L. Richards & Associates Limited.
DESIGN: BP
DRAWN: KTK
CHECKED: GF
JLR #: 26610
DRAWING #:
FIGURE 3-1
File Location: R:\26000\26610 - Barrhaven Expansion - Minto Brazeau Mattamy\JLR DWG\GIS\26610 C BSUEA EXTENTS.mxd
Plot Date: September 12, 2017 8:45:23 AM

Table 5-1: Inventory of Model Boundary Water Crossings

Culvert ID	Location	Type	Size (mm)
CR-C1	On Cambrian Road, 910 m east of Borrisokane Road, carries Clarke West Municipal Drain	Circ. CSP	1650
CR-C2	On Cambrian Road at Borrisokane Road	Circ. CSP	N/A
BDR-C4	On Barnsdale Road, 50 m west of Borrisokane Road	Circ. CSP	1200
BDR-C5	On Barnsdale Road, 500 m west of the existing Greenbank Road	Circ. CSP	500
BDR-C6	On Barnsdale Road, 60 m west of the existing Greenbank Road	Circ. CSP	400

It should be noted that culvert CR-C2 was not included as part of the topographical survey and size is currently unknown.

The 2014 Barrhaven South Master Servicing Study Draft Addendum (Draft 2014 BSMSSA) prepared by Stantec, notes that water crossing CR-C1 is to be replaced with storm sewers when the Clarke West Municipal Drain is enclosed as part of the adjacent development and the Clarke Stormwater Management Facility is constructed. The Draft 2014 BSMSSA also indicated that culvert CR-C2 is to be maintained, and will accommodate flows from the existing catchment area south of Cambrian Road up to the 1:100 year event. Should future development occur south of the woodlot draining to CR-C2, grading and servicing from the future development area in the vicinity of the woodlot should be developed to maximize overland sheet flow drainage (not channelized) towards the woodlot.

Table 5-2: Inventory of Model Water Crossings (Internal)

Culvert ID	Location	Type	Size (mm)
CVR-C1	East of Borrisokane Road along the north corner of the BSUEA	Circ. CSP	500
CVR-C2	East of Borrisokane Road at Field Entrance	Circ. CSP	450
CVR-C3	East of Borrisokane Road at Field Entrance	Circ. CSP	400
CVR-C4	Borrisokane Road Crossing north of Barnsdale Road	Circ. CSP	1200
BDR-C1	Viewbank Road Crossing	Circ. CSP	400
BDR-C2	Field Entrance Crossing South of Barnsdale Road	Circ. CSP	400
BDR-C3	Field Entrance Crossing South of Barnsdale Road	Circ. CSP	500
BDR-C7	Barnsdale Road Crossing close to the existing Greenbank Road Intersection	Circ. CSP	500

Table 5-2, above, summarizes the various culvert crossings within the BSUEA. As shown above, all the culverts are 500 mm in diameter or less with the exception of CVR-C4, which is 1200 mm in diameter.

B5.5.1 Storm Distribution

The hydrological response of the BSUEA and abutting lands was simulated under a 6 hour, 12 hour and 24 hour SCS Type II storm distribution. The SCS Type II storm distribution was developed by the American Soil Conservation Service and is generally used for estimating flows in rural areas. The critical storm event under pre-development conditions, with the highest peak runoff, was found to occur under the 12 hour SCS Type II storm distribution.

B5.6 Modeling Results

The pre-development SWMHYMO simulation results, predicting flows at each of the culverts for the critical storm event, are shown in Table 5-5, below. The estimated capacity and level of service of each culvert is also provided. The details of culvert CR-C2, crossing Cambrian Road at Borrisokane Road, could not be obtained in the field due to obstructions and/or structural failure. Hence, the capacity and level of service at this culvert could not be confirmed.

Table 5-5: Hydrological Simulation Results at Culvert Locations (12 hour SCS Type II storm)

Culvert ID	Flow (m^3/s) at culvert location for return period (recurrence)						Estimated Culvert Capacity (m^3/s)	Estimated Level of Service (years)
	1:2 yr	1:5 yr	1:10 yr	1:25 yr	1:50 yr	1:100 yr		
CR-C1	0.3	0.7	1.0	1.6	2.0	2.5	5.5	1:100
CR-C2	0.2	0.4	0.7	1.0	1.3	1.6	N/A	N/A
CVR-C1	0.1	0.3	0.5	0.8	1.0	1.3	0.4	1:5
CVR-C2	0.0	0.1	0.1	0.2	0.2	0.3	0.2	1:25
CVR-C3	0.0	0.1	0.2	0.2	0.3	0.4	0.3	1:50
CVR-C4	0.2	0.4	0.6	0.9	1.1	1.4	2.6	1:100
BDR-C1	0.0	0.0	0.1	0.1	0.1	0.2	0.2	1:100
BDR-C2	0.0	0.1	0.1	0.1	0.2	0.2	0.2	1:50
BDR-C3	0.1	0.1	0.1	0.2	0.2	0.3	0.5	1:100
BDR-C4	0.2	0.4	0.6	0.9	1.2	1.5	2.6	1:100
BDR-C5	0.0	0.0	0.0	0.0	0.0	0.1	0.3	1:100
BDR-C6	0.0	0.0	0.1	0.1	0.2	0.2	0.2	1:100
BDR-C7	0.1	0.1	0.1	0.2	0.3	0.4	0.3	1:50
Total Flow to Thomas Baxter Municipal Drain	0.2	0.5	0.7	1.1	1.3	1.6	N/A	N/A

OUTLET TRUNK STORM SEWER TO JOCK RIVER
DISTANCE FROM MH205 TO JOCK RIVER 1:100 YR FLOOD PLAIN LIMIT IS APPROXIMATELY 815 M
INVERT AT MH205 = 93.42 M
INVERT AT JOCK RIVER 100 YR FLOOD PLAIN = APPROXIMATELY 92.0 M
OUTLET SEWER = 825 MM DIA. @ 0.17 %

CAMBRIAN RD
TO CLARK POND
TODD POND
OUTLET
FUTURE COLLECTOR RD
BORRISOKANE RD
HIGHWAY 416
TRAIL RD
RIVER MIST RD
EX GREENBANK RD
DUNDONALD DR
DES SOLDATS
RIENDEAU ST
FAMEFLOWER ST
KILBIRNIE DR
LAURALEAF CR.
BREAKSTONE RD
KNOCKADERRY CR.
ALEX PATTERSON AVE
NEW GREENBANK RD
BARNSDALE RD
DRUMMOND SWM POND
DRUMMOND AGGREGATE EXTRACTION AREA
BRAZEAU SWM POND
BRAZEAU AGGREGATE EXTRACTION AREA
SWM DRY POND
DRY SWM POND
PARK & RIDE
FRENCH PUBLIC ELEMENTARY SCHOOL
FRENCH CATHOLIC ELEMENTARY SCHOOL
NEIGHBOURHOOD PARK
COMMERCIAL
MEDIUM DENSITY
PARKETTE 1
PARKETTE 2
STREET 1
STREET 2
STREET 3
STREET 4
STREET 5
STREET 6
EAST WEST COLLECTOR
POND 1 (NORTH)
POND 2 (SOUTH)
SOUTH POND
710 HDS
825 HDS
SCHOOL
PARK

LEGEND

- PROPOSED STORM (EES SYSTEM), PER 2018 BSUEA MSS
- PROPOSED STORM (CONVENTIONAL), PER 2018 BSUEA MSS
- FUTURE STORM, PER 2014 BS MSS
- EXISTING STORM
- DRAINAGE BOUNDARY
- LIMIT OF STUDY AREA FOR BSUEA
- 710 HDS — HYDROLOGY DYNAMIC SEPARATOR
- AREA IN HECTARES* / RUNOFF COEFFICIENT* (5.48 | 0.64 | 318 - 364)
- PIPE REACH UPSTREAM MAINTENANCE HOLE TO DOWNSTREAM MAINTENANCE HOLE

* IF RED, AREAS DESIGNATED AS COMMERCIAL, SCHOOLS OR PARKS

NOTE:

ROADWAYS WITHIN A DRAINAGE AREA WHICH IS TRIBUTARY TO AN EES SEWER, ARE TO BE DESIGNED WITH EES SEWERS. CONVERSELY, ROADWAYS WITHIN A DRAINAGE AREA WHICH IS TRIBUTARY TO A CONVENTIONAL SEWER, ARE TO BE DESIGNED WITH CONVENTIONAL SEWERS.

No.	ISSUE / REVISION	DD/MM/YY
4	ISSUED FOR PLANNING COMMITTEE APPROVAL	04/05/18
3	ADDRESS COMMENTS, RE-ISSUE BSUEA MSS 2ND SUBMISSION	26/02/18
2	ISSUED AS PART OF DRAFT MSS	20/09/17
1	ISSUED FOR PRE-TAC WORKING MEETING	31/08/17

VERIFY SHEET SIZE AND SCALES. BAR TO THE RIGHT IS 25mm IF THIS IS A FULL SIZE DRAWING. 0 25mm

SCALE: 1:4000

CLIENT:

CONSULTANT: www.jlrichards.ca

J.L.Richards ENGINEERS · ARCHITECTS · PLANNERS

CONSULTANT:

PROFESSIONAL STAMP: LICENSED PROFESSIONAL ENGINEER M. N. L. DALRYMPLE PROVINCE OF ONTARIO May 4/18

PROJECT NORTH

PROJECT:

BARRHAVEN SOUTH URBAN EXPANSION AREA (BSUEA)

-

DRAWING:

MASTER STORM DRAINAGE PLAN EES

DESIGN: JW
DRAWN: CJM
CHECKED: LD
JLR #: 26610

DRAWING #: MST-2

PLOT DATE: May 4, 2018 8:44:19 AM

File Location: n:\26000\26610 - barrhaven expansion - minto brazeau nattamy\JLR DWG\civil\26610 C-MST-2.dwg

ETOBICOKE EXFILTRATION SYSTEM STORM SEWERS

Maintenance Hole Number		SEWER DATA			Upstream	Downstream
		Dia	Slope	Length	Obvert	Obvert
FROM	TO	(mm)	(%)	(m)		
DI-1	170	900	1.05	56.1	107.04	106.45
170	172	900	1.05	186.5	106.45	104.47
172	174	1350	0.30	184.4	104.47	103.92
174	176	1350	0.30	156.7	103.92	103.45
176	152	1350	0.30	161.4	103.45	102.96
150	152	675	0.15	264.6	102.30	101.90
177	152	675	0.15	237.4	102.00	101.65
152	154	1500	0.35	175.8	101.45	100.82
154	156	1500	0.55	311.7	100.53	98.82
705 (ex.)	163	525	0.42	41.5	100.82	100.65
163	156	750	0.15	118.5	100.65	100.47
156	158	1500	0.55	202.6	97.86	96.74
158	159	1500	0.55	108.1	96.20	95.60
158	158A	1500	0.95	40.0	96.74	97.13
159	159A	1500	3.54	43.0	95.60	97.13
DI-2	300	900	1.05	121.1	105.68	104.39
300	302	900	0.35	168.1	104.39	103.81
302	304	900	0.94	162.6	102.02	100.49
304	321	1200	0.15	63.3	100.49	100.39
321	322	1200	0.15	88.2	100.39	100.28
322	323	1200	0.15	75.4	100.28	100.15
323	324	1200	0.35	140.8	100.15	99.82
320	324	825	0.15	139.2	99.83	99.62
324	330	1500	0.15	183.6	99.82	99.38
330	332	1500	0.15	144.2	99.38	99.16
332	334	1650	0.15	131.1	99.16	98.96
334	336	1650	0.15	173.3	98.96	98.70
336	337	1650	0.15	168.8	97.58	97.33
337	P2-N	1650	0.15	36.0	97.33	97.29
159	825HDS	1050	0.35	26.2	95.15	95.05
825HDS	822	1200	0.12	160.8	95.05	94.86
314	318	1050	0.15	170.2	101.68	101.43
316	318	1200	0.15	96.0	101.43	101.28
318	364	1200	0.58	266.2	101.28	99.62
364	362	1200	0.70	88.2	99.10	98.48
362	190	1200	0.70	177.7	97.78	96.54
351	190	600	0.67	134.4	95.83	94.93
754	190	1800	0.13	15.0	94.99	94.93
190	190A	1200	0.07	30.0	94.32	94.30
190A	190B	1200	0.09	52.7	94.30	94.25
190B	755	600	0.13	15.3	93.64	93.62
110	111	450	2.70	89.4	102.90	100.49
111	112	675	0.90	101.2	100.49	99.58
313	112	525	0.74	140.0	100.60	99.56
112	710	675	1.30	73.3	99.56	98.61
112	710	675	1.30	73.3	99.56	98.61
712	711	375	2.56	104.3	102.031	99.361
711	710	450	1.32	104.4	99.407	98.027
710	720	750	0.61	118.2	98.102	97.397
753	754	1800	0.11	54.9	95.008	94.949
754	755	1800	0.13	74.9	94.939	94.839
755	822	1800	0.13	79.5	94.84	94.74
EX.822	EX.821	1800	0.14	123.1	94.07	93.90
EX.821	EX.820	1800	0.15	121.9	93.90	93.71
EX.748	EX.747	600	0.20	83.1	95.95	95.79
EX.747	EX.745	600	0.99	12.1	95.72	95.60
EX.746	EX.744	600	0.20	69.4	95.58	95.44
EX.743	EX.744	450	1.31	81.4	95.92	94.92
EX.744	EX.820	675	0.32	12.4	93.75	93.70
EX.820	EX.102	1800	0.16	121.7	93.71	93.52
270	265	1500	0.15	100.0	99.40	99.30
265	260	1500	0.15	357.3	98.00	97.47
260	245	1500	0.15	227.8	97.47	97.12
250	245	1500	0.15	345.0	97.84	97.12
245	240	2100	0.15	84.9	97.12	97.00
240	Brazeau SWM Pond	2100	0.15	241.7	97.00	96.63
Brazeau SWM Pond	235	675	0.17	37.0	95.19	95.12
230	225	1500	0.15	450.0	97.56	96.99
225	215	1500	0.15	220.1	96.99	96.66
220	215	1500	0.15	408.7	97.27	96.66
215	Drummond SWM Pond	2100	0.15	350.0	96.66	96.13
Drummond SWM Pond	210	675	0.15	25.0	94.69	94.65
235	210	675	0.17	272.0	95.12	94.65
210	205	825	0.17	223.0	94.65	94.26
205	Flood Plain	825	0.17	617.0	94.26	92.94
900	227 (ex.)	975	0.15	120.0	97.83	97.75

patersongroup **memorandum**

consulting engineers

re: **Groundwater Infiltration Review**
Proposed Residential Development
Brazeau Pit and Drummonds Pit- Borrisokane Road - Ottawa

to: Caivan Communities - **Mr. Andrew Finnson** - afinnson@caivan.com

date: August 30, 2019

file: PG4504-MEMO.06 Revision 1

Paterson Group (Paterson) has prepared the current memorandum report to provide a review of the hydrogeological characteristics in support of groundwater infiltration recommendations for the aforementioned site.

Background Information

It is currently understood that the proposed residential development consists of a mixture of single family and townhouse style residential dwellings. It is also understood that the development will be serviced by municipal infrastructure that outlets to a stormwater management pond.

The field program for the geotechnical investigation at the Brazeau Pit was completed between November 16, 2018 and April 10, 2019. At that time, a total of 12 boreholes and 15 test pits were advanced to a maximum depth of 5.9 m below existing grade. The results of the investigation indicated that, in general, the subsurface profile consisted of a thin layer of fill material overlying a deposit of silty sand/sand with varying amounts of gravel and cobbles. A thick layer of fill material was encountered within the southeast portion of the subject site and primarily consisted of silty sand with varying amounts of clay, gravel, cobbles, organics and construction debris. This was typically underlain by a till deposit composed of a silty sand matrix with gravel, cobbles and boulders. A very stiff to stiff silty clay layer was noted between the silty sand/sand and till deposits at select boreholes within the western portion of the property. A DCPT test was completed at one borehole location and encountered practical refusal at a depth of 23.5 m. However, bedrock was not conclusively encountered as part of the geotechnical investigations for the proposed development.

The field program for the geotechnical investigation at the Drummonds Pit was completed between July 22 and July 26, 2019. At that time, a total of 8 boreholes and 14 test pits were advanced to a maximum depth of 11.3 m below existing grade. The results of the investigation indicated that, in general, the subsurface profile consisted of a fill material comprised of silty sand to sand and/or silty clay with varying amounts of gravel, cobbles and boulders. Depending on the depth of excavation during the extraction of the aggregate material, the above noted fill material is underlain by either silty sand/sand with varying amounts of gravel, cobbles and boulders or a glacial till deposit composed of a silty sand to silty clay matrix with varying amounts of gravel, cobbles and boulders. A very stiff to stiff silty clay layer was noted underlying the silty sand/sand or fill material at select test holes. A DCPT test was completed at one borehole location and encountered practical refusal at a depth of 11.6 m.

Bedrock was not conclusively encountered as part of the geotechnical investigations for the proposed development. However, based on available mapping, the site is located in an area where bedrock consists of dolomite of the Oxford formation, with overburden thickness ranging from 15 to 25 m.

Hydrogeological Setting

The subject site is located primarily within the Jock Downstream Reach subwatershed of the Jock watershed, with a negligible percentage of the property being located within the Mud Creek subwatershed of the Lower Rideau watershed.

Hydraulic Conductivity and Infiltration Values

Hydraulic conductivity testing was not completed as part of the geotechnical investigations for the proposed development. However, testing completed directly south of the subject site as part of the Community Development Plan (CDP) determined that the hydraulic conductivity of the silty sand/sand deposit ranged from 3.0×10^{-6} to 4.8×10^{-4} m/sec. The hydraulic conductivity values obtained from within the till deposit were slightly lower, and ranged from 5.0×10^{-7} to 7.6×10^{-5} m/sec. The values obtained from the field testing to the south are consistent with published values, and are considered applicable to the materials encountered at the subject site. With regards to the silty clay layer noted underlying the silty sand/sand deposit, hydraulic conductivity values were anticipated to range from 1.0×10^{-9} to 1.0×10^{-7} m/sec, and were based on published values. Due to the variability in the fill material noted on site, hydraulic conductivity values are anticipated to range from 1.0×10^{-7} to 1.0×10^{-4} m/sec and is dependant on the ratio of silty sand/sand to silty clay within the material. **For infiltration system design purposes, it is recommended to use an infiltration rate of 75 mm/hr for the Brazeau Pit site and an infiltration rate of 50 mm/hr for the Drummond Pit site.**

Based on discussions with David Schaeffer Engineering Ltd., it is understood that a version of the Etobicoke exfiltration system is being proposed for the development in order to ensure infiltration volumes to the underlying aquifer systems be maintained. The exfiltration system is proposed to be installed below the curb lines of the development and placed over native silty sand/sand, free-draining sand material 1.5 m in thickness or a silty sand/sand to silty clay fill material. **It is understood that the subject area is required to meet post-development infiltration levels of 40% of the area precipitation. It is further understood that the annual precipitation for the area is 844 mm, so a post-development infiltration level of 40% would require that a minimum infiltration of 338 mm be achieved for the subject site.**

Water Levels and Flow Directions

Water levels obtained at the time of the geotechnical investigations ranged from 0 to 9.1 m depth below existing grade. Based on the recovered water levels, it is expected that the local groundwater flow direction trends to the north towards the Jock River, located approximately 1.4 km north from the north property boundary of the Drummonds Pit. This is corroborated by the groundwater divide separating the Jock Downstream Reach subwatershed and the Mud Creek subwatershed located at the southern boundary of the Brazeau Pit. Its location at the southern edge of the property would suggest that groundwater flows north, away from the divide.

Groundwater Recharge and Discharge

The presence of overburden soils with moderate to high hydraulic conductivity overlying the bedrock aquifer units are considered to provide the potential for significant groundwater recharge within the study area. The Kars esker is considered to transmit large quantities of water that are recharged through the infiltration of precipitation within the non-cohesive material comprising the original overburden materials in the area. The subject site represents a small portion of the existing zone identified by the Mississippi-Rideau Source Protection Region (MRSPR) as a zone of significant groundwater recharge.

Recommendations

As previously discussed, existing conditions at the subject site currently allow for significant volumes of recharge to occur. As such, it is recommended that measures be taken as part of the proposed development to ensure that infiltration volumes to the underlying aquifer systems be maintained. In accomplishing this, the following are some of the potential measures that could be implemented at the subject site:

- ❏ Transport the water using a modified version of the Etobicoke exfiltration system for the development with a minimum 1 m vertical separation between the base of the system and the seasonally high water table to allow for adequate infiltration.
- ❏ Allocate land for City parks, providing opportunities to allow clean water to infiltrate into the overburden aquifer system.
- ❏ Promote infiltration of clean water from rooftops by directing stormwater to grassed areas as opposed to driveways and/or municipal infrastructure.
- ❏ Implement Low Impact Development (LID) measures in conjunction with BMP for stormwater quality and quantity control to assist in infiltrating clean water, treating salt impacted water where required or redirecting salt impacted water away from infiltration locations.

It is important to note that not all of the above may necessarily need to be employed at the subject site, and that the measures required to maintain existing infiltration will be dependant on the final design of the proposed development.

We trust that this information satisfies your requirements.

Best Regards,

Paterson Group Inc.

Mike Killam, P.Eng.

David J. Gilbert, P.Eng.

Paterson Group Inc.

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LEGEND

- SUBJECT LANDS
- STORM TRUNK
- LOCAL STORM SEWER
- STORM DRAINAGE AREA
- STORM DRAINAGE AREA
  RUN-OFF COEFFICIENT
  UPSTREAM MH/DOWNSTREAM MH
  STORM FREQUENCY
- TOP OF GRADE
  PROPOSED STORM OBVERT
- OVERLAND FLOW ROUTE
- EXTERNAL DRAINAGE
- STORM MANHOLE

MEANDER BELT LIMIT
MEANDER BELT LIMIT
MEANDER BELT LIMIT
MEANDER BELT LIMIT
JOCK RIVER
DITCH INV 89.45
EX. TWIN 1200 CSP CULVERT
OPEN SPACE
PROPOSED CHANNEL
COMM
SCHOOL
OUTLET CHANNEL
PROPOSED CULVERT
PARK
CLARKE SWM POND
EX. TWIN 1200 CSP CULVERT
Twin 800Ø CSP Culvert
ASSUME FUTURE DEVELOPMENT CONTROLLED POST TO PRE DEVELOPMENT UP TO THE 100-YEAR EVENT
PARK
EX. DRAINAGE DITCH 6m BOTTOM WIDE 10m TOP WIDTH
EMPLOYMENT
EX. 1200 CSP CULVERT
PROPOSED CHANNEL
PROTECTED WOODLOT
APARTMENT
PARKETTE
COMMERCIAL
DITCH INV 91.10
Ex. CULVERT
PROPOSED CULVERT
CAMBRIAN ROAD
TRAIL ROAD FACILITY STORM OUTLET TO BORRISOKANE ROAD SIDE DITCH
PROTECTED WOODLOT
SCHOOL
COMMERCIAL
DRAINAGE TO SOUTH WOODLOT, FUT. DEVELOPMENT ASSUMED CONTROL POST TO PRE
SWM POND 1
DRY POND
MAX W/L 97.70
BOTTOM 95.00
VOL 35,000m³
4.06Ha
MH 1001 MH 1002
1.3
2-year
3.60Ha
0.68
167 168
2-year
1.50Ha
0.68
167 168
5-year
6.95Ha
0.68
167 168
2-year
LANDS OWNED BY MATTAMY
URBAN BOUNDARY
DRUMMOND LANDS, FUT. DEVELOPMEN TO CONTROL FLOW TO 595.4 L/S
7.79Ha
0.75
165 166
2-year
0.62Ha
0.68
134 163
2-year
0.58Ha
0.68
133 134
2-year
0.07Ha
0.68
133 134
5-year
0.70Ha
0.68
121 133
5-year
1.69
0.68
132 133
5-year
0.95
0.68
164 165
2-year
6.76
0.68
164 165
2-year
1.59
0.68
125 132
2-year
1.43
0.68
162 163
2-year
1.52
0.68
157 162
2-year
15.50
0.75
163 164
2-year
0.20Ha
0.68
152 157
2-year
0.15Ha
0.68
151 152
2-year
5.54
0.68
150 151
2-year
0.07Ha
0.68
121 133
2-year
0.54Ha
0.68
120 121
2-year
1.72Ha
0.30
120 121
2-year
2.91
0.68
120 121
2-year
1.58Ha
0.68
125 132
2-year
2.74Ha
0.68
120 121
2-year
1.11
0.68
110 121
2-year
3.13
0.68
110 121
2-year
HIGHWAY 416
BORRISOKANE ROAD
FUTURE GREENBANK ROAD
URBAN BOUNDARY

WATER LEVELS PER J.D. BARNES, NOVEMBER 2015.

100-YEAR WATER LEVEL
50-YEAR WATER LEVEL
25-YEAR WATER LEVEL
10-YEAR WATER LEVEL
5-YEAR WATER LEVEL
2-YEAR WATER LEVEL
BOTTOM OF DITCH
EXISTING CENTERLINE OF ROAD
EXISTING CENTERLINE OF ROAD

MH 1008 — MH 1007 — MH 1006 — MH 1005 — MH 1004 — MH 1003

PROPOSED GRADES
STORM INVERT
CENTERLINE CHAINAGE

92.386 — 94.240 — 92.910 — 95.160 — 93.548 — 98.008

1200Ø STM 106.0 @ 0.20%
1200Ø STM 106.0 @ 0.20%
1200Ø STM 106.0 @ 0.20%
1050Ø STM 106.0 @ 0.35%
900Ø STM 106.0 @ 1.10%

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CAIVAN - BRAZEAU
STORM SERVICING PLAN
CITY OF OTTAWA

PROJECT No. :	18-1030
SCALE:	1:3,500
DATE:	SEPTEMBER 2019
DRAWING No.	1

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
Unknown Road9 - 09																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00														
			0.54	0.68	1.02	1.02			0.00	0.00			0.00	0.00			0.00	0.00														
			1.72	0.30	1.43	2.46			0.00	0.00			0.00	0.00			0.00	0.00														
			2.74	0.68	5.18	7.63			0.00	0.00			0.00	0.00			0.00	0.00														
	120	121	2.91	0.68	5.50	13.14			0.00	0.00			0.00	0.00			0.00	0.00	10.00	76.81	104.19	122.14	178.56	1009	750	750	CONC	0.95	83.0	1085.09	2.46	0.56	0.93
To Unknown Road1 - 01, Pipe 121 - 133						13.14				0.00				0.00				0.00	10.56														
Unknown Road1 - 01																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00	16.33														
					0.00	0.00	1.11	0.68	2.10	2.10			0.00	0.00			0.00	0.00														
	110	121	3.13	0.68	5.92	5.92			0.00	2.10			0.00	0.00			0.00	0.00	16.33	58.80	79.49	93.07	135.88	515	600	600	CONC	1.75	85.5	812.26	2.87	0.50	0.63
Contribution From Unknown Road9 - 09, Pipe 120 - 121						13.14				0.00				0.00				0.00	10.56														
			0.07	0.68	0.13	19.19			0.00	2.10			0.00	0.00			0.00	0.00														
	121	133			0.00	19.19	0.70	0.68	1.32	3.42			0.00	0.00			0.00	0.00	16.83	57.77	78.09	91.42	133.46	1375	1200	1200	CONC	0.20	118.0	1743.57	1.54	1.28	0.79
To Unknown Road6 - 06, Pipe 133 - 134						19.19				3.42				0.00				0.00	18.10														
Unknown Road6 - 06																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00	12.28														
			1.58	0.68	2.99	2.99			0.00	0.00			0.00	0.00			0.00	0.00														
	125	132	1.59	0.68	3.01	5.99			0.00	0.00			0.00	0.00			0.00	0.00	12.28	69.04	93.52	109.58	160.10	414	750	750	CONC	0.20	84.0	497.87	1.13	1.24	0.83
					0.00	5.99	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00	15.36														
	132	133	1.69	0.68	3.19	9.19			0.00	0.00			0.00	0.00			0.00	0.00	15.36	60.92	82.40	96.49	140.90	560	900	900	CONC	0.15	63.0	701.13	1.10	0.95	0.80
Contribution From Unknown Road1 - 01, Pipe 121 - 133						19.19				3.42				0.00				0.00	18.10														
					0.00	28.37	0.07	0.68	0.13	3.55			0.00	0.00			0.00	0.00														
	133	134	0.58	0.68	1.10	29.47			0.00	3.55			0.00	0.00			0.00	0.00	18.10	55.30	74.71	87.45	127.64	1895	1500	1500	CONC	0.15	115.0	2737.76	1.55	1.24	0.69
	134	163	0.62	0.68	1.17	30.64			0.00	3.55			0.00	0.00			0.00	0.00	19.34	53.12	71.74	83.96	122.51	1883	1650	1650	CONC	0.15	115.0	3530.01	1.65	1.16	0.53
To Unknown Road12 - 11, Pipe 163 - 164						30.64				3.55				0.00				0.00	20.50														
Unknown Road12 - 11																																
					0.00	0.00	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00	17.19														
	150	151	5.54	0.68	10.47	10.47			0.00	0.00			0.00	0.00			0.00	0.00	17.19	57.03	77.08	90.24	131.72	597	900	900	CONC	0.15	80.5	701.13	1.10	1.22	0.85
	151	152	0.15	0.68	0.28	10.76			0.00	0.00			0.00	0.00			0.00	0.00	18.41	54.74	73.94	86.55	126.31	589	900	900	CONC	0.15	15.0	701.13	1.10	0.23	0.84
	152	157	0.20	0.68	0.38	11.13			0.00	0.00			0.00	0.00			0.00	0.00	18.64	54.33	73.39	85.90	125.36	605	900	900	CONC	0.20	54.5	809.60	1.27	0.71	0.75
					0.00	11.13	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00	14.80														
	157	162	1.52	0.68	2.87	14.01			0.00	0.00			0.00	0.00			0.00	0.00	19.35	53.10	71.71	83.92	122.46	744	900	900	CONC	0.25	59.5	905.16	1.42	0.70	0.82
					0.00	14.01	0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00	14.54														
	162	163	1.43	0.68	2.70	16.71			0.00	0.00			0.00	0.00			0.00	0.00	20.05	51.95	70.15	82.09	119.77	868	975	975	CONC	0.25	53.5	1120.53	1.50	0.59	0.77
Contribution From Unknown Road6 - 06, Pipe 134 - 163						30.64				3.55				0.00				0.00	20.50														
	163	164	15.50	0.75	32.32	79.67			0.00	3.55			0.00	0.00			0.00	0.00	20.64	51.02	68.87	80.59	117.57	4310	1950	1950	CONC	0.15	72.5	5511.18	1.85	0.65	0.78
To Unknown Road14 - 13, Pipe 164 - 165						79.67				3.55				0.00				0.00	21.30														
Unknown Road14 - 13																																
Contribution From Unknown Road12 - 11, Pipe 163 - 164						79.67				3.55				0.00				0.00	21.30														
					0.00	79.67	0.95	0.68	1.80	5.35			0.00	0.00			0.00	0.00														
	164	165	6.76	0.68	12.78	92.45			0.00	5.35			0.00	0.00			0.00	0.00	21.30	50.03	67.53	79.01	115.26	4987	2100	2100	CONC	0.15	82.5	6715.38	1.94	0.71	0.74
	165	166	7.79	0.75	16.24	108.69			0.00	5.35			0.00	0.00			0.00	0.00	22.01	49.01	66.13	77.37	112.86	5681	2100	2100	CONC	0.15	82.5	6715.38	1.94	0.71	0.85
	166	167			0.00	108.69			0.00	5.35			0.00	0.00			0.00	0.00	22.72	48.04	64.80	75.81	110.57	5568	2100	2100	CONC	0.15	62.0	6715.38	1.94	0.53	0.83
To Unknown Road11 - 1001, Pipe 167 - 168						108.69				5.35				0.00				0.00	23.25														
Unknown Road11 - 1001																																
Contribution From Unknown Road14 - 13, Pipe 166 - 167						108.69				5.35				0.00				0.00	23.25														
					0.00	108.69	1.50	0.68	2.84	8.19			0.00	0.00			0.00	0.00														
			3.60	0.68	6.81	115.50			0.00	8.19			0.00	0.00			0.00	0.00														
	167	168	6.95	0.68	13.14	128.63			0.00	8.19			0.00	0.00			0.00	0.00	23.25	47.33	63.84	74.68	108.92	6611	2100	2100	CONC	0.20	27.0	7754.25	2.24	0.20	0.85
	168	169			0.00	128.63			0.00	8.19			0.00	0.00			0.00	0.00	23.45	47.07	63.49	74.27	108.31	6575	2100	2100	CONC	0.20	94.5	7754.25	2.24	0.70	0.85

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: ADF	PROJECT: Brazeau Lands		
Checked:	LOCATION: City of Ottawa		
Dwg. Reference:	File Ref: 1030	Date: 11 Sep 2019	Sheet No. SHEET 1 OF 2

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
Unknown Road19 - 2002																																
			0.00	0.00	0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00						1300									
	1001	1002			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	1300	825	825	CONC	1.20	33.0	1572.44	2.94	0.19	0.83
	1002	1003			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.19	76.09	103.22	120.99	176.87	1300	900	900	CONC	0.70	27.5	1514.61	2.38	0.19	0.86
To Unknown Road18 - 2001, Pipe 1003 - 1004						0.00				0.00				0.00				0.00	10.38					1300									
Unknown Road18 - 2001																																
Contribution From Unknown Road19 - 2002, Pipe 1002 - 1003						0.00				0.00				0.00				0.00	10.38					1300									
	1003	1004			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.38	75.38	102.23	119.83	175.16	1300	900	900	CONC	1.10	106.0	1898.67	2.98	0.59	0.68
	1004	1005			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	10.97	73.27	99.33	116.41	170.14	1300	1050	1050	CONC	0.35	106.0	1615.52	1.87	0.95	0.80
	1005	1006			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	11.92	70.15	95.05	111.37	162.74	1300	1200	1200	CONC	0.20	106.0	1743.57	1.54	1.15	0.75
	1006	1007			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	13.06	66.75	90.38	105.88	154.68	1300	1200	1200	CONC	0.20	106.0	1743.57	1.54	1.15	0.75
	1007	1008			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	14.21	63.70	86.20	100.96	147.45	1300	1200	1200	CONC	0.20	106.0	1743.57	1.54	1.15	0.75
To Unknown Road20 - 2003, Pipe 1008 - 1009						0.00				0.00				0.00				0.00	15.36					1300									
Unknown Road20 - 2003																																
Contribution From Unknown Road18 - 2001, Pipe 1007 - 1008			0.00			0.00				0.00				0.00				0.00	15.36					1300									
	1008	1009			0.00	0.00			0.00	0.00			0.00	0.00			0.00	0.00	15.36	60.94	82.42	96.52	140.94	1300	1200	1200	CONC	0.20	18.0	1743.57	1.54	0.19	0.75

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: ADF	PROJECT: **Brazeau Lands**		
Checked:	LOCATION: **City of Ottawa**		
Dwg. Reference:	File Ref: 1030	Date: 11 Sep 2019	Sheet No. SHEET 2 OF 2

5.4.3 Stormwater Management Facilities (SWMFs)

The SWMFs, either wet ponds or dry ponds, should be designed in accordance with Section 8 of the OSDG and MOE's publication entitled "SWM Planning and Design Manual, 2003".

The normal water level in the wet ponds should be above the highest elevation of either: (i) the free flowing water level in the downstream storm sewer during the 1:2 year event; or (ii) the elevation of the underlying groundwater table.

For safety reasons, the live storage in dry ponds should be kept to 1.5 m (OSDG) to 2.0 m deep (MOE). A minimum 300 mm freeboard should be provided between the 1:100 year water surface elevation and the overflow elevation.

SWMFs should be integrated into the community through the use of pathways or other linkages.

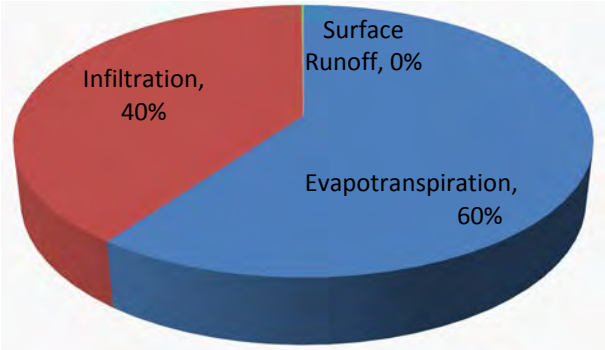
5.4.4 Water Balance

The Hydrogeological Existing Conditions Report (Paterson Group Inc., 2017) recommended that infiltration measures be incorporated into the BSUEA's storm servicing design, as the subject area contributes to groundwater recharge of the esker, which should be preserved. The Paterson Group Inc. (Paterson) Report recommended that:

- Distributed infiltration be achieved to promote recharge of overburden aquifer and preserve the pre-infiltration condition for the three (3) subwatersheds; and,
- Only captured runoff that is relatively free of roadway salts be infiltrated to minimize adverse impacts on the esker.

An analysis (using the PCSWMM software platform) was carried out and is summarized in the Existing Condition Report (Appendix B) to determine the various contributions of the water budget based on long-term simulations. To simulate the infiltration, the analysis utilized measured data compiled as part of Paterson's field program. Infiltration to groundwater recharge zones was simulated based on measured saturated field hydraulic conductivity, which was translated to infiltration rates (refer to Section B6.1.1 of Appendix B). The analysis revealed that overall pre-development infiltration from the subject site (excluding the aggregate extraction areas) accounted for 40% of the overall water budget (Figure 5-2). The City and RVCA have agreed with Paterson's recommendation that pre-development infiltration levels should be maintained and distributed infiltration be achieved across the site, and should not be concentrated at one or two location(s).

Figure 5-2: Existing Water Budget Breakdown



5.5 Storm Servicing Strategy

Based on the storm drainage connections and criteria set out in Sections 5.2 and 5.4 respectively, a stormwater management strategy has been developed. The strategy strives to preserve pre-development infiltration across the BSUEA, which in turn, impacts the individual stormwater management strategies developed for each of the servicing areas depicted in Figure 4-2. Sub-section 5.4 presents the rationale in developing storm servicing strategies, Sub-section 5.5.5 the storm drainage and design methodology, Sub-sections 5.7 5.8, and 5.9 present the analyses carried out for the conventional, EES and infiltration gallery servicing strategies, respectively while Sub-section 5.10.2 summarizes the impact of the strategies on the municipal drains.

5.5.1 EES Infiltration Strategy

5.5.1.1 Background

During the preparation of the Existing Condition Report, it became evident that storm servicing for the BSUEA would need to incorporate measures to recharge the overburden aquifer. As a result of extensive work and consultation with the both the City and RVCA over a nine (9) month period, the preferred infiltration servicing strategy has been identified as the Etobicoke Exfiltration System (EES). During this nine (9) month period, a number of Memoranda were prepared to support the selection process. All documents and work undertaken (Memoranda and Presentation) are described below (Sections 5.5.1.1 to 5.5.1.6) and included in Appendix E.

In September 2016, a Memorandum to the City outlined potential infiltration measures that could be considered for the BSUEA. The Memorandum outlined general considerations related to infiltration and nine (9) specific infiltration measures, which ranged from reduced lot grading to infiltration galleries and bio-retention cells. The advice from the City and RVCA following submission of the Memorandum is that infiltration measures should be spread across the site so as to mimic current infiltration patterns and should not rely on infrastructure on private properties. After further review and discussions, the EES was selected as the preferred measure to preserve the water budget and carried forward for further sizing and analysis.

5.8 Analysis of EES Results

5.8.1 BSUEA Site Wide Infiltration with EES

A water budget analysis was carried out as part of the Existing Condition Report (Section B6, Appendix B). This analysis revealed that pre-development infiltration across the BSUEA accounted for 40% of the total precipitation based on long-term simulations. Based on the post-development simulation results, the water budget for the overall BSUEA lands is shown in Table 5-8 below and compared in the table with the existing conditions water budget. The use of the EES along the local road network within the BSUEA lands achieves an infiltration of 44% which is greater than under existing conditions, which shows that infiltration within ±10% of existing is achievable. It should be noted that this analysis has excluded the Brazeau and Drummond properties which have been assumed to integrate measures to promote infiltration and preserve pre-infiltration rates along both properties separately from the remaining BSUEA. Further refinements to the high level infiltration concept, including sizing of the EES, can be investigated during detailed design.

Table 5-8: BSUEA EES Water Budget Results

Water Budget Component	Annual Average Depth (mm)	Budget (%)	Existing Condition Budget (%)
Precipitation	844	100%	100%
Evapotranspiration	231	27%	60%
Infiltration	377	44%	40%
Surface Runoff	225	27%	0%

5.8.2 Minto Lands

5.8.2.1 Major System Cascading and Ponding Levels

The simulated elevations along the major overland system nodes are shown in Table 5-9 and Table 5-10. There is no ponding during the 1:5 year event or 1:10 year event for local/collector roads and arterial roads, while the depth of flow along the major system is maintained to or below 350 mm during the 1:100 year event.

Table 5-9: Minto EES Local and Collector Road Major Node Depths

Major System Node	3 hr Chi 1:5 yr Ponding Depth (mm)	24 hr SCS 1:5 yr Ponding Depth (mm)	3 hr Chi 1:100 yr Ponding Depth (mm)	24 hr SCS 1:100 yr Ponding Depth (mm)
S_110-111	10	10	350	210
S_111-112	10	10	250	30
S_150-152	10	10	210	160
S_152-154	10	10	80	70

Table 5-13: Minto EES Pond Parameters and Results

Pond Parameter	Dry Pond 1	Dry Pond 2	Western Spill-over Pond
Water Quality	Not Required	Not Required	Not Required
Simulated Release Rate (m^3/s)	1.7	0.5	0.33
Pond Invert (m)	95	95.6	100
Pond Top of Bank (m)	95.75	96.8	100.7
Active Storage Depth (m)	0.75	1.2	1.1
Freeboard (m)	>0.3	>0.3	>0.3
Outlet Elevation (m)	95	95.6	100
Outlet Diameter (m)	0.675	0.375	0.4
Drawdown Time (hrs)	6	12	6
Surface Area (ha)	1.5	1.7	1.2

5.8.3 Mattamy Lands East and Mattamy Lands West

The Mattamy Lands East was modelled at the conceptual level as part of the Half Moon Bay South – Phase 4 Stormwater Management Report (Stantec, 2015) while the minor system of Mattamy Lands West was included in the Draft BSMSSA, Stantec, 2014. Neither of these Reports included an assessment of EES within the storm minor system.

Including the EES within these areas would not alter the stormwater management approach as neither of the Mattamy Lands requires additional water quality control and the MSS designs do not affect major system storage requirements. The use of EES in Mattamy Lands East, however, may improve the downstream HGLs in the Half Moon Bay South subdivision and areas draining to the Todd Pond as exfiltration of clean runoff into the underlying groundwater and esker would be promoted resulting in a reduction in the flow and increase in available capacity in the conventional sewers.

5.8.4 Brazeau and Drummond Aggregate Extraction Areas

The EES has been identified as a suitable strategy on urban development in the BSUEA to achieve distributed infiltration as per the recommendations of Paterson's Existing Conditions Report. Assuming that both aggregate extraction areas are developed as residential, infiltrating clean runoff from local roads can achieve the required infiltration. Alternatively, infiltration galleries could also supplement or replace part of an EES. At detailed design of these properties, the strategy to preserve pre-development infiltration rates will need to be reviewed in consultation with the Geotechnical Engineer once it is known what type of fill material was used to meet the minimum rehabilitation elevations.

APPENDIX E

LEGEND:

- SITE BOUNDARY
- STORM OVERLAND FLOW ARROW
- 192.85 PROPOSED CENTERLINE ELEVATION
- 103.50 / 103.50 PROPOSED ELEVATION / EXISTING ELEVATION
- 244.50 EXISTING CONTOUR ELEVATION
- 109.54BW BOTTOM OF WALL ELEVATION
- 110.60TW TOP OF WALL ELEVATION

CUT-FILL DEPTH ALONG CENTER LINE:

CUT DEPTH (m)	FILL DEPTH (m)
0 - 1.0	0 - 1.0
1.0 - 2.0	1.0 - 2.0
2.0 - 3.0	2.0 - 3.0
> 3.0	> 3.0

SWM POND 1
DRY POND
MAX W/L 97.70
BOTTOM 95.00
VOL 35,000m³

HIGHWAY 416
BORRISOKANE ROAD
FUTURE GREENBANK ROAD
URBAN BOUNDARY
Promenade Dundonald Drive
MATCH EXISTING
RETAINING WALL
BLOCK 1 … BLOCK 176
PART 2 PLAN 5R-13403
PART 3 PLAN 5R-13403
PART 2, PLAN 4R-28416
PART 3, PLAN 4R-28416
LOT 7 CONCESSION 3 (RIDEAU FRONT)
PART 2, PART 2, PLAN 4RP-L2A1N924R-21192

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CAIVAN - BRAZEAU
PRELIMINARY GRADING PLAN
CITY OF OTTAWA

PROJECT No. :	18-1030
SCALE:	1:2,000
DATE:	SEPTEMBER 2019
DRAWING No.	2