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FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT

FOR

HOBIN ARCHITECTURE INC.
770 BROOKFIELD ROAD

CITY OF OTTAWA

PROJECT NO.: 17-966

JUNE 2018 – REV 2

FUNCTIONAL SERVICING AND STORMWATER MANAGEMENT REPORT
FOR
770 BROOKFIELD ROAD

HOBIN ARCHITECTURE INC.

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1.0 INTRODUCTION

David Schaeffer Engineering Limited (DSEL) has been retained by Hobin Architecture Inc. to prepare a Functional Servicing and Stormwater Management report in support of the application for a Site Place Control (SPC) at 770 Brookfield Road.

The subject property is located within the City of Ottawa urban boundary, in the River ward. As illustrated in ***Figure 1***, the subject property is located 160m east of the Riverside Drive and Brookfield Road intersection. Comprised of a single parcel of land, the subject property measures approximately ***2.47 ha*** and is zoned General Mixed Use (GM).

Figure 1: Site Location

The proposed SPC would allow for the first phase of the development consisting of five residential/commercial buildings within ***1.39 ha*** of the subject site. The proposed first phase of development would include approximately ***1,200 m²*** of ground level retail with above and underground parking. The residential component consists of 426 units. The proposed ultimate development consists of 6 residential/commercial buildings. The full build-out would include approximately ***1,200 m²*** of ground level retail with surface and underground parking lots. The residential component consists of ***852*** units. A copy of the proposed Phase 1 Site Plan and Master Site Plan prepared by J. Barry Hobin & Associates is included in ***Drawings/Figures***.

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

1.1 Existing Conditions

The existing site contains an undeveloped area formally the location of a two-storey building. The former Hobson Road right-of-way runs along the eastern property line and is subject to easement. The elevations range between 77.94m and 79.70m with an elevation change of 1.76m from the Northeast to the Southwest corner of the property.

Annis, O`Sullivan, Vollebekk Ltd. completed a topographical survey of the site on November 20th, 2003 and updated on October 5th, 2017. A reduced plot of the survey is included in ***Drawings/Figures.***

Sewer and watermain mapping collected from the City of Ottawa indicate that the following services exist across the property frontages within the adjacent municipal right-of-ways:

Watermains:

- 300mm diameter local service within Brookfield Road

Storm Sewers:

- 750mm diameter local sewer within Brookfield Road tributary to the Sawmill Creek sub-watershed

Sanitary Sewers:

- 250mm diameter local sewer within Brookfield Road tributary to the Rideau River Trunk Collector

1.2 Required Permits / Approvals

The proposed development is subject to the site plan control approval process. The City of Ottawa must approve the engineering design drawings and reports prior to the issuance of site plan control.

The proposed development is a single parcel; as a result, the stormwater management system qualifies for an exemption under the OWRA. The Site was confirmed to be exempt. Correspondence with the MOECC is included in ***Appendix A***.

The subject property contains large trees, and re-grading the site to accommodate the proposed development may impact or require removal of existing trees. Trees requiring removal will be subject to the City of Ottawa Urban Tree Conservation By-law No. 2009-200.

1.3 Pre-consultation

Pre-consultation with relevant parties, including the City of Ottawa, Rideau Valley Conservation Authority (RVCA) and MOE was conducted either in person or via email for the proposed development.

Pre-consultation correspondence, along with the servicing guidelines checklist, is located in ***Appendix A***.

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)

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

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

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

- **Design Guidelines for Sewage Works,**
  Ministry of the Environment, 2008.
  (MOE* Design Guidelines*)

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

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

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

- **Sawmill Creek Subwatershed Study**
  CH2MHILL, May 2003 Update
  (Sawmill Creek SS)

- **Geotechnical Investigation**
  Paterson Group, PG3275-1, November 28, 2014
  (Geotechnical Report)

3.0 WATER SUPPLY SERVICING

3.1 Existing Water Supply Services

The subject property lies within the City of Ottawa 2W2C pressure zone, as shown by the Pressure zone map included in ***Appendix B***.

The existing development is serviceable from a local 300 mm diameter watermain within the Brookfield Road right-of-way along with a 200 mm diameter watermain located in the former Hobson Road right-of-way. The existing site currently contains no facilities that have a water demand as such no existing demand exists.

3.2 Water Supply Servicing Design

The development is proposed to be serviced via 150 mm diameter connections to the existing 300 mm diameter municipal watermain within the Brookfield Road right-of-way, as shown by ***SSP-1***.

In accordance with City of Ottawa technical bulletin ISDTB-2014-02, redundant service connections will be required due to an anticipated design flow of greater than 50 m^3/day, for each phase.

Table 1 summarizes the ***Water Supply Guidelines*** employed in the preparation of the preliminary water demand estimate.

Table 1
Water Supply Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Residential Average Daily Demand	280 L/d/P
Residential Maximum Daily Demand	2.5 x Average Daily *
Residential Maximum Hourly	5.5 x Average Daily *
Commercial Retail	2.8 L/m^2/d
Commercial Maximum Daily Demand	1.5 x avg. day
Commercial Maximum Hour Demand	1.8 x max. day
Minimum Watermain Size	150mm diameter
Minimum Depth of Cover	2.4m from top of watermain to finished grade
During normal operating conditions desired operating pressure is within	350kPa and 480kPa
During normal operating conditions pressure must not drop below	275kPa
During normal operating conditions pressure must not exceed	552kPa
During fire flow operating pressure must not drop below	140kPa

Daily average based on Appendix 4-A from **Water Supply Guidelines*
*** Residential Max. Daily and Max. Hourly peaking factors per MOE Guidelines for Drinking-Water Systems Table 3-3 for 0 to 500 persons.*
-Table updated to reflect ISD-2010-2

Table 2 and ***Table 3*** summarize the estimated water supply demand and boundary conditions for the Phase 1 and Ultimate developments based on the ***Water Supply Guidelines***.

Table 2
Water Demand
Proposed Conditions

Design Parameter	Estimated Demand[1] Phase 1 (L/min)	Estimated Demand[1] Ultimate (L/min)
Average Daily Demand	151.5	300.6
Max Day + Fire Flow	376.3 + 18,000 = 17,376.3	749.2 + 18,000 = 18,749.2
Peak Hour	826.6	1646.8
1) Water demand calculation per ***Water Supply Guidelines***. See ***Appendix B*** for detailed calculations.		

Table 3
Boundary Conditions
Proposed Conditions – Ultimate

Design Parameter	Boundary Condition[2] (m H_2O / kPa)
Average Daily Demand	56.0 / 549..4
Max Day + Fire Flow	34.0 / 333.5
Peak Hour	46.2 / 453.2
2) Boundary conditions supplied by the City of Ottawa for the demands indicated in the correspondence; assumed ground elevation 78.4m. See ***Appendix B.***	

Fire flow requirements are to be determined in accordance with Local Guidelines (***FUS***), City of Ottawa ***Water Supply Guidelines***, and the Ontario Building Code.

Using the ***FUS*** method a conservative estimation of fire flow had been established. The following assumptions were assumed:

- Type of construction – Non-Combustible Construction
- Occupancy type – Non-Combustible
- Sprinkler Protection – Supervised Sprinkler System

Table 4 summarizes the estimated fire flows for each building. Detailed calculations can be found in ***Appendix***.

Table 4: FUS Estimated Fire Flow Summary

Phase	Anticipated Demand (L/min)
Building A	18,000
Building B	13,000
Building C	16,000
Building D	13,000
Building E1	5,000
Building E2	5,000

As shown by ***Table 4***, the above assumptions result in an estimated maximum fire flow of approximately ***18,000 L/min***, actual building materials selected will affect the estimated flow. A certified fire protection system specialist would need to be employed to design the building fire suppression system and confirm the actual fire flow demand.

The City of Ottawa was contacted to obtain boundary conditions associated with the estimated water demand as indicated in the boundary request correspondence included in ***Appendix B***.

Initial boundary conditions obtained indicate residual pressures during average day demands exceed the required pressure range as specified in ***Table 1*** and the ***Water Supply Guidelines***; as a result, buildings will need to be equipped with pressure reducing valves.

Based on the updated Site Plan, the anticipated water demand for the site decreased by approximately 16%. It is not anticipated to have a significant impact to the previously provided boundary conditions.

3.3 Water Supply Conclusion

The calculated water demand under proposed conditions was submitted to the City of Ottawa for establishing boundary conditions. As demonstrated by ***Table 2***, based on the

City's model, pressures during average day demands exceed the required pressure range, as a result, buildings will need to be equipped with pressure reducing valves.

The proposed water supply design conforms to all relevant City Guidelines and Policies.

4.0 WASTEWATER SERVICING

4.1 Existing Wastewater Services

The subject site lies within the Rideau River Collector Sewer catchment area, as shown by the City sewer mapping included in ***Appendix C***. An existing 250mm diameter sanitary sewer within the Brookfield Road right-of-way and an existing 300mm sanitary sewer within the Hobson Road right-of-way are available to service the proposed development.

4.2 Wastewater Design

The development is proposed to be serviced by a 200mm diameter connection to the existing 250 sanitary sewer within the Brookfield Road right-of-way, as shown by the ***SSP-1***.

Table 5 summarizes the ***City Standards*** employed in the design of the proposed wastewater sewer system.

Table 5
Wastewater Design Criteria

Design Parameter	Value
Residential Average Apartment	1.8 P/unit
Average Daily Demand	280 L/d/per
Peaking Factor	Harmon's Peaking Factor. Max 4.0, Min 2.0
Commercial Floor Space	2.8 L/m^2/d
Infiltration and Inflow Allowance	0.28L/s/ha
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.	

Table 6 demonstrates the estimated peak flow from the proposed Phase 1 and Ultimate developments. See ***Appendix C*** for associated calculations.

Table 6
Summary of Estimated Peak Wastewater Flow

Design Parameter	Total Flow - Phase 1 (L/s)	Total Flow - Ultimate (L/s)
Estimated Average Dry Weather Flow	2.6	5.0
Estimated Peak Dry Weather Flow	8.3	15.7
Estimated Peak Wet Weather Flow	9.1	16.5

The estimated peak wet weather sanitary flow for the Phase 1 and Ultimate development is ***9.1 L/s*** and ***16.5 L/s***, respectively.

A sanitary analysis was conducted for the local municipal sanitary sewers located across the frontage of the subject property in order to assess the available capacity. The analysis was conducted from the site to the upstream extents of the drainage area located near the intersection of Hobson Road and Springland Drive, as shown by the sanitary drainage plan in ***Appendix C***.

City of Ottawa Sewer Design Guidelines (2004) Figure 4.3 'Peak Flow Design Parameters' were employed to generate a conservative estimate of the existing wastewater flow conditions within the sewer.

Based on the sanitary analysis, the controlling section of the local sewer system is located at the intersection of Brookfield Road and Hobson Road (nodes 2-3) with an available residual capacity of ***15.8 L/s***; detailed calculations are included in ***Appendix C***. In addition, based on coordination with City staff the available residual capacity of the sanitary sewer within Brookfield Road is ***14.0 L/s.***

The analysis above indicates that sufficient capacity for the Phase 1 development is available in the local sewers. Based on constraints within Brookfield Road Phase 2 will either connect to the existing sanitary sewer within Hobson Road or the existing sanitary sewers within Brookfield Road will need to be upgraded.

4.3 Wastewater Servicing Conclusions

The site is tributary to the Rideau River Collector sewer; based on the sanitary analysis sufficient capacity is available within Brookfield Road to accommodate the Phase 1 estimated peak wet weather flow of ***9.1 L/s***. The Ultimate development, with an estimated peak wet weather flow of ***16.5 L/s***, will either require the use of the sanitary sewer within Hobson Road or the sanitary sewer within Brookfield Road will need to be upgraded to support the development.

The proposed wastewater design conforms to all relevant ***City Standards***.

5.0 STORMWATER MANAGEMENT

5.1 Existing Stormwater Services

Stormwater runoff from the subject property is tributary to the City of Ottawa sewer system located within the Sawmill Creek sub-watershed. As such, approvals for proposed development within this area are under the approval authority of the City of Ottawa.

Flows that influence the watershed in which the subject property is located are further reviewed by the principal authority. The subject property is located within the Ottawa River watershed, and is therefore subject to review by the Rideau Valley Conservation Authority (RVCA). Consultation with the RVCA is located in ***Appendix A***.

It was determined that the existing development contained no stormwater management controls for flow attenuation. The estimated pre-development Phase 1 and Ultimate peak flows for the 2, 5, and 100-year are summarized in ***Table 7***:

Table 7
Summary of Existing Peak Storm Flow Rates – Phase 1

City of Ottawa Design Storm	Estimated Peak Flow Rate Phase 1 (L/s)	Estimated Peak Flow Rate Phase 1 (L/s)
2-year	305.7	204.2
5-year	414.7	276.0
100-year	888.3	589.7

5.2 Post-development Stormwater Management Target

Stormwater management requirements for the proposed development were reviewed with the City of Ottawa, where the proposed development is required to:

- Meet an allowable release rate based on a Rational Method Coefficient of 0.50, employing the City of Ottawa IDF parameters for a 2-year storm with a time of concentration equal to or greater than 10 minutes.
- Attenuate all storms up to and including the City of Ottawa 100-year design event on site.
- Provide quality controls to an enhanced level of treatment due to the site's distance from the outlet and the current Site Plan; correspondence with the RVCA is included in ***Appendix A***.

Based on the above the allowable release rate for the proposed Phase 1 and Ultimate development is ***159.9 L/s*** and ***198.5 L/s***, respectively.

5.3 Proposed Stormwater Management System

It is proposed that the stormwater outlet from the proposed development will be to the 750 mm diameter storm sewer within the Brookfield Road right-of-way.

To meet the stormwater objectives the proposed development may contain a combination of roof top flow attenuation along with subsurface storage.

Flow from rooftops will be controlled before discharging to the existing storm sewer system. The release rate and storage calculations for roof top attenuation were estimated based on Zurn Industries Ltd. design guidelines for Model Z-105-5 Control-Flo Single Notch drains. According to the Control-Flo Roof Drainage System Specification Drainage sheets notch ratings, each notch releases 5 G.P.M. per inch of head relevant literature is provide in ***Appendix D***. Other products may be specified provided that the restricted release rate and sufficient storage is provided to meet or exceed the values in ***Appendix D***.

Area A, as shown by drawing ***SWM-1***, is tributary to the storm sewer within Brookfield Road. Approximately ***365.0 m^3*** of underground storage via two Triton S-29 or an approved equivalent storage system and will be attenuated by a ***182 mm*** ICD located in ***STM102***. Detailed calculations are located in ***Appendix D***.

To meet stormwater quality criteria specified by RVCA, an oil/grit separator will be installed downstream of ***STM102*** and the catchbasins collecting runoff from the parking areas, as shown by ***SSP-1***. This will provide and enhanced level of quality control (80% TSS removal) in accordance with the RVCA requirement. Stormceptor sizing has been included in ***Appendix D***.

Table 8 summarizes post-development Phase 1 flow rates.

Table 8
Stormwater Flow Rate Summary

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Required Storage	100-Year Available Storage
	(L/s)	(m^3)	(L/s)	(m^3)	(m^3)
Unattenuated Areas	20.3	0.0	43.3	0.0	0.0
Attenuated Areas	78.4	146.6	116.2	364.5	365.0
Total	**98.7**	**146.6**	**159.6**	**364.5**	**365.0**

It is calculated that approximately ***364.5 m^3*** of storage will be required on site to attenuate flow to the established release rate of ***159.8 L/s***; storage calculations are contained within ***Appendix D***.

Table 9 summarizes post-development Ultimate flow rates.

Table 9
Stormwater Flow Rate Summary

Control Area	5-Year Release Rate	5-Year Storage	100-Year Release Rate	100-Year Required Storage
	(L/s)	(m^3)	(L/s)	(m^3)
Unattenuated Areas	42.9	0.0	91.9	0.0
Attenuated Areas	53.3	432.9	106.6	865.0
Total	**96.2**	**432.9**	**198.5**	**865.0**

It is calculated that approximately ***865.0 m^3*** of storage will be required on site to attenuate flow to the established release rate of ***198.5 L/s***; storage calculations are contained within ***Appendix D***.

5.4 Stormwater Servicing Conclusions

Post development stormwater runoff will be required to be restricted to the allowable target release rate for storm events up to and including the 100-year storm in accordance with City of Ottawa ***City Standards***.

The post-development allowable release rate for the Phase 1 development was calculated as ***159.9 L/s***; it is estimated that ***364.5 m^3*** will be required to meet this release rate. The post-development allowable release rate for the Ultimate development was calculated as ***198.5 L/s***; it is estimated that ***865.0 m^3*** will be required to meet this release rate.

Based on consultation with the RVCA, stormwater quality controls to an enhanced level of treatment are required.

The proposed stormwater design conforms to all relevant ***City Standards*** and Policies for approval

6.0 UTILITIES

Gas, Hydro services currently exist within the Brookfield Road right-of-way. Utility servicing will be coordinated with the individual utility companies prior to site development.

7.0 EROSION AND SEDIMENT CONTROL

Soil erosion occurs naturally and is a function of soil type, climate and topography. The extent of erosion losses is exaggerated during construction where vegetation has been removed and the top layer of soil becomes agitated.

Prior to topsoil stripping, earthworks or underground construction, erosion and sediment controls will be implemented and will be maintained throughout construction.

Silt fence will be installed around the perimeter of the site and will be cleaned and maintained throughout construction. Silt fence will remain in place until the working areas have been stabilized and re-vegetated.

Catch basins will have SILTSACKs or an approved equivalent installed under the grate during construction to protect from silt entering the storm sewer system.

A mud mat will be installed at the construction access in order to prevent mud tracking onto adjacent roads.

Erosion and sediment controls must be in place during construction. The following recommendations to the contractor will be included in contract documents.

- Limit extent of exposed soils at any given time.
- Re-vegetate exposed areas as soon as possible.
- Minimize the area to be cleared and grubbed.
- Protect exposed slopes with plastic or synthetic mulches.
- Install silt fence to prevent sediment from entering existing ditches.
- No refueling or cleaning of equipment near existing watercourses.
- Provide sediment traps and basins during dewatering.
- Install filter cloth between catch basins and frames.
- Plan construction at proper time to avoid flooding.

Establish material stockpiles away from watercourses, so that barriers and filters may be installed.

The contractor will, at every rainfall, complete inspections and guarantee proper performance. The inspection is to include:

- Verification that water is not flowing under silt barriers.
- Clean and change filter cloth at catch basins.

8.0 CONCLUSION AND RECOMMENDATIONS

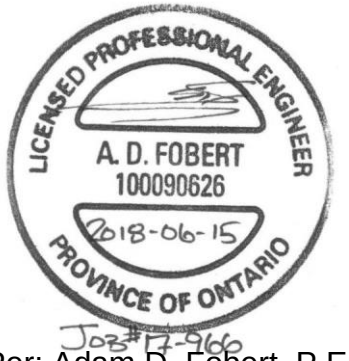
David Schaeffer Engineering Ltd. (DSEL) has been retained by Hobin Architecture Inc. to prepare a Functional Servicing and Stormwater Management report in support of the application for a Site Plan Control (SPC) at 770 Brookfield Road. The preceding report outlines the following:

- Based on boundary conditions provided by the City, average day demands exceed the required pressure range as specified by the City of Ottawa, therefore buildings will require pressure reducing valves;
- The FUS method for estimating fire flow indicated ***18,000 L/min*** is required for the proposed development;
- The proposed Phase 1 development is estimated to have a peak wet weather flow of ***9.1 L/s***. The proposed Ultimate development is estimated to have a peak wet weather flow of ***16.5L/s***; Based on the sanitary analysis conducted the existing municipal sewer infrastructure has sufficient capacity to support the Phase 1 development. The Ultimate development will either require the use of the sanitary sewer within Hobson Road or the sanitary sewer within Brookfield Road will need to be upgraded to support the development.
- Based on pre-consultation with the City of Ottawa, the proposed Phase 1 development will be required to attenuate post development flows to an equivalent release rate of ***159.9 L/s*** for all storms up to and including the 100-year storm event. It is estimated that ***364.5 m^3*** of onsite storage will be required to attenuate flow to the established release rate;
- Based on pre-consultation with the City of Ottawa, the proposed Ultimate development will be required to attenuate post development flows to an equivalent release rate of ***198.5 L/s*** for all storms up to and including the 100-year storm event. It is estimated that ***865.0 m^3*** of onsite storage will be required to attenuate flow to the established release rate;
- Based on consultation with the RVCA, stormwater quality controls to an enhanced level of treatment are required.

Prepared by,
David Schaeffer Engineering Ltd.

Per: Anthony J. Temelini, EIT.

Reviewed by,
David Schaeffer Engineering Ltd.



Per: Adam D. Fobert, P.Eng

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APPENDIX A

Pre-Consultation

DEVELOPMENT SERVICING STUDY CHECKLIST

17-966 30/10/2017

4.1 General Content		
☐	Executive Summary (for larger reports only).	N/A
☒	Date and revision number of the report.	Report Cover Sheet
☒	Location map and plan showing municipal address, boundary, and layout of proposed development.	Drawings/Figures
☒	Plan showing the site and location of all existing services.	Figure 1 / EX-1
☒	Development statistics, land use, density, adherence to zoning and official plan, and reference to applicable subwatershed and watershed plans that provide context to applicable subwatershed and watershed plans that provide context to which individual developments must adhere.	Section 1.0
☒	Summary of Pre-consultation Meetings with City and other approval agencies.	Section 1.3
☒	Reference and confirm conformance to higher level studies and reports (Master Servicing Studies, Environmental Assessments, Community Design Plans), or in the case where it is not in conformance, the proponent must provide justification and develop a defendable design criteria.	Section 2.1
☒	Statement of objectives and servicing criteria.	Section 1.0
☒	Identification of existing and proposed infrastructure available in the immediate area.	Sections 3.1, 4.1, 5.1
☒	Identification of Environmentally Significant Areas, watercourses and Municipal Drains potentially impacted by the proposed development (Reference can be made to the Natural Heritage Studies, if available).	Section 5.1
☒	Concept level master grading plan to confirm existing and proposed grades in the development. This is required to confirm the feasibility of proposed stormwater management and drainage, soil removal and fill constraints, and potential impacts to neighbouring properties. This is also required to confirm that the proposed grading will not impede existing major system flow paths.	GP-1
☐	Identification of potential impacts of proposed piped services on private services (such as wells and septic fields on adjacent lands) and mitigation required to address potential impacts.	N/A
☒	Proposed phasing of the development, if applicable.	GP-1, SSP-1
☒	Reference to geotechnical studies and recommendations concerning servicing.	Section 1.4
☒	All preliminary and formal site plan submissions should have the following information: -Metric scale -North arrow (including construction North) -Key plan -Name and contact information of applicant and property owner -Property limits including bearings and dimensions -Existing and proposed structures and parking areas -Easements, road widening and rights-of-way -Adjacent street names	GP-1, SSP-1

4.2 Development Servicing Report: Water		
☐	Confirm consistency with Master Servicing Study, if available	N/A
☒	Availability of public infrastructure to service proposed development	Section 3.1
☒	Identification of system constraints	Section 3.1
☒	Identify boundary conditions	Section 3.1, 3.2
☒	Confirmation of adequate domestic supply and pressure	Section 3.3

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Confirmation of adequate fire flow protection and confirmation that fire flow is calculated as per the Fire Underwriter's Survey. Output should show available fire flow at locations throughout the development.	Section 3.2
☐	Provide a check of high pressures. If pressure is found to be high, an assessment is required to confirm the application of pressure reducing valves.	N/A
☐	Definition of phasing constraints. Hydraulic modeling is required to confirm servicing for all defined phases of the project including the ultimate design	N/A
☐	Address reliability requirements such as appropriate location of shut-off valves	N/A
☐	Check on the necessity of a pressure zone boundary modification	N/A
☒	Reference to water supply analysis to show that major infrastructure is capable of delivering sufficient water for the proposed land use. This includes data that shows that the expected demands under average day, peak hour and fire flow conditions provide water within the required pressure range	Section 3.2, 3.3
☒	Description of the proposed water distribution network, including locations of proposed connections to the existing system, provisions for necessary looping, and appurtenances (valves, pressure reducing valves, valve chambers, and fire hydrants) including special metering provisions.	Section 3.2, 3.3
☐	Description of off-site required feedermains, booster pumping stations, and other water infrastructure that will be ultimately required to service proposed development, including financing, interim facilities, and timing of implementation.	N/A
☒	Confirmation that water demands are calculated based on the City of Ottawa Design Guidelines.	Section 3.2
☐	Provision of a model schematic showing the boundary conditions locations, streets, parcels, and building locations for reference.	N/A

4.3 Development Servicing Report: Wastewater

☒	Summary of proposed design criteria (Note: Wet-weather flow criteria should not deviate from the City of Ottawa Sewer Design Guidelines. Monitored flow data from relatively new infrastructure cannot be used to justify capacity requirements for proposed infrastructure).	Section 4.2
☐	Confirm consistency with Master Servicing Study and/or justifications for deviations.	N/A
☐	Consideration of local conditions that may contribute to extraneous flows that are higher than the recommended flows in the guidelines. This includes groundwater and soil conditions, and age and condition of sewers.	N/A
☒	Description of existing sanitary sewer available for discharge of wastewater from proposed development.	Section 4.1
☒	Verify available capacity in downstream sanitary sewer and/or identification of upgrades necessary to service the proposed development. (Reference can be made to previously completed Master Servicing Study if applicable)	Section 4.2
☒	Calculations related to dry-weather and wet-weather flow rates from the development in standard MOE sanitary sewer design table (Appendix 'C') format.	Section 4.2, Appendix C
☒	Description of proposed sewer network including sewers, pumping stations, and forcemains.	Section 4.2
☐	Discussion of previously identified environmental constraints and impact on servicing (environmental constraints are related to limitations imposed on the development in order to preserve the physical condition of watercourses, vegetation, soil cover, as well as protecting against water quantity and quality).	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☐	Pumping stations: impacts of proposed development on existing pumping stations or requirements for new pumping station to service development.	N/A
☐	Forcemain capacity in terms of operational redundancy, surge pressure and maximum flow velocity.	N/A
☐	Identification and implementation of the emergency overflow from sanitary pumping stations in relation to the hydraulic grade line to protect against basement flooding.	N/A
☐	Special considerations such as contamination, corrosive environment etc.	N/A

4.4 Development Servicing Report: Stormwater Checklist

☒	Description of drainage outlets and downstream constraints including legality of outlets (i.e. municipal drain, right-of-way, watercourse, or private property)	Section 5.1
☒	Analysis of available capacity in existing public infrastructure.	Section 5.1, Appendix D
☒	A drawing showing the subject lands, its surroundings, the receiving watercourse, existing drainage patterns, and proposed drainage pattern.	Drawings/Figures
☒	Water quantity control objective (e.g. controlling post-development peak flows to pre-development level for storm events ranging from the 2 or 5 year event (dependent on the receiving sewer design) to 100 year return period); if other objectives are being applied, a rationale must be included with reference to hydrologic analyses of the potentially affected subwatersheds, taking into account long-term cumulative effects.	Section 5.2
☒	Water Quality control objective (basic, normal or enhanced level of protection based on the sensitivities of the receiving watercourse) and storage requirements.	Section 5.2
☒	Description of the stormwater management concept with facility locations and descriptions with references and supporting information	Section 5.3
☐	Set-back from private sewage disposal systems.	N/A
☐	Watercourse and hazard lands setbacks.	N/A
☒	Record of pre-consultation with the Ontario Ministry of Environment and the Conservation Authority that has jurisdiction on the affected watershed.	Appendix A
☐	Confirm consistency with sub-watershed and Master Servicing Study, if applicable study exists.	N/A
☒	Storage requirements (complete with calculations) and conveyance capacity for minor events (1:5 year return period) and major events (1:100 year return period).	Section 5.3
☐	Identification of watercourses within the proposed development and how watercourses will be protected, or, if necessary, altered by the proposed development with applicable approvals.	N/A
☒	Calculate pre and post development peak flow rates including a description of existing site conditions and proposed impervious areas and drainage catchments in comparison to existing conditions.	Section 5.1, 5.3
☐	Any proposed diversion of drainage catchment areas from one outlet to another.	N/A
☐	Proposed minor and major systems including locations and sizes of stormwater trunk sewers, and stormwater management facilities.	N/A
☐	If quantity control is not proposed, demonstration that downstream system has adequate capacity for the post-development flows up to and including the 100-year return period storm event.	N/A
☐	Identification of potential impacts to receiving watercourses	N/A
☐	Identification of municipal drains and related approval requirements.	N/A

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

☒	Descriptions of how the conveyance and storage capacity will be achieved for the development.	Section 5.3
☐	100 year flood levels and major flow routing to protect proposed development from flooding for establishing minimum building elevations (MBE) and overall grading.	N/A
☐	Inclusion of hydraulic analysis including hydraulic grade line elevations.	N/A
☒	Description of approach to erosion and sediment control during construction for the protection of receiving watercourse or drainage corridors.	Section 6.0
☐	Identification of floodplains – proponent to obtain relevant floodplain information from the appropriate Conservation Authority. The proponent may be required to delineate floodplain elevations to the satisfaction of the Conservation Authority if such information is not available or if information does not match current conditions.	N/A
☐	Identification of fill constraints related to floodplain and geotechnical investigation.	N/A

4.5 Approval and Permit Requirements: Checklist

☒	Conservation Authority as the designated approval agency for modification of floodplain, potential impact on fish habitat, proposed works in or adjacent to a watercourse, cut/fill permits and Approval under Lakes and Rivers Improvement Act. The Conservation Authority is not the approval authority for the Lakes and Rivers Improvement ct. Where there are Conservation Authority regulations in place, approval under the Lakes and Rivers Improvement Act is not required, except in cases of dams as defined in the Act.	Section 1.2
☐	Application for Certificate of Approval (CofA) under the Ontario Water Resources Act.	N/A
☐	Changes to Municipal Drains.	N/A
☐	Other permits (National Capital Commission, Parks Canada, Public Works and Government Services Canada, Ministry of Transportation etc.)	N/A

4.6 Conclusion Checklist

☒	Clearly stated conclusions and recommendations	Section 8.0
☐	Comments received from review agencies including the City of Ottawa and information on how the comments were addressed. Final sign-off from the responsible reviewing agency.	
☐	All draft and final reports shall be signed and stamped by a professional Engineer registered in Ontario	

*Extracted from the City of Ottawa-Servicing Study Guidelines for Development Applications

MEMO

December 16, 2014

To / Destinataire	Simon Deiaco, Planner
From / Expéditeur	Cody Oram, Project Manager, Infrastructure Approvals
Subject / Objet	**Pre-Application Consultation** File No. PC2014-0288 **770 Brookfield Rd. & Ward No. 16,** *Proposed apartment complex (student housing).* *Phased development with multiple buildings, mixed use.*

Please note the following information regarding the engineering design submission for the above noted site:

1. The Servicing Study Guidelines for Development Applications are available at the following address: http://ottawa.ca/en/development-application-review-process-0/servicing-study-guidelines-development-applications

2. Servicing & site works shall be in accordance with the following documents:
   - ⇨ Ottawa Sewer Design Guidelines (2013)
   - ⇨ Ottawa Design Guidelines – Water Distribution (2010)
   - ⇨ Geotechnical Investigation and Reporting Guidelines for Development Applications in the City of Ottawa (2007)
   - ⇨ City of Ottawa Slope Stability Guidelines for Development Applications (2004)
   - ⇨ City of Ottawa Environmental Noise Control Guidelines (2006)
   - ⇨ City of Ottawa Park and Pathway Development Manual (2012)
   - ⇨ City of Ottawa Accessibility Design Standards (2012)
   - ⇨ Ottawa Standard Tender Documents (2013)
   - ⇨ Ontario Provincial Standards for Roads & Public Works (2013)

3. Record drawings and utility plans are also available for purchase from the City (Contact the City's Information Centre by email at InformationCentre@ottawa.ca or by phone at (613) 580-2424 x.44455).

4. The Stormwater Management Criteria, for the subject site, is to be based on the following:

i. The City's downstream storm system outfalls to Sawmill Creek. Please contact Jocelyn Chandler, Planner, RVCA (jocelyn.chandler@rvca.ca) regarding the Sawmill Creek Subwatershed Study requirements applicable to this development.

ii. Flows to the storm sewer in excess of the 2-year storm release rate, calculated using the pre-development runoff coefficient or a maximum equivalent 'C' of 0.5, whichever is less, up to and including the 100-year storm event, must be detained on site.

iii. Calculate the time of concentration (Cannot be less than 10 minutes).

5. Services (Storm, Sanitary & Water Supply)
   i. Services should be grouped in a common trench to minimize the number of road cuts and connected to the existing infrastructure within Brookfield Road.
   ii. Connections to easement sewers are typically not permitted.

6. Water Boundary condition requests must include the location of the service and the expected loads required by the proposed development. Please provide the following information:
   i. Location of service
   ii. Type of development and the amount of fire flow required.
   iii. Average daily demand: ___ l/s.
   iv. Maximum daily demand: ___l/s.
   v. Maximum hourly daily demand: ___ l/s.

Should you have any questions or require additional information, please contact me directly at (613) 580-2424, x 13422 or by email at cody.oram@ottawa.ca .

Robert Freel

From: Jocelyn Chandler <jocelyn.chandler@rvca.ca>
Sent: December-17-14 2:40 PM
To: Robert Freel
Subject: RE: 770 Brookfield - RVCA Pre-consult

Hello Bobby,
As discussed:
The stormwater from this site will be connected to the municipal sewers on either Brookfield or Hobson Rd which outlet 500 or 1000 metres respectively downstream to Sawmill Creek with no quality treatment. Sawmill Creek requires 80% TSS removal for travelled surfaces. The rooftops and landscaped areas do not require quality treatment for surface water quality objectives.

Jocelyn

Jocelyn Chandler M.Pl. MCIP, RPP
Planner, RVCA
t) 613-692-3571 x1137
f) 613-692-0831
jocelyn.chandler@rvca.ca
www.rvca.ca
mail: Box 599 3889 Rideau Valley Dr., Manotick, ON K4M 1A5
courier: 3889 Rideau Valley Dr., Nepean, ON K2C 3H1

From: Robert Freel [mailto:rfreel@dsel.ca]
Sent: Wednesday, December 17, 2014 2:16 PM
To: Jocelyn Chandler
Subject: 770 Brookfield - RVCA Pre-consult

Hi Jocelyn,

As discussed please find attached conceptual site plans for the Brookfield development Phase 1 and ultimate. It is contemplated that servicing would occur from both Brookfield and Hobson Roads. Can you provide any criteria that maybe required with regards to quality.

If you would like to discuss please feel free to contact me.

Thanks,

Bobby Freel, EIT.

DSEL

david schaeffer engineering ltd.

120 Iber Road, Unit 203
Stittsville, ON K2S 1E9

phone: (613) 836-0856 ext.258
cell: (613) 314-7675
email: rfreel@DSEL.ca

Alison Gosling

From: Des Rochers, Christina (MOECC) <Christina.Desrochers@ontario.ca>
Sent: Friday, November 10, 2017 1:38 PM
To: Alison Gosling
Subject: RE: 770 Brookfield Road

Thank you Alison,

Based on your clarification below and having reviewed the project information provided for the proposed Hobin Architecture Inc. development, it is the Ministry's position that you have correctly identified that the works proposed at 770 Brookfield Road meet the exemption requirements set out in Ontario Regulation 525/98 made under the Ontario Water Resources Act.

Subsection 53(1) and (3) of the Act do not apply to the use, operation, establishment, alteration, extension or replacement of or a change in a storm water management facility that,

- *(a) is designed to service one lot or parcel of land;*
- *(b) discharges into a storm sewer that is not a combined sewer;*
- *(c) does not service industrial land or a structure located on industrial land; and*
- *(d) is not located on industrial land.*

As we discussed on November 9, 2017, should the parcel be subdivided into more than one lot after the completion of the development, an ECA will become a mandatory requirement.

Thank you.

Christina Des Rochers
Water Inspector | Inspectrice de l'eau
Safe Drinking Water Branch | Direction du contrôle de la qualité de l'eau potable
Ministry of the Environment and Climate Change | Ministère de l'Environnement et de l'Action en Matière de changement climatique
Tel. 613-521-3450 ex. 231
Fax. 613-521-5437
Spills Action Centre | Centre d'intervention en cas de déversement 1-800-268-6060

From: Alison Gosling [mailto:AGosling@dsel.ca]
Sent: November-10-17 9:02 AM
To: Des Rochers, Christina (MOECC)
Subject: RE: 770 Brookfield Road

Hi Christina,

It is our understanding that the development will remain under the one ownership in the post-development phase and there will be one stormwater system to service the entire parcel.

Thank you,

Alison Gosling, E.I.T.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

From: MOECCOttawaSewage (MOECC) [mailto:MOECCOttawaSewage@ontario.ca]
Sent: Tuesday, October 31, 2017 11:05 AM
To: Alison Gosling <AGosling@dsel.ca>
Cc: Des Rochers, Christina (MOECC) <Christina.Desrochers@ontario.ca>
Subject: RE: 770 Brookfield Road

Good morning,

The MOECC Ottawa District Office has received your pre-submission consultation request. The Water Inspector assigned to your file is Christina Des Rochers and will be contacting you.

Thank you,

Jéhanne Hurlbut
District Administrative Assistant (Bilingual)
Ontario Ministry of the Environment and Climate Change
Ottawa District Office
103-2430 Don Reid Drive
Ottawa, ON K1H 1E1
Ph: (613) 521-3450 X 221

From: Alison Gosling [mailto:AGosling@dsel.ca]
Sent: Monday, October 30, 2017 12:19 PM
To: MOECCOttawaSewage (MOECC) <MOECCOttawaSewage@ontario.ca>
Subject: 770 Brookfield Road

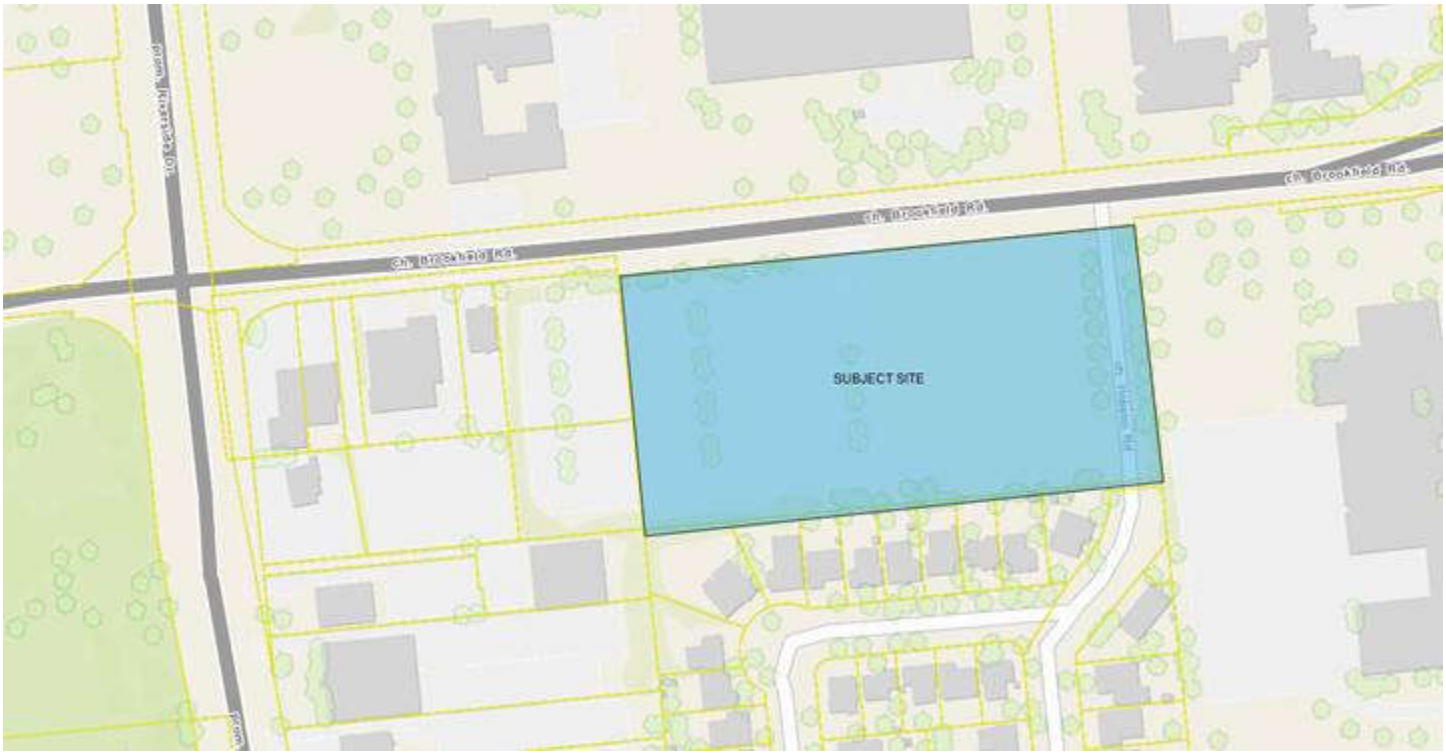
Good afternoon,

We just wanted to touch base with you regarding a proposed Phase I development we are working on located at 770 Brookfield Road.

Currently comprised a single parcel of land, the existing 2.5ha site currently an above ground parking lot and is zoned General Mixed Use. The development proposes to construct 5 residential/commercial buildings.It appears that the existing site currently directs flow towards the private catch basin system within the subject site and is tributary to the Sawmill Creek sub-watershed.

As the proposed sewage works and stormwater management facility will be servicing a single parcel of land which will be owned and operated by a single entity, does not discharge to a combined sewer system, and is not proposed to be used for industrial purposes, it is assumed this falls within the exemption requirements for an Environmental Compliance Approval as per O.Reg 525/98, Section 3 (a) & Ontario Water Resources Act Section 53. 6 (c).

I hope you could comment on my assumption that this property would be exempt from requiring an ECA. Please feel free to call to discuss this further.



Thank you,

Alison Gosling, E.I.T.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

APPENDIX B

Water Supply

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Phase 1

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4		0
Semi-detached	2.7		0
Townhouse	2.7		0
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	426	767

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	767	214.8	149.1	536.9	372.8	1181.2	820.3

Institutional / Commercial / Industrial Demand

			Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**	**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Commercial floor space	2.8 $L/m^2/d$	1,200	3.36	2.3	5.0	3.5	9.1	6.3
Office	75 $L/9.3m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
		Total I/CI Demand	3.4	2.3	5.0	3.5	9.1	6.3
		Total Demand	**218.1**	**151.5**	**541.9**	**376.3**	**1190.3**	**826.6**

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Ultimate

Water Demand Design Flows per Unit Count
City of Ottawa - Water Distribution Guidelines, July 2010

Domestic Demand

Type of Housing	Per / Unit	Units	Pop
Single Family	3.4		0
Semi-detached	2.7		0
Townhouse	2.7		0
Apartment			0
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	852	1534

	Pop	Avg. Daily		Max Day		Peak Hour	
		m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Total Domestic Demand	1534	429.5	298.3	1073.8	745.7	2362.4	1640.5

Institutional / Commercial / Industrial Demand

			Avg. Daily		Max Day		Peak Hour	
Property Type	**Unit Rate**	**Units**	m^3/d	L/min	m^3/d	L/min	m^3/d	L/min
Commercial floor space	2.8 $L/m^2/d$	1,200	3.36	2.3	5.0	3.5	9.1	6.3
Office	75 $L/9.3m^2/d$		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Light	35,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
Industrial - Heavy	55,000 L/gross ha/d		0.00	0.0	0.0	0.0	0.0	0.0
		Total I/CI Demand	3.4	2.3	5.0	3.5	9.1	6.3
		Total Demand	**432.9**	**300.6**	**1078.8**	**749.2**	**2371.4**	**1646.8**

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	19730.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	24721.6	L/min	
	25000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Non-Combustible	-25%	
Fire Flow	**18750.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%	
Reduction	**-9375**	**L/min**

4. Increase for Separation Distance

N	>45m	0%	
S	30.1m-45m	5%	
E	0m-3m	25%	
W	10.1m-20m	15%	
	% Increase	**45%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**8437.5**	**L/min**

Total Fire Flow

Fire Flow	17812.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	18000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	9150.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	16835.4	L/min	
	17000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Non-Combustible	-25%
Fire Flow	**12750.0 L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%
Reduction	**-6375 L/min**

4. Increase for Separation Distance

N	3.1m-10m	20%	
S	30.1m-45m	5%	
E	20.1m-30m	10%	
W	10.1m-20m	15%	
	% Increase	**50%**	*value not to exceed 75% per FUS Part II, Section 4*

Increase	**6375.0 L/min**

Total Fire Flow

Fire Flow	12750.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	13000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Hobin Archiecture Inc.
770 Brookfield Road
FUS-Fire Flow Demand
Building C

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	19730.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	24721.6	L/min	
	25000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Non-Combustible	-25%	
Fire Flow	**18750.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%	
Reduction	**-9375**	**L/min**

4. Increase for Separation Distance

N	>45m	0%	
S	20.1m-30m	10%	
E	>45m	0%	
W	0m-3m	25%	
	% Increase	**35%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**6562.5**	**L/min**

Total Fire Flow

Fire Flow	15937.5	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	16000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	9150.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	16835.4	L/min	
	17000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Non-Combustible	-25%	
Fire Flow	**12750.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%	
Reduction	**-6375**	**L/min**

4. Increase for Separation Distance

N	3.1m-10m	20%	
S	30.1m-45m	5%	
E	10.1m-20m	15%	
W	20.1m-30m	10%	
	% Increase	**50%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**6375.0**	**L/min**

Total Fire Flow

Fire Flow	12750.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	13000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1260.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	6247.4	L/min	
	6000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Non-Combustible	-25%	
Fire Flow	**4500.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%	
Reduction	**-2250**	**L/min**

4. Increase for Separation Distance

N	30.1m-45m	5%	
S	3.1m-10m	20%	
E	10.1m-20m	15%	
W	0m-3m	25%	
	% Increase	**65%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**2925.0**	**L/min**

Total Fire Flow

Fire Flow	5175.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	5000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Fire Flow Estimation per Fire Underwriters Survey

Water Supply For Public Fire Protection - 1999

Fire Flow Required

1. Base Requirement

$F = 220C\sqrt{A}$ L/min *Where **F** is the fire flow, **C** is the Type of construction and **A** is the Total floor area*

Type of Construction: Non-Combustible Construction

C	0.8		*Type of Construction Coefficient per FUS Part II, Section 1*
A	1260.0	m^2	*Total floor area based on FUS Part II section 1*

Fire Flow	6247.4	L/min	
	6000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Adjustments

2. Reduction for Occupancy Type

Non-Combustible	-25%	
Fire Flow	**4500.0**	**L/min**

3. Reduction for Sprinkler Protection

Sprinklered	-50%	
Reduction	**-2250**	**L/min**

4. Increase for Separation Distance

N	30.1m-45m	5%	
S	3.1m-10m	20%	
E	0m-3m	25%	
W	10.1m-20m	15%	
	% Increase	**65%**	*value not to exceed 75% per FUS Part II, Section 4*
	Increase	**2925.0**	**L/min**

Total Fire Flow

Fire Flow	5175.0	L/min	*fire flow not to exceed 45,000 L/min nor be less than 2,000 L/min per FUS Section 4*
	5000.0	**L/min**	*rounded to the nearest 1,000 L/min*

Notes:
-Type of construction, Occupancy Type and Sprinkler Protection information provided by _____.
-Calculations based on Fire Underwriters Survey - Part II

Boundary Conditions Unit Conversion

Connection 1 (Ultimate)

	Height (m)	Elevation (m)	m H_2O	PSI	kPa
Avg. DD	134.2	78.2	56.0	79.7	549.4
Fire Flow	112.2	78.2	34.0	48.4	333.5
Peak Hour	124.4	78.2	46.2	65.7	453.2

Alison Gosling

From: Oram, Cody <Cody.Oram@ottawa.ca>
Sent: Friday, November 24, 2017 4:38 PM
To: Alison Gosling; Anthony Temelini
Cc: Robert Freel
Subject: RE: 770 Brookfield - Boundary Condition Request
Attachments: 770 Brookfield (Updated) November 2017.pdf

Follow Up Flag: Follow up
Flag Status: Flagged

The following are boundary conditions, HGL, for hydraulic analysis at 770 Brookfield St (zone 2C) assumed to be connected to the 305 mm on Brookfield St (see attached PDF for location).

Minimum HGL = 124.4 m

Maximum HGL = 134.2 m

The maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

Max Day + Fire Flow = 112.2 m (Connection 1)

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of water mains deteriorate over time, as such must be assumed in the absence of actual field test data. The variation in physical water main properties can therefore alter the results of the computer model simulation.

Regards,

Cody Oram, P.Eng. Senior Engineer
Development Review, South Services
Planning, Infrastructure and Economic Development Department | Services de planification, d'infrastructure et de développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste **13422**, fax/téléc:613-580-2576, cody.oram@ottawa.ca

Please be aware that I will be away on vacation between Nov 27 to Dec 1, 2017

From: Alison Gosling [mailto:AGosling@dsel.ca]
Sent: Tuesday, November 14, 2017 2:10 PM
To: Anthony Temelini <ATemelini@dsel.ca>; Oram, Cody <Cody.Oram@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>
Subject: RE: 770 Brookfield - Boundary Condition Request

Good afternoon Cody,

We would like to request updated boundary conditions for the ultimate development at 770 Brookfield Road. Please supersede the previous request.

1. Location of Service / Street Number: 770 Brookfield Road

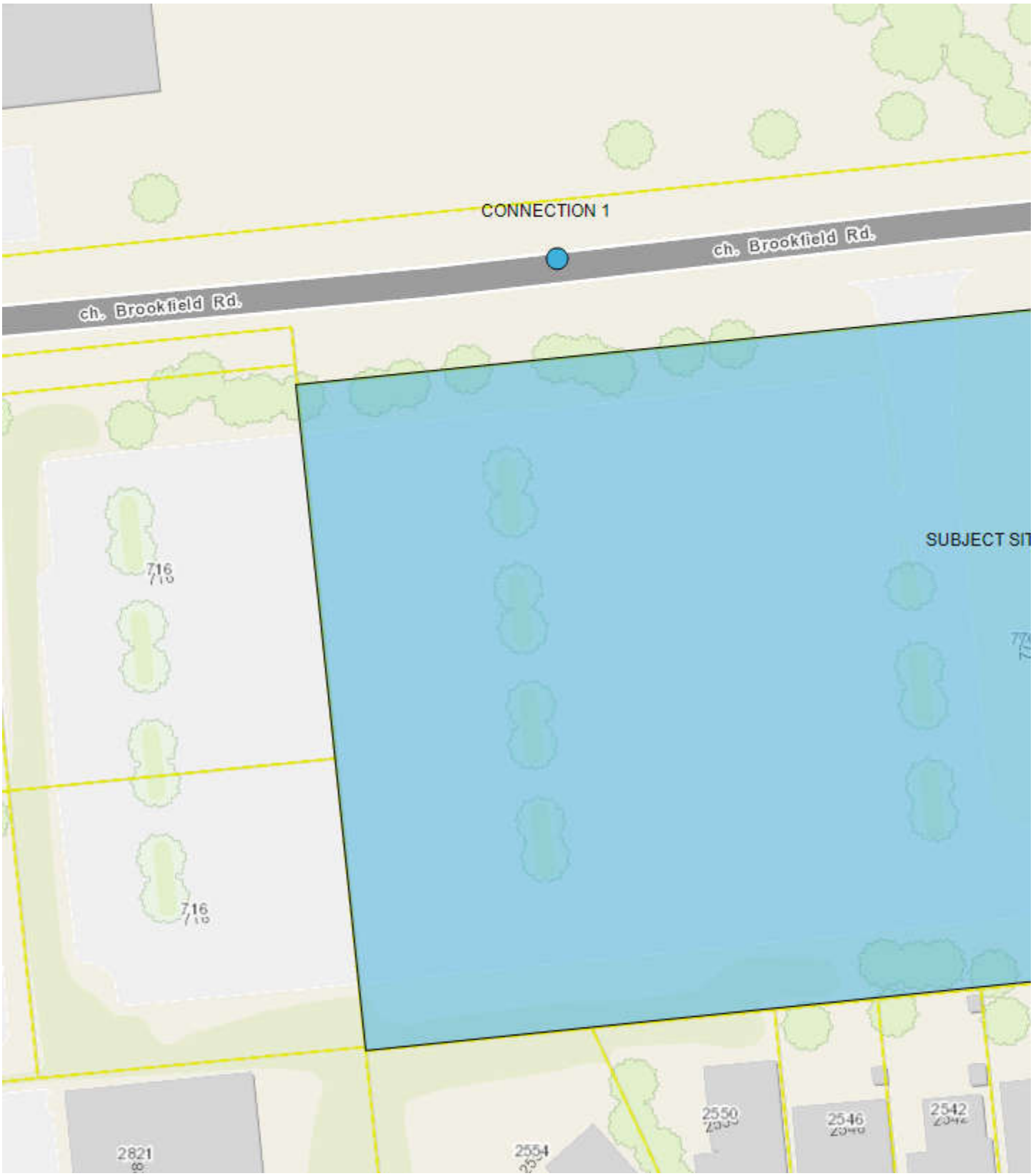
2. Type of development and the amount of fire flow required for the proposed development:

   - The development is intended to be residential/commercial. The full build-out consists of 808 residential units and 2244 m^2 of commercial space .
   - It is anticipated that the development will have a dual connection to the existing 305 mm diameter watermain within Brookfield Road, as shown by the attached water distribution map.
   - Fire demand based on FUS was used to calculate fire demand. Based on our calculations, we anticipate a maximum fire flow demand of 17 000 L/min.

3. Demands:

	L/min	L/s
Avg. Daily	357.5	5.96
Max Day	890.0	14.83
Peak Hour	1955.6	32.59

It you have any questions please feel free to contact me.



Thank you,

Alison Gosling, E.I.T.
Project Coordinator / Junior Designer

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.542
fax: (613) 836-7183
email: agosling@dsel.ca

From: Anthony Temelini
Sent: Monday, October 30, 2017 5:09 PM
To: Oram, Cody <Cody.Oram@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Alison Gosling <AGosling@dsel.ca>
Subject: RE: 770 Brookfield - Boundary Condition Request

Hi Cody,

As the previous site plan for 770 Brookfield has been updated, we would like to request updated water boundary conditions for the site. Please note that at this time, we only require the updated boundary conditions for Phase 1 (we will request the updated boundary conditions for Phase 2 at a later time), based on the following proposed development demands:

1. Location of Service / Street Number: 770 Brookfield Road

2. Type of development and the amount of fire flow required for the proposed development:

   - Phased development – Phase 1 to have 355 residential units and 1206 m^2 of commercial space .
   - It is anticipated that the development will have a dual connection to the existing 305 mm diameter watermain within Brookfield Road, as shown by the attached water distribution map.
   - Fire demand based on FUS was used to calculate fire demand. Based on our calculations, we anticipate a maximum fire flow demand of 17 000 L/min.

3. Demands:

Phase 1

	L/min	L/s
Avg. Daily	157.4	2.62
Max Day	391.4	6.52
Peak Hour	859.9	14.33

It you have any questions please feel free to contact me.

Thank you,

Anthony Temelini, E.I.T.
Project Coordinator

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.524
email: atemelini@dsel.ca

From: Oram, Cody [mailto:Cody.Oram@ottawa.ca]
Sent: Monday, October 30, 2017 10:29 AM
To: Anthony Temelini
Cc: Robert Freel; Alison Gosling
Subject: RE: 770 Brookfield - Boundary Condition Request

Hi Anthony,

The following are boundary conditions, HGL, for hydraulic analysis at 770 Brookfield St (zone 2C) assumed to be connected to the 305 mm on Brookfield St (see attached PDF for location).

Phase 1 Demands - Connection 1 Only

Minimum HGL = 124.6 m

Maximum HGL = 134.7 m

The maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

Available fire flow = 467 L/s assuming a residual of 20 psi and a ground elevation of 78.4 m

Phase 2 Demands - Both Connections

Minimum HGL = 124.4 m (Both Connections)

Maximum HGL = 134.5 m (Both Connections)

The maximum pressure is estimated to be above 80 psi. A pressure check at completion of construction is recommended to determine if pressure control is required.

Available fire flow = 461 L/s assuming a residual of 20 psi and a ground elevation of 78.4 m (Connection 1)

Available fire flow = 484 L/s assuming a residual of 20 psi and a ground elevation of 77.7 m (Connection 2)

These are for current conditions and are based on computer model simulation.

Disclaimer: The boundary condition information is based on current operation of the city water distribution system. The computer model simulation is based on the best information available at the time. The operation of the water distribution system can change on a regular basis, resulting in a variation in boundary conditions. The physical properties of watermains deteriorate over time, as such must be assumed in the absence of actual

field test data. The variation in physical watermain properties can therefore alter the results of the computer model simulation.

Regards,

Cody Oram, P.Eng. Senior Engineer
Development Review, South Services
Planning, Infrastructure and Economic Development Department | Services de planification, d'infrastructure et de développement économique
City of Ottawa | Ville d'Ottawa
110 Laurier Avenue West. Ottawa, ON | 110, avenue. Laurier Ouest. Ottawa (Ontario) K1P 1J1
613.580.2424 ext./poste **13422**, fax/téléc:613-580-2576, cody.oram@ottawa.ca

From: Anthony Temelini [mailto:ATemelini@dsel.ca]
Sent: Thursday, October 19, 2017 2:21 PM
To: Oram, Cody <Cody.Oram@ottawa.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Alison Gosling <AGosling@dsel.ca>
Subject: RE: 770 Brookfield - Boundary Condition Request

Hi Cody,

In response to your questions:

1) It is not anticipated that the two connections will be looped within the municipal road allowance at this time;
2) Is it possible to get boundary conditions for both scenarios (i.e. boundary conditions for Phase 1 demands only and boundary conditions for the total demands)? At this time, there is still some uncertainty as to whether both connections would be installed independently or whether both would be installed as part of Phase 1.

Please let us know if you are able to provide the demands for both scenarios and feel free to contact me if you have any further questions.

Thank you,

Anthony Temelini, E.I.T.
Project Coordinator

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.524
email: atemelini@dsel.ca

From: Oram, Cody [mailto:Cody.Oram@ottawa.ca]
Sent: Wednesday, October 18, 2017 4:12 PM
To: Anthony Temelini
Cc: Robert Freel; Alison Gosling
Subject: RE: 770 Brookfield - Boundary Condition Request

Hi Anthony,
Our water modelling group requires clarification on the following;

1. Will the two connections be looped?
2. Does the consultant need boundary conditions for each phase, or just for the total demands? (If for each phase, are both connections to be installed in the first phase or only one?)

Thank you,
Cody

From: Oram, Cody
Sent: Wednesday, October 18, 2017 9:50 AM
To: 'Anthony Temelini' <ATemelini@dsel.ca>
Cc: Robert Freel <RFreel@dsel.ca>; Alison Gosling <AGosling@dsel.ca>; Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Subject: RE: 770 Brookfield - Boundary Condition Request

Hi Anthony,

I've requested the water boundary conditions and will forward them to you as soon as I get them.

Cody

From: Anthony Temelini [mailto:ATemelini@dsel.ca]
Sent: Tuesday, October 17, 2017 5:49 PM
To: Shillington, Jeffrey <jeff.shillington@ottawa.ca>
Cc: Oram, Cody <Cody.Oram@ottawa.ca>; Robert Freel <RFreel@dsel.ca>; Alison Gosling <AGosling@dsel.ca>
Subject: RE: 770 Brookfield - Boundary Condition Request

Hi Jeff,

I just wanted to follow up on my e-mail below. Have you had a chance to review the boundary condition request for 770 Brookfield?

Please let me know.

Thanks,

Anthony Temelini, E.I.T.
Project Coordinator

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.524
email: atemelini@dsel.ca

From: Anthony Temelini
Sent: Wednesday, October 11, 2017 10:19 AM
To: 'jeff.shillington@ottawa.ca'
Cc: cody.oram@ottawa.ca; Robert Freel; Alison Gosling
Subject: FW: 770 Brookfield - Boundary Condition Request

Hi Jeff,

In Cody's absence, can you please review the boundary condition request below for 770 Brookfield?

Please let me know if you have any questions or comments.

Thank you,

Anthony Temelini, E.I.T.
Project Coordinator

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.524
email: atemelini@dsel.ca

From: Anthony Temelini
Sent: Friday, October 06, 2017 1:06 PM
To: 'cody.oram@ottawa.ca'
Cc: Alison Gosling; Robert Freel
Subject: 770 Brookfield - Boundary Condition Request

Good afternoon Cody,

We would like to request updated water boundary conditions for 770 Brookfield Road using the following proposed development demands:

1. Location of Service / Street Number: 770 Brookfield Road

2. Type of development and the amount of fire flow required for the proposed development:

- The phased development proposes approximately 544 total residential units and 550 m^2 of total commercial space.
- It is anticipated that the development will have a dual connection to the existing 305 mm diameter watermain within Brookfield Road, as shown by the attached water distribution map.
- Fire demand based on FUS will be used to calculate fire demand. Sufficient information is unavailable at this time to complete a calculation – we would request that the available fire flow at 140 kPa be provided for later comparison.

3. Demands

Phase 1

	L/min	L/s
Avg. Daily	119.8	2.00
Max Day	346.4	5.77
Peak Hour	514.0	8.57

Phase 2

	L/min	L/s
Avg. Daily	119.4	1.99
Max Day	345.8	5.76
Peak Hour	512.9	8.55

Total

	L/min	L/s
Avg. Daily	239.2	3.99
Max Day	692.2	11.53
Peak Hour	1026.9	17.12

It you have any questions please feel free to contact me.

Thank you,

Anthony Temelini, E.I.T.
Project Coordinator

DSEL
david schaeffer engineering ltd.

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

phone: (613) 836-0856 ext.524
email: atemelini@dsel.ca

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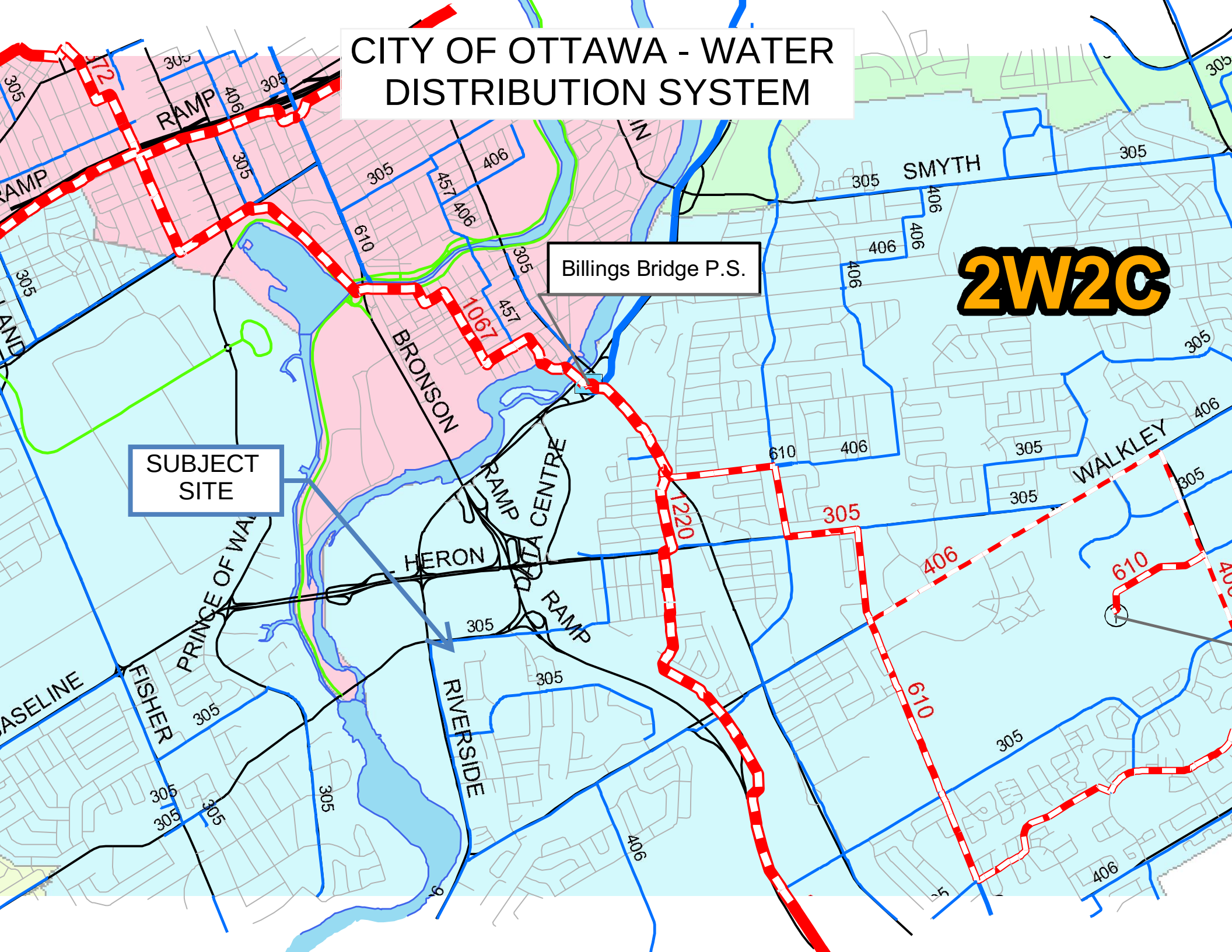

CITY OF OTTAWA - WATER DISTRIBUTION SYSTEM
Billings Bridge P.S.
2W2C
SUBJECT SITE
SMYTH
BRONSON
RAMP
CENTRE
HERON
RIVERSIDE
FISHER
WALKLEY
PRINCE OF WA
ASELINE
1067
1220
610
406
305
457

APPENDIX C

Wastewater Collection

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Phase I
Building A

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	1.99	**ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.66**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	288	519

Total Pop	**519**	
Average Domestic Flow	**1.68**	**L/s**
Peaking Factor	**3.97**	
Peak Domestic Flow	**6.67**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	2.8	$L/m^2/d$		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.00**
I/C/I Peak Factor	1.0
Peak Institutional / Commercial Flow	0.00
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.00**

** assuming a 12 hour commercial operation*
*** peak I/C/I flow per City of Ottawa Sewer Design Guidelines Appendix 4B and ISTB-2018-01*

Total Estimated Average Dry Weather Flow Rate	**1.7 L/s**
Total Estimated Peak Dry Weather Flow Rate	**6.7 L/s**
Total Estimated Peak Wet Weather Flow Rate	**7.3 L/s**

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Phase I
Building B

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	1.99	**ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.66**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	138	249

Total Pop	**249**	
Average Domestic Flow	**0.81**	**L/s**
Peaking Factor	**4.00**	
Peak Domestic Flow	**3.23**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	2.8	$L/m^2/d$		0.00
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.00**
I/C/I Peak Factor	1.0
Peak Institutional / Commercial Flow	0.00
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.00**

** assuming a 12 hour commercial operation*
*** peak I/C/I flow per City of Ottawa Sewer Design Guidelines Appendix 4B and ISTB-2018-01*

Total Estimated Average Dry Weather Flow Rate	**0.8**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**3.2**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**3.9**	**L/s**

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Phase I
Building E1

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	1.99	**ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.66**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**0**	
Average Domestic Flow	**0.00**	**L/s**
Peaking Factor	**4.00**	
Peak Domestic Flow	**0.00**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	2.8	$L/m^2/d$	600	0.04
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.04**
I/C/I Peak Factor	1.0
Peak Institutional / Commercial Flow	0.04
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.04**

** assuming a 12 hour commercial operation*
*** peak I/C/I flow per City of Ottawa Sewer Design Guidelines Appendix 4B and ISTB-2018-01*

Total Estimated Average Dry Weather Flow Rate	**0.0**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.0**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**0.7**	**L/s**

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Phase I
Building E1

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area	1.99	**ha**

Extraneous Flow Allowances

Infiltration / Inflow	**0.66**	**L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8		0

Total Pop	**0**	
Average Domestic Flow	**0.00**	**L/s**
Peaking Factor	**4.00**	
Peak Domestic Flow	**0.00**	**L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	2.8	$L/m^2/d$	600	0.04
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow	**0.04**
I/C/I Peak Factor	1.0
Peak Institutional / Commercial Flow	0.04
Peak Industrial Flow**	0.00
Peak I/C/I Flow	**0.04**

** assuming a 12 hour commercial operation*
*** peak I/C/I flow per City of Ottawa Sewer Design Guidelines Appendix 4B and ISTB-2018-01*

Total Estimated Average Dry Weather Flow Rate	**0.0**	**L/s**
Total Estimated Peak Dry Weather Flow Rate	**0.0**	**L/s**
Total Estimated Peak Wet Weather Flow Rate	**0.7**	**L/s**

Hobin Architecture Inc.
770 Brookfield Road
Proposed Site Conditions - Ultimate

Wastewater Design Flows per Unit Count
City of Ottawa Sewer Design Guidelines, 2004

Site Area 2.47 **ha**

Extraneous Flow Allowances

Infiltration / Inflow **0.82 L/s**

Domestic Contributions

Unit Type	Unit Rate	Units	Pop
Single Family	3.4		0
Semi-detached and duplex	2.7		0
Townhouse	2.7		0
Stacked Townhouse	2.3		0
Apartment			
Bachelor	1.4		0
1 Bedroom	1.4		0
2 Bedroom	2.1		0
3 Bedroom	3.1		0
Average	1.8	852	1534

Total Pop **1534**

Average Domestic Flow **4.97 L/s**

Peaking Factor **3.14**

Peak Domestic Flow **15.60 L/s**

Institutional / Commercial / Industrial Contributions

Property Type	Unit Rate		No. of Units	Avg Wastewater (L/s)
Commercial floor space*	2.8	$L/m^2/d$	1,200	0.08
Hospitals	900	L/bed/d		0.00
School	70	L/student/d		0.00
Industrial - Light**	35,000	L/gross ha/d		0.00
Industrial - Heavy**	55,000	L/gross ha/d		0.00

Average I/C/I Flow **0.08**

I/C/I Peak Factor 1.0
Peak Institutional / Commercial Flow 0.08
Peak Industrial Flow** 0.00
Peak I/C/I Flow **0.08**

** assuming a 12 hour commercial operation*
*** peak industrial flow per City of Ottawa Sewer Design Guidelines Appendix 4B*

Total Estimated Average Dry Weather Flow Rate	**5.0 L/s**
Total Estimated Peak Dry Weather Flow Rate	**15.7 L/s**
Total Estimated Peak Wet Weather Flow Rate	**16.5 L/s**

EXISTING SANITARY SEWER CALCULATION SHEET (OFFSITE)

CLIENT: **HOBIN ARCHITECTURE INC.**
LOCATION: **770 Brookfield Road**
FILE REF: **17-966**
DATE: **22-Nov-17**

DESIGN PARAMETERS

Avg. Daily Flow Res.	350	L/p/d	Peak Fact Res. Per Harmons:	Min = 2.0, Max =4.0	Infiltration / Inflow	0.28	L/s/ha
Avg. Daily Flow Comn	50,000	L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	50,000	L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indus	35,000	L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013	

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data										
Area ID	Up	Down	Area	Number of Units by type				Pop.	Cumulative Area	Cumulative Pop.	Peak. Fact.	Q_{res}	Area	Accu. Area	Area	Accu. Area	Area	Accu. Area	Q_{C+I+I} †	Total Area	Accu. Area	Infiltration Flow†	Total Flow	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full	$Q_{residual}$	US INV	DS INV
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)	(L/s)		
A †	1	2	1.840			10	178	347.0	1.840	347.0	4.00	5.62	0.95	0.95	3.09	3.09	0.34	0.34	4.3	6.220	6.220	1.742	11.68	250	0.29	123.7	0.049	0.063	0.65	32.1	0.36	20.4	75.27	74.91
	2	3	0.000					0.0	1.840	347.0	4.00	5.62		0.95		3.09		0.34	4.3	0.000	6.220	1.742	11.68	250	0.21	126.7	0.049	0.063	0.56	27.4	0.43	15.8	74.91	74.64
	3	4	0.000					0.0	1.840	347.0	4.00	5.62		0.95		3.09		0.34	4.3	0.000	6.220	1.742	11.68	300	0.21	99.9	0.071	0.075	0.63	44.3	0.26	32.7	74.64	74.43
	4	5	0.000					0.0	1.840	347.0	4.00	5.62		0.95		3.09		0.34	4.3	0.000	6.220	1.742	11.68	300	0.20	88.3	0.071	0.075	0.62	43.7	0.27	32.0	74.43	74.25
B	5	6	2.390	27				92.0	4.230	439.0	4.00	7.11		0.95		3.09		0.34	4.3	2.390	8.610	2.411	13.84	300	0.21	80.0	0.071	0.075	0.63	44.6	0.31	30.8	74.25	74.08
	6	7	0.000					0.0	4.230	439.0	4.00	7.11		0.95		3.09		0.34	4.3	0.000	8.610	2.411	13.84	300	0.22	100.3	0.071	0.075	0.64	45.3	0.31	31.5	74.08	73.86
C	7	8	0.450	5				17.0	4.680	456.0	3.99	7.38		0.95		3.09		0.34	4.3	0.450	9.060	2.537	14.23	300	0.43	85.7	0.071	0.075	0.90	63.5	0.22	49.3	73.86	73.49
D	8	9	0.400	4				14.0	5.080	470.0	3.99	7.59		0.95		3.09		0.34	4.3	0.400	9.460	2.649	14.55	300	0.18	89.1	0.071	0.075	0.58	41.0	0.36	26.4	73.49	73.33
	9	10	0.000					0.0	5.080	470.0	3.99	7.59		0.95		3.09		0.34	4.3	0.000	9.460	2.649	14.55	300	0.43	37.4	0.071	0.075	0.89	63.2	0.23	48.7	73.33	73.17
E	10	11	0.450	6				20.0	5.530	490.0	3.98	7.90		0.95		3.09		0.34	4.3	0.450	9.910	2.775	14.98	300	0.26	42.4	0.071	0.075	0.70	49.2	0.30	34.3	73.17	73.06
F	11	12	2.790	36				122.0	8.320	612.0	3.93	9.74		0.95		3.09		0.34	4.3	2.790	12.700	3.556	17.61	300	0.23	79.7	0.071	0.075	0.65	46.0	0.38	28.4	73.06	72.88

† Park flow included as part of the indicated flow rate

SANITARY SEWER CALCULATION SHEET (ONSITE)

CLIENT: **HOBIN ARCHITECTURE**
LOCATION: **770 BROOKFIELD - PHASE 1**
FILE REF: **17-966**
DATE: **15-Jun-18**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.28	L/s/ha
Avg. Daily Flow Comn	50,000	L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	50,000	L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust	35,000	L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013	

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units				Pop.	Cumulative		Peak.	Q_{res}	Area	Accu.	Area	Accu.	Area	Accu.	Q_{C+I+I}	Total	Accu.	Infiltration	Total	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
				by type					Area	Pop.	Fact.			Area		Area		Area		Area	Area	Flow	Flow								
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
BLOCK A	SAN5	SAN4	2.47				288		2.471	0.0	4.00	0.00		0.00		0.00		0.00	0.0	2.471	2.471	0.692	0.69	200	0.50	83.4	0.031	0.050	0.74	23.2	0.03
BLOCK B	SAN4	SAN3	0.000				138		2.471	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	2.471	0.692	0.69	200	0.50	20.5	0.031	0.050	0.74	23.2	0.03
BLOCK E	SAN3	SAN2	0.000						2.471	0.0	4.00	0.00	0.12	0.12		0.00		0.00	0.1	0.120	2.591	0.725	0.83	200	0.50	80.4	0.031	0.050	0.74	23.2	0.04
	SAN2	SAN1	0.000						2.471	0.0	4.00	0.00		0.12		0.00		0.00	0.1	0.000	2.591	0.725	0.83	200	4.30	13.6	0.031	0.050	2.16	68.0	0.01

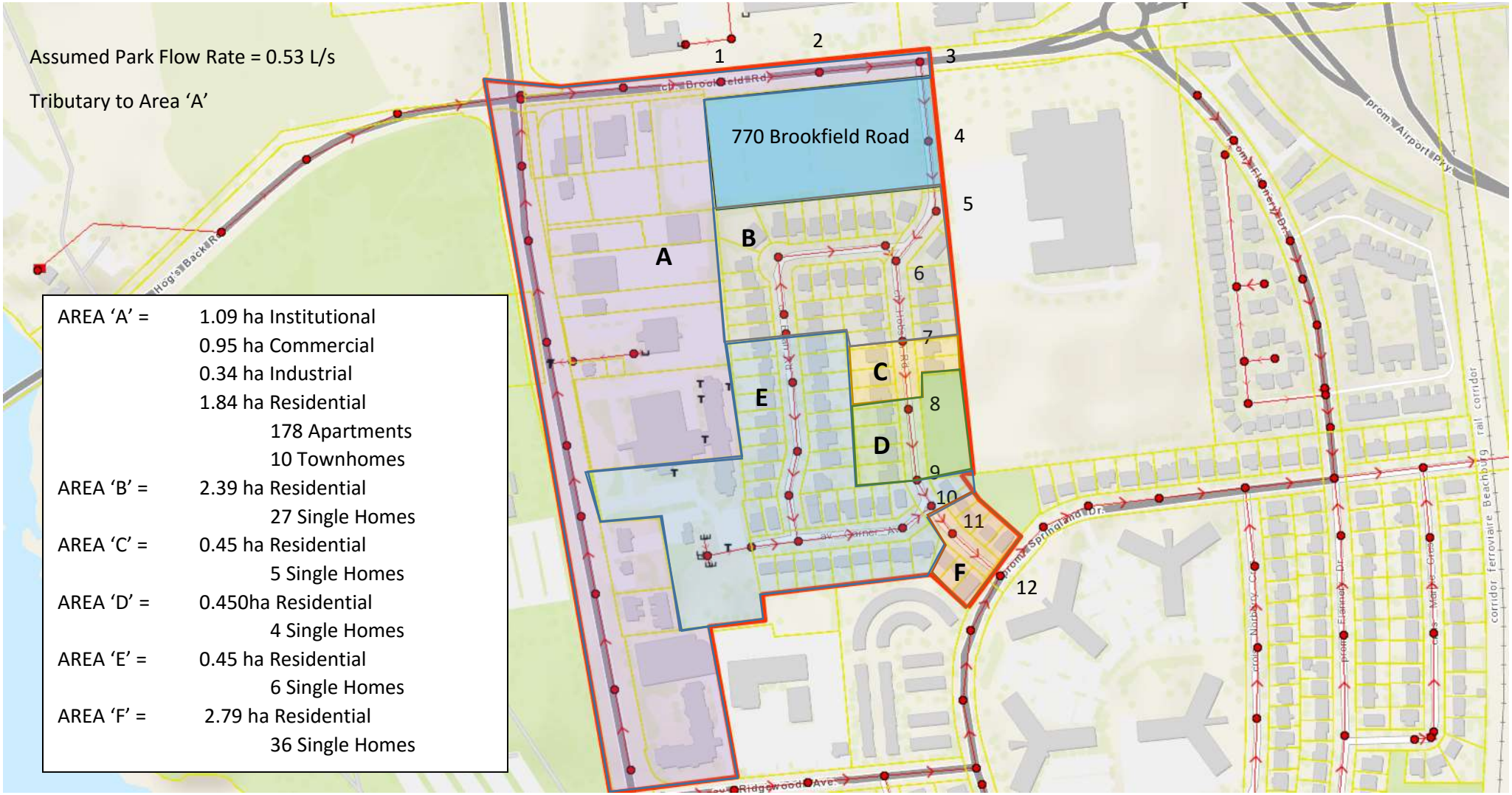
SANITARY SEWER CALCULATION SHEET (ONSITE)

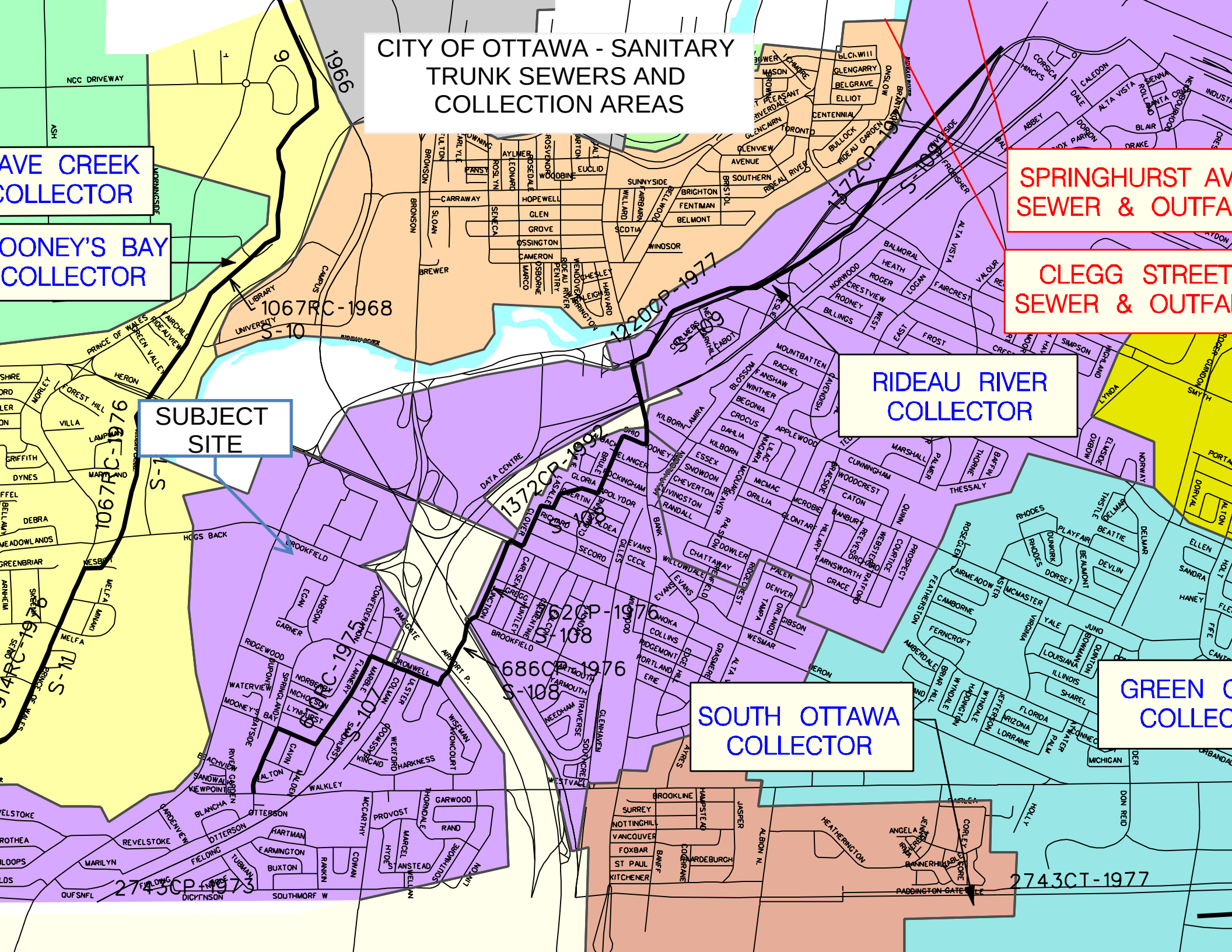
CLIENT: **HOBIN ARCHITECTURE**
LOCATION: **770 BROOKFIELD - ULTIMATE**
FILE REF: **17-966**
DATE: **15-Jun-18**

DESIGN PARAMETERS

Avg. Daily Flow Res.	280	L/p/d	Peak Fact Res. Per Harmons: Min = 2.0, Max =4.0		Infiltration / Inflow	0.28	L/s/ha
Avg. Daily Flow Comn	50,000	L/ha/d	Peak Fact. Comm.	1.5	Min. Pipe Velocity	0.60	m/s full flowing
Avg. Daily Flow Instit.	50,000	L/ha/d	Peak Fact. Instit.	1.5	Max. Pipe Velocity	3.00	m/s full flowing
Avg. Daily Flow Indust	35,000	L/ha/d	Peak Fact. Indust. per MOE graph		Mannings N	0.013	

Location			Residential Area and Population									Commercial		Institutional		Industrial			Infiltration				Pipe Data							
Area ID	Up	Down	Area	Number of Units				Pop.	Cumulative		Peak.	Q_{res}	Area	Accu.	Area	Accu.	Area	Accu.	Q_{C+I+I}	Total	Accu.	Infiltration	Total	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Q_{cap}	Q / Q full
				by type					Area	Pop.	Fact.			Area		Area		Area		Area	Area	Flow	Flow								
			(ha)	Singles	Semi's	Town's	Apt's		(ha)		(-)	(L/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(L/s)	(ha)	(ha)	(L/s)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(-)
BLOCK A	SAN5	SAN4	2.47				288		2.471	0.0	4.00	0.00		0.00		0.00		0.00	0.0	2.471	2.471	0.692	0.69	200	0.50	83.4	0.031	0.050	0.74	23.2	0.03
BLOCK B	SAN4	SAN3	0.000				138		2.471	0.0	4.00	0.00		0.00		0.00		0.00	0.0	0.000	2.471	0.692	0.69	200	0.50	20.5	0.031	0.050	0.74	23.2	0.03
BLOCK E	SAN3	SAN2	0.000				426		2.471	0.0	4.00	0.00	0.12	0.12		0.00		0.00	0.1	0.120	2.591	0.725	0.83	200	0.50	80.4	0.031	0.050	0.74	23.2	0.04
	SAN2	SAN1	0.000						2.471	0.0	4.00	0.00		0.12		0.00		0.00	0.1	0.000	2.591	0.725	0.83	200	4.30	13.6	0.031	0.050	2.16	68.0	0.01


Assumed Park Flow Rate = 0.53 L/s
Tributary to Area 'A'
770 Brookfield Road
A
B
C
D
E
F
1
2
3
4
5
6
7
8
9
10
11
12
AREA 'A' = 1.09 ha Institutional
0.95 ha Commercial
0.34 ha Industrial
1.84 ha Residential
178 Apartments
10 Townhomes
AREA 'B' = 2.39 ha Residential
27 Single Homes
AREA 'C' = 0.45 ha Residential
5 Single Homes
AREA 'D' = 0.450ha Residential
4 Single Homes
AREA 'E' = 0.45 ha Residential
6 Single Homes
AREA 'F' = 2.79 ha Residential
36 Single Homes


CITY OF OTTAWA - SANITARY TRUNK SEWERS AND COLLECTION AREAS
AVE CREEK COLLECTOR
OONEY'S BAY COLLECTOR
SUBJECT SITE
RIDEAU RIVER COLLECTOR
SOUTH OTTAWA COLLECTOR
SPRINGHURST AV SEWER & OUTFA
CLEGG STREET SEWER & OUTFA
GREEN C COLLEC
1067RC-1968
S-10
1372CP-1977
S-109
1220CP-1977
1372CP-1992
S-108
620CP-1976
S-108
686CT-1976
S-108
1067RC-1976
S-11
914RC-1976
S-11
1067RC-1975
S-107
2743CP-1973
2743CT-1977
NCC DRIVEWAY
1966
HOGS BACK
DATA CENTRE
AIRPORT P.

APPENDIX D

Stormwater Management

Hobin Architecture Inc.
770 Brookfield Road
Existing Site Conditions - Ultimate

Estimated Peak Stormwater Flow Rate
City of Ottawa Sewer Design Guidelines, 2012

Existing Drainage Characteristics From Internal Site

Area	2.470	ha
C	0.51	Rational Method runoff coefficient
L	103.4	m
Up Elev	78.87	m
Dn Elev	77.27	m
Slope	1.5	%
Tc	16.8	min

	Imp.	Perv.	Total
Area	1.110	1.360	2.470
C	0.9	0.2	0.51

1) Time of Concentration per Federal Aviation Administration

$$t_c = \frac{1.8(1.1-C)L^{0.5}}{S^{0.333}}$$

tc, in minutes
C, rational method coefficient, (-)
L, length in ft
S, average watershed slope in %

Estimated Peak Flow

	2-year	5-year	100-year	
i	57.9	78.2	133.6	mm/hr
Q	204.2	276.0	589.7	L/s

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area	2.47	ha
C	0.50	Rational Method runoff coefficient
t_c	16.8	min

2-year

i	57.9	mm/hr
Q	198.5	L/s

	Imp.	Perv.	Total
Area	0.057	0.275	0.332
C	0.9	0.2	0.32

Estimated Post Development Peak Flow from Unattenuated Areas

Total Area	0.25	ha
C	0.60	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual}* (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10.0	104.2	42.9	42.9	0.0	0.0	178.6	91.9	91.9	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Total Area	2.22	ha
C	0.85	Rational Method runoff coefficient

	5-year					100-year				
t_c (min)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)	i (mm/hr)	Q_{actual} (L/s)	$Q_{release}$ (L/s)	Q_{stored} (L/s)	V_{stored} (m^3)
10	104.2	546.9	52.9	494.0	296.4	178.6	1102.6	106.6	996.0	597.6
15	83.6	438.6	53.0	385.6	347.0	142.9	882.4	106.6	775.8	698.2
20	70.3	368.7	53.1	315.7	378.8	120.0	740.7	106.6	634.1	760.9
25	60.9	319.6	53.1	266.5	399.8	103.8	641.3	106.6	534.7	802.0
30	53.9	283.1	53.2	229.9	413.8	91.9	567.3	106.6	460.7	829.3
35	48.5	254.7	53.2	201.4	423.0	82.6	509.9	106.6	403.3	847.0
40	44.2	231.9	53.3	178.6	428.8	75.1	464.0	106.6	357.4	857.9
45	40.6	213.2	53.3	159.9	431.9	69.1	426.4	106.6	319.8	863.5
50	37.7	197.6	53.3	144.3	432.9	64.0	394.9	106.6	288.3	865.0
55	35.1	184.4	53.4	131.0	432.3	59.6	368.2	106.6	261.6	863.3
60	32.9	172.9	53.4	119.5	430.3	55.9	345.1	106.6	238.6	858.9
65	31.0	162.9	53.4	109.5	427.1	52.6	325.1	106.6	218.5	852.2
70	29.4	154.2	53.4	100.7	423.0	49.8	307.5	106.6	200.9	843.7
75	27.9	146.4	53.5	92.9	418.1	47.3	291.8	106.6	185.2	833.5
80	26.6	139.4	53.5	85.9	412.5	45.0	277.8	106.6	171.2	822.0
85	25.4	133.2	53.5	79.7	406.2	43.0	265.2	106.6	158.7	809.2
90	24.3	127.5	53.5	74.0	399.4	41.1	253.9	106.6	147.3	795.3
95	23.3	122.3	53.5	68.8	392.1	39.4	243.5	106.6	136.9	780.5
100	22.4	117.6	53.6	64.1	384.3	37.9	234.1	106.6	127.5	764.8
105	21.6	113.3	53.6	59.7	376.2	36.5	225.4	106.6	118.8	748.4
110	20.8	109.3	53.6	55.7	367.7	35.2	217.4	106.6	110.8	731.3

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

5-year $Q_{attenuated}$	**0.00 L/s**	**100-year $Q_{attenuated}$**	**0.00 L/s**
5-year Max. Storage Required	**432.9 m^3**	**100-year Max. Storage Required**	**865.0 m^3**

Summary of Release Rates and Storage Volumes

Control Area	5-Year Release Rate (L/s)	5-Year Storage (m^3)	100-Year Release Rate (L/s)	100-Year Storage (m^3)
Unattenuated Areas	42.9	0.0	91.9	0.0
Attenutated Areas	0.0	432.9	0.0	865.0
Total	**42.9**	**432.9**	**91.9**	**865.0**

Stormwater - Proposed Development
City of Ottawa Sewer Design Guidelines, 2012

Target Flow Rate

Area	1.99	ha
C	0.50	Rational Method runoff coefficient
t_c	16.8	min

	2-year	
i	57.9	mm/hr
Q	159.9	L/s

Estimated Post Development Peak Flow from Unattenuated Areas

U	**Imp.**	**Perv.**	**Total**
Area	0.094	0.044	0.138
C	0.9	0.2	0.68

Area ID	**U**	
Total Area	0.138	ha
C	0.68	Rational Method runoff coefficient

	5-year					**100-year**				
t_c (min)	**i (mm/hr)**	**Q_{actual} (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**	**i (mm/hr)**	**Q_{actual}* (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**
16.8	78.2	20.3	20.3	0.0	0.0	133.6	43.3	43.3	0.0	0.0

Note:
C value for the 100-year storm is increased by 25%, to a maximum of 1.0 per Ottawa Sewer Design Guidelines (5.4.5.2.1)

Estimated Post Development Peak Flow from Attenuated Areas

Building ID	**BLDG A + BLDG B + BLDG E1 + BLDG E2**	
Roof Area	0.491	ha
Avail Storage Area	0.466	
C	0.90	Rational Method runoff coefficient
t_c	10	min, tc at outlet without restriction

Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations

Estimated Number of Roof Drains

Building Length	280.0	
Building Width	18.5	
Number of Drains	20	
m^2 / Drain	233.2	max 232.25m^2/notch as recommended by Zurn for Ottawa

Roof Top Rating Curve per Zurn Model Z-105-5

d (m)	**A (m^2)**	**V_{acc} (m^3)**	**V_{avail} (m^3)**	**Q_{notch} (L/s)**	**Q_{roof} (L/s)**	**$V_{drawdown}$ (hr)**
0.000	0	0.0	0.0	0.00	0.00	0.00
0.025	291.5	2.4	2.4	0.38	7.60	0.09
0.050	1166.1	17.0	19.4	0.77	15.40	0.40
0.075	2623.8	46.2	65.6	1.14	22.80	0.96
0.100	4664.5	89.9	155.5	1.52	30.40	1.78
0.125	4664.5	116.6	272.1	1.90	38.00	2.63
0.150	4664.5	116.6	388.7	2.28	45.60	3.34

* Assumes one notch opening per drain, assumes maximum slope of 10cm

	5-year					**100-year**				
t_c (min)	**i (mm/hr)**	**Q_{actual} (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**	**i (mm/hr)**	**Q_{actual} (L/s)**	**$Q_{release}$ (L/s)**	**Q_{stored} (L/s)**	**V_{stored} (m^3)**
10	104.2	127.9	23.7	104.2	62.5	178.6	243.5	31.4	212.1	127.3
15	83.6	102.6	23.7	78.8	71.0	142.9	194.9	31.4	163.5	147.2
20	70.3	86.2	23.7	62.5	75.0	120.0	163.6	31.4	132.2	158.7
25	60.9	74.7	23.7	51.0	76.5	103.8	141.6	31.4	110.2	165.4
30	53.9	66.2	23.7	42.5	76.4	91.9	125.3	31.4	93.9	169.0
35	48.5	59.6	23.7	35.8	75.2	82.6	112.6	31.4	81.2	170.6
40	44.2	54.2	23.7	30.5	73.2	75.1	102.5	31.4	71.1	170.6
45	40.6	49.9	23.7	26.1	70.6	69.1	94.2	31.4	62.8	169.5
50	37.7	46.2	23.7	22.5	67.5	64.0	87.2	31.4	55.8	167.5
55	35.1	43.1	23.7	19.4	64.0	59.6	81.3	31.4	49.9	164.8
60	32.9	40.4	23.7	16.7	60.2	55.9	76.2	31.4	44.8	161.4
65	31.0	38.1	23.7	14.4	56.1	52.6	71.8	31.4	40.4	157.6
70	29.4	36.1	23.7	12.3	51.8	49.8	67.9	31.4	36.5	153.4
75	27.9	34.2	23.7	10.5	47.3	47.3	64.5	31.4	33.1	148.8
80	26.6	32.6	23.7	8.9	42.6	45.0	61.4	31.4	30.0	143.9
85	25.4	31.1	23.7	7.4	37.8	43.0	58.6	31.4	27.2	138.7
90	24.3	29.8	23.7	6.1	32.9	41.1	56.1	31.4	24.7	133.3
95	23.3	28.6	23.7	4.9	27.8	39.4	53.8	31.4	22.4	127.7
100	22.4	27.5	23.7	3.8	22.7	37.9	51.7	31.4	20.3	121.8
105	21.6	26.5	23.7	2.8	17.4	36.5	49.8	31.4	18.4	115.9
110	20.8	25.6	23.7	1.8	12.1	35.2	48.0	31.4	16.6	109.7

5-year Q_{roof}	**23.73**	**L/s**	**100-year Q_{roof}**	**31.39**	**L/s**
5-year Max. Storage Required	**76.5**	**m^3**	**100-year Max. Storage Required**	**170.6**	**m^3**
5-year Storage Depth	**0.078**	**m**	**100-year Storage Depth**	**0.103**	**m**
5-year Estimated Drawdown Time	**1.06**	**hr**	**00-year Estimated Drawdown Time**	**1.89**	**hr**

Estimated Post Development Peak Flow from Attenuated Areas

Area ID A

Available Sub-surface Storage
Maintenance Structures

A	Imp.	Perv.	Total
Area	0.897	0.468	1.365
C	0.9	0.2	0.66

Total Subsurface Storage (m^3) 365.0

Stage Attenuated Areas Storage Summary

		Surface Storage			Surface and Subsurface Storage			
	Stage	**Ponding**	**h_o**	**delta d**	**V***	**V_{acc}****	**$Q_{release}$†**	**$V_{drawdown}$**
	(m)	**(m^2)**	**(m)**	**(m)**	**(m^3)**	**(m^3)**	**(L/s)**	**(hr)**
Orifice INV	75.07		0.00			0.0	0.0	0.00
U/G STORAGE INV	75.77		0.70	0.70	0.0	0.0	58.8	0.00
U/G STORAGE S/L	76.23		1.16	0.46	121.7	121.7	75.6	0.45
U/G STORAGE OBV	76.68		1.61	0.46	121.7	243.3	89.3	0.76
T/L	77.81		2.74	1.13	121.7	365.0	116.4	0.87

* V=Incremental storage volume
**V_{acc}=Total surface and sub-surface
† $Q_{release}$ = Release rate calculated from orifice equation

Orifice Location **STM102** **Dia** 182
Total Area 1.365 ha
C 0.66 Rational Method runoff coefficient *Note: Rational Method Coefficient "C" increased by 25% for 100-year calculations*

	5-year					100-year				
t_c	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**	**i**	**Q_{actual}‡**	**$Q_{release}$**	**Q_{stored}**	**V_{stored}**
(min)	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**	**(mm/hr)**	**(L/s)**	**(L/s)**	**(L/s)**	**(m^3)**
10	104.2	284.5	78.4	206.1	123.6	178.6	589.9	116.2	473.7	284.2
15	83.6	232.8	78.4	154.4	139.0	142.9	478.4	116.2	362.1	325.9
20	70.3	199.5	78.4	121.1	145.3	120.0	406.6	116.2	290.4	348.4
25	60.9	176.1	78.4	97.7	146.6	103.8	356.2	116.2	240.0	360.0
30	53.9	158.7	78.4	80.3	144.5	91.9	318.8	116.2	202.5	364.5
35	48.5	145.1	78.4	66.7	140.1	82.6	289.7	116.2	173.5	364.3
40	44.2	134.3	78.4	55.9	134.1	75.1	266.5	116.2	150.2	360.5
45	40.6	125.4	78.4	47.0	126.9	69.1	247.4	116.2	131.1	354.1
50	37.7	118.0	78.4	39.5	118.6	64.0	231.4	116.2	115.2	345.6
55	35.1	111.6	78.4	33.2	109.6	59.6	217.9	116.2	101.6	335.4
60	32.9	106.2	78.4	27.8	99.9	55.9	206.2	116.2	90.0	323.9
65	31.0	101.4	78.4	23.0	89.7	52.6	196.1	116.2	79.8	311.3
70	29.4	97.2	78.4	18.8	79.0	49.8	187.1	116.2	70.9	297.7
75	27.9	93.5	78.4	15.1	68.0	47.3	179.2	116.2	63.0	283.3
80	26.6	90.2	78.4	11.8	56.6	45.0	172.1	116.2	55.9	268.2
85	25.4	87.2	78.4	8.8	44.9	43.0	165.8	116.2	49.5	252.5
90	24.3	84.5	78.4	6.1	32.9	41.1	160.0	116.2	43.7	236.2
95	23.3	82.0	78.4	3.6	20.7	39.4	154.7	116.2	38.5	219.4
100	22.4	79.8	78.4	1.4	8.3	37.9	150.0	116.2	33.7	202.2
105	21.6	77.7	77.7	0.0	0.0	36.5	145.6	116.2	29.3	184.6
110	20.8	75.8	75.8	0.0	0.0	35.2	141.5	116.2	25.3	166.7

5-year $Q_{attenuated}$ **78.41 L/s** **100-year $Q_{attenuated}$** **116.25 L/s**
5-year Max. Storage Required **146.6 m^3** **100-year Max. Storage Required** **364.5 m^3**
Est. 5-year Storage Elevation **76.32 m** **Est. 100-year Storage Elevation** **77.81 m**

Summary of Release Rates and Storage Volumes

Control Area	**5-Year Release Rate (L/s)**	**5-Year Required Storage (m^3)**	**100-Year Release Rate (L/s)**	**100-Year Required Storage (m^3)**	**100-Year Available Storage (m^3)**
Unattenuated Areas	20.3	0.0	43.3	0.0	0.0
Attenutated Areas	78.4	146.6	116.2	364.5	365.0
Total	**98.7**	**146.6**	**159.6**	**364.5**	**365.0**

Hobin Architecture Inc.
770 Brookfield Road
Storm Sewer Calculation Sheet - Phase I

										Sewer Data								
Area ID	Up	Down	Area	C	Indiv AxC	Acc AxC	T_C	I	Q	DIA	Slope	Length	$A_{hydraulic}$	R	Velocity	Qcap	Time Flow	Q / Q full
			(ha)	(-)			(min)	(mm/hr)	(L/s)	(mm)	(%)	(m)	(m^2)	(m)	(m/s)	(L/s)	(min)	(-)
B1	STM106	STM105	0.120	0.72	0.09	0.09	10.0	104.2	25.0	250	0.43	84.3	0.049	0.063	0.79	39.0	1.8	0.64
BLDG A			0.206	0.90	0.19	0.27												
B2	STM105	STM104	0.059	0.72	0.04	0.31	11.8	95.7	83.5	375	0.34	89.3	0.110	0.094	0.93	102.2	1.6	0.82
BLDG B2			0.208	0.52	0.11	0.42												
BLDG B1			0.157	0.90	0.14	0.56												
B3	STM104	STM103	0.127	0.72	0.09	0.66	13.4	89.2	162.3	525	0.34	24.0	0.216	0.131	1.16	250.8	0.3	0.65
B4	STM107	STM103	0.668	0.72	0.48	0.48	10.0	104.2	139.2	450	0.34	95.0	0.159	0.113	1.05	166.2	1.5	0.84
B5	STM103	STM102	0.194	0.72	0.14	1.28	13.7	87.9	311.6	600	0.34	76.2	0.283	0.150	1.27	358.0	1.0	0.87
BLDG E-1			0.063	0.90	0.06	1.33												
BLDG E-2	STM102	OGS	0.063	0.90	0.06	1.39	14.7	84.5	325.9	600	0.50	2.9	0.283	0.150	1.54	434.2	0.0	0.75
	OGS	STM101			0.00	1.39	14.8	84.4	325.5	600	1.00	15.4	0.283	0.150	2.17	614.0	0.1	0.53

Site Calculator

- System Builder
- Field Diagram
- Summary

Parameters

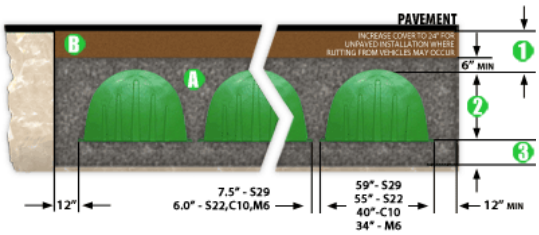
Units: English
Storage Volume: 10000 Cu. Ft
Chamber Selection: S-29 [+]
Header Row Position: Left
Fill Over Embedment Stone: 12 In
Embedment Stone:
Over: 6
Under: 6
Porosity: 0.4
Controlled By (in Ft):
Width
45
Accessories:
Dumpsters: 0
Bins: 0
Floors: ☐

Double Stacked
Double Stacked?: ☐
Lower Chamber: S-29
Stone Between: 6

Note: After making an input change you must hit recalculate to update the Field Diagram and Project Results. RECALCULATE SAVE
NOTICE: This calculator works best in when used with Firefox browser. If using Internet Explorer, please be sure to disable Protected Mode. This calculator has shown issues when used in Chrome with AdBlock enabled. If using Chrome, please disable AdBlock.
This calculator is provided for your convenience only and is not meant for final quotation and/or engineering purposes. Please contact Triton for more information.

HydroCAD Stormwater Modeling Need to model out a full system, or need engineering ready calculations? Triton chambers are available for modeling in HydroCAD by clicking on the HydroCAD banner to the left.

Project Results



- 1 Total Cover Over Chambers: 18.00 In
- 2 Height of Chamber: 36.0 In
- 3 Embedment Stone Under Chambers: 6.00 In
- A Volume of Embedment Stone Required: 339 Cu. Yd
- B Volume of Fill Material Required: 143 Cu. Yd

Total Storage Provided:	10025.9 Cu. Ft
Type of Distribution Chambers:	S-29
# of Distribution Chambers Required:	218
# of end caps required:	16
Type of header row chambers required:	S-29
# of header row chambers required:	14
Floors:	0
Bins:	0
Dumpsters:	0
Required Bed Size:	3881.81 Sq. Ft
Volume of Embedment Stone Required:	339.59 Cu. Yd
Volume of Fill Material Required:	143.77 Cu. Yd
Volume of Excavation:	718.85 Cu. Yd
Area of Filter Fabric:	552.92 Sq. Yd
# of Chambers long:	32
# of rows:	7
Actual Trench Length:	96.643 Ft
Actual Trench Width:	40.167 Ft

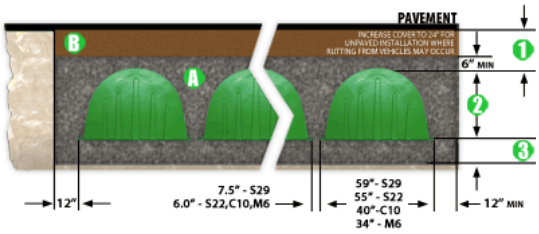
Field Diagram

WIRE DIAGRAM

Chamber Type

Dimensions 59" x 36" x 35" (WxHxL)
1498.6mm x 914.4mm x 889mm
Weight 32 lbs / 14.5 kg
Bare Chamber Storage 29 ft³ / 0.82 m³

Project Results



- 1 Total Cover Over Chambers: 18.00 In
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Volume of Embedment Stone Required:	339.59 Cu. Yd
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Volume of Excavation:	718.85 Cu. Yd
Area of Filter Fabric:	552.92 Sq. Yd
# of Chambers long:	32
# of rows:	7
Actual Trench Length:	96.643 Ft
Actual Trench Width:	40.167 Ft

Triton Stormwater Solutions, LLC
7600 Grand River Rd, Suite 195
Brighton, Michigan 48114
Phone: (810) 222-7652 - Fax: (810) 222-1769

DOWNLOADS

Zurn Roof Drains

Control-Flo...Today's Successful Answer to More

THE ZURN "CONTROL-FLO CONCEPT"

Originally, Zurn introduced the scientifically-advanced "Control-Flo" drainage principle for dead-level roofs. Today, after thousands of successful applications in modern, large dead-level roof areas, Zurn engineers have adapted the comprehensive "Control-Flo" data to **sloped roof** areas.

WHAT IS "CONTROL-FLO"?

It is an advanced method of removing rain water off dead-level or sloped roofs. As contrasted with conventional drainage practices, which attempt to drain off storm water as quickly as it falls on the roof's surface, "Control-Flo" drains the roof at a controlled rate. Excess water accumulates on the roof under controlled conditions...then drains off at a lower rate after a storm abates.

CUTS DRAINAGE COSTS

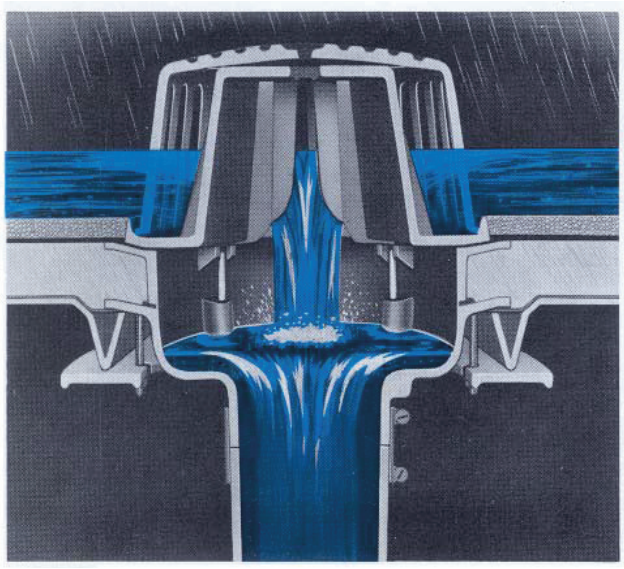
Fewer roof drains, smaller diameter piping, smaller sewer sizes, and lower installation costs are possible with a "Control-Flo" drainage system because roof areas are utilized as temporary storage reservoirs.

REDUCES PROBABILITY OF STORM DAMAGE

Lightens load on combination sewers by reducing rate of water drained from roof tops during severe storms thereby reducing probability of flooded sewers, and consequent backflow into basements and other low areas.

THANKS TO EXCLUSIVE ZURN "AQUA-WEIR" ACTION

Key to successful "Control-Flo" drainage is a unique scientifically-designed weir containing accurately calibrated notches with sides formed by parabolic curves which provide flow rates directly proportional to the head. Shape and size of notches are based on predetermined flow rates, and all factors involved in roof drainage to assure permanent regulation of drainage flow rates for specific geographic locations and rainfall intensities.

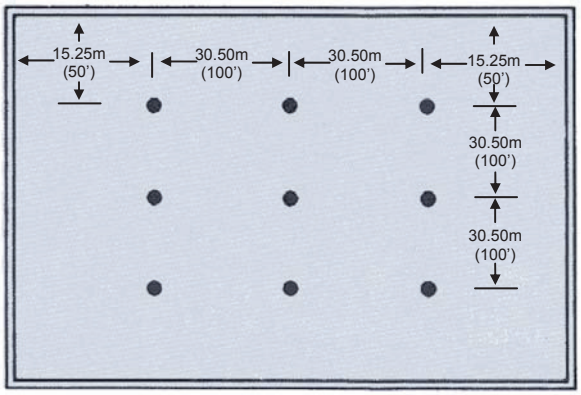


DEFINITION

DEAD LEVEL ROOFS

DIAGRAM "A"

A dead-level roof for purposes of applying the Zurn "Control-Flo" drainage principle is one which has been designed for zero slope across its entire surface. Measurements shown are for maximum distances.



(Plan View)

(Section View)

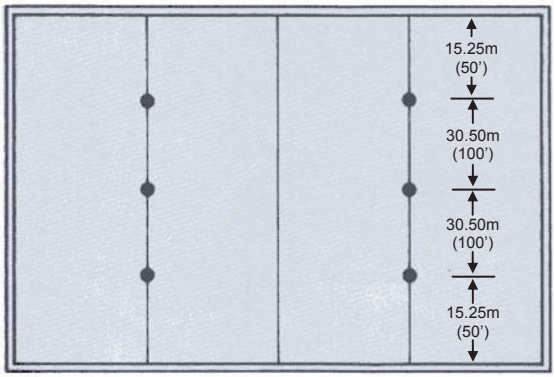
SLOPED ROOFS

DIAGRAM "B"

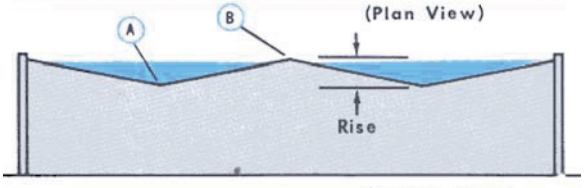
A sloped roof is one designed commonly with a shallow slope. The Zurn "Control-Flo" drainage system can be applied to any slope which results in a total rise up to 152mm (6").

The total rise of a roof as calculated for "Control-Flo" application is defined as the vertical increase in height in inches, from the low point or valley of a sloping roof (A) to the top of the sloping section (B). (Example: a roof that slopes 3mm (1/8") per foot having a 7.25m (24') span would have a rise of 7.25m x 3mm or 76mm (24' x 1/8" or 3")).

Measurements shown are for maximum distances.



(Plan View)

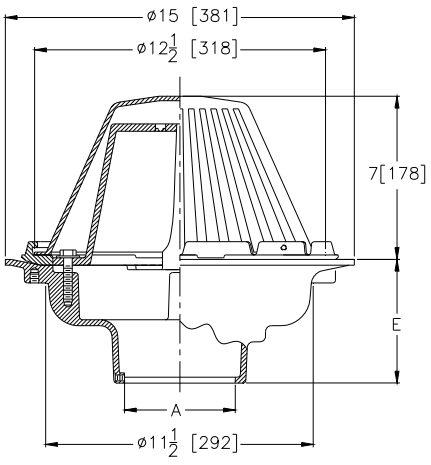


(Section View)

Dimensions and other measurements given in metric and imperial forms.

Economical Roof Drainage Installations

SPECIFICATION DATA



ENGINEERING SPECIFICATION: ZURN Z-105 "Control-Flo" roof drain for dead -level or sloped roof construction, Dura-Coated cast iron body. "Control-Flo" weir shall be linear functioning with integral membrane flashing clamp/ gravel guard and Poly-Dome. All data shall be verified proportional to flow rates.

ROOF DESIGN RECOMMENDATIONS

Basic roofing design should incorporate protection that will prevent roof overloading by installing adequate over-flow scuppers in parapet walls.

GENERAL INFORMATION

The “Control-Flo” roof drainage data is tabulated for four areas (232.25m^2 (2500 sq. ft.), 464.502m^2 (5000 sq. ft.), 696.75m^2 (7500 sq. ft.), 929m^2 (10,000 sq. ft.) notch areas ratings) for each locality. For each notch area rating the maximum discharge in L.P.M. (G.P.M.) - draindown in hours, and maximum water depth at the drain in inches for a dead level roof — 51mm (2 inch) rise — 102mm (4 inch) rise and 152mm (6 inch) rise—are tabulated. The rise is the total change in elevation from the valley to the peak. Values for areas, rise or combination thereof other than those listed, can be arrived at by extrapolation. All data listed is based on the fifty-year return frequency storm. In other words the maximum conditions as listed will occur on the average of once every fifty years.

NOTE: The tabulated “Control-Flo” data enables the individual engineer to select his own design limiting condition. The limiting condition can be draindown time, roof load factor, or maximum water depth at the drain. If draindown time is the limiting factor because of possible freezing conditions, it must be recognized that the maximum time listed will occur on the average of once every 50 years and would most likely be during a heavy summer thunder storm. Average winter draindown times would be much shorter in duration than those listed.

GENERAL RECOMMENDATIONS

On sloping roofs, we recommend a design depth referred to as an equivalent depth. An equivalent depth is the depth of water attained at the drains that results in the same roof stresses as those realized on a dead-level roof. In all cases this equivalent depth is almost equal to that attained by using the same notch area rating for the different rises to 152mm (6”). With the same depth of water at the drain the roof stresses will decrease with increasing total rise. Therefore, it would be possible to have a depth in excess of 152mm (6”) at the drain on a sloping roof without exceeding stresses normally encountered in a 152mm (6”) depth on a dead-level roof. However, it is recommended that scuppers be placed to limit the maximum water depth on any roof to 152mm (6”) to prevent the overflow of the weirs on the drains and consequent overloading of drain piping. In the few cases where the data shows a flow rate in excess of 136 L.P.M. (30 G.P.M.) if all drains and drain lines are sized according to recommendations, and the one storm in fifty years occurs, the only consequence will be a brief flow through the scuppers or over-flow drains.

NOTE: An equivalent depth is that depth of water attained at the drains at the lowest line or valley of the roof with all other conditions such as notch area and rainfall intensity being equal. For Toronto, Ontario a notch area rating of 464.50m^2 (5,000 sq. ft.) results in a 74mm (2.9 inch) depth on a dead level roof for a 50-year storm. For the same notch area and conditions, equivalent depths for a 51mm (2”), 102mm (4”) and 152mm (6”) rise respectively on a sloped roof would be 86mm (3.4”), 104mm (4.1”) and 124mm (4.9”). Roof stresses will be approximately equal in all cases.

Control-Flo Drain Selection Is Quick and Easy...

The exclusive Zurn “Selecta-Drain” Chart (pages 8—11) tabulates selection data for 34 localities in Canada. Proper use of this chart constitutes your best assurance of sure, safe, economical application of Zurn “Control-Flo” systems for your specific geographical area. If the “Selecta-Drain Chart does not cover your specific design criteria, contact Zurn Industries Limited, Mississauga, Ontario, for additional data for your locality. Listed below is additional information pertinent to proper engineering of the “Control-Flo” system.

ROOF USED AS TEMPORARY RETENTION

The key to economical “Control-Flo” is the utilization of large roof areas to temporarily store the maximum amount of water without overloading average roofs or creating excessive draindown time during periods of heavy rainfall. The data shown in the “Selecta-Drain” Chart enables the engineer to select notch area ratings from 232.25 m^2 (2,500 $ft.^2$) to 929m^2 (10,000 $ft.^2$) and to accurately predict all other design factors such as maximum roof load, L.P.M. (G.P.M.) discharge, draindown time and water depth at the drain. Obviously, as design factors permit the notch area rating to increase the resulting money saved in being able to use small leaders and drain lines will also increase.

ROOF LOADING AND RUN-OFF RATES

The four values listed in the “Selecta-Drain” Chart for notch area ratings for different localities will normally span the range of good design. If areas per notch below 232.25m^2 (2,500 $ft.^2$) are used considerable economy of the “Control-Flo” concept is being lost. The area per notch is limited to 929m^2 (10,000 $ft.^2$) to keep the draindown time within reasonable limits. Extensive studies show that stresses due to water load on a sloping roof for any fixed set of conditions are very nearly the same as those on a dead-level roof. A sloping roof tends to concentrate more water in the valleys and increase the water depth at this point. The greater depth around the drain leads to a faster run-off rate, particularly a faster early run -off rate. As a result, the total volume of water stored on the roof is less, and the total load on the sloping roof is less. By using the same area on the sloping roof as on the dead-level roof the increase in roof stresses due to increased water depth in the valleys is offset by the decrease in the total load due to less water stored. The net result of the maximum roof stress is approximately the same for any single span rise and fixed set of conditions. A fixed set of conditions, would be the same notch area, the same frequency store, and the same locality.

SPECIAL CONSIDERATIONS FOR STRUCTURAL SAFETY: Normal practice of roof design is based on 18kg (40 lbs.) per 929 cm^2 (sq ft.). (Subject to local codes and by-laws.) Thus it is extremely important that design is in accordance with normal load factors so deflection will be slight enough in any bay to prevent progressive deflection which could cause water depths to load the roof beyond its design limits.

ADDITIONAL NOTCH RATINGS

The ‘Selecta-Drain” Chart along with Tables I and II enables the engineer to select “Control-Flo” Drains and drain pipe sizes for most Canadian applications. These calculations are computed for a proportional flow weir that is sized to give a flow of 23 L.P.M. (5 G.P.M.) per inch of head. The 23 L.P.M. (5 G.P.M.) per inch of head notch opening is selected as the bases of design as it offers the most economical installation as applied to actual rainfall experienced in Canada.

Should you require design criteria for locations outside of Canada or for special project applications please contact Zurn Industries Limited, Mississauga, Ontario.

LEADER AND DRAIN PIPE SIZING

Since all data in the “Selecta-Drain” Chart is based on the 50-year-storm it is possible to exceed the water depth listed in these charts if a 100-year or 1000-year storm would occur. Therefore, for good design it is recommended that scuppers or other methods be used to limit water depth to the design depth and tables I and II be used to size the leaders and drain pipes. If the roof is capable of supporting more water than the design depth it is permissible to locate the scuppers or other overflow means at a height that will allow a greater water depth on the roof. However, in this case the leader and drain pipes should be sized to handle the higher flow rates possible based on a flow rate of 23 L.P.M. (5 G.P.M.) per inch of depth at the drain.

PROPER DRAIN LOCATION

The following good design practice is recommended for selecting the proper number of “Control-Flo” drains for a given area. **On dead-level roofs**, drains should be located no further than 15.25m (50 feet) from edge of roof and no further than 30.50m (100 feet) between drains. See diagram “A” page 2. **On sloping roofs**, drains should be located in the valleys at a distance no greater than 15.25m (50 feet) from each end of the valleys and no further than 30.50m (100 feet) between drains. See diagram “B” page 2. Compliance with these recommendations will assure good run off regardless of wind direction.

Detailed Stormceptor Sizing Report – Ottawa - 0.724ha

Project Information & Location			
Project Name	Ottawa	**Project Number**	-
City	Ottawa	**State/ Province**	Ontario
Country	Canada	**Date**	10/30/2017
Designer Information		**EOR Information (optional)**	
Name	Brandon O'Leary	**Name**	Alison Gosling
Company	Forterra	**Company**	David Schaeffer Engineering Ltd.
Phone #	905-630-0359	**Phone #**	
Email	brandon.oleary@forterrabp.com	**Email**	

Stormwater Treatment Recommendation

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

Site Name	Ottawa - 0.724ha
Recommended Stormceptor Model	STC 750
Target TSS Removal (%)	80.0
TSS Removal (%) Provided	80
PSD	Fine Distribution
Rainfall Station	OTTAWA MACDONALD-CARTIER INT'L A

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

Stormceptor Sizing Summary		
Stormceptor Model	**% TSS Removal Provided**	**% Runoff Volume Captured Provided**
STC 300	71	85
STC 750	80	94
STC 1000	81	94
STC 1500	82	94
STC 2000	84	99
STC 3000	86	99
STC 4000	88	100
STC 5000	89	100
STC 6000	90	100
STC 9000	93	100
STC 10000	93	100
STC 14000	95	100
StormceptorMAX	Custom	Custom

Stormceptor
The Stormceptor oil and sediment separator is sized to treat stormwater runoff by removing pollutants through gravity separation and flotation. Stormceptor's patented design generates positive TSS removal for each rainfall event, including large storms. Significant levels of pollutants such as heavy metals, free oils and nutrients are prevented from entering natural water resources and the re-suspension of previously captured sediment (scour) does not occur.
Stormceptor provides a high level of TSS removal for small frequent storm events that represent the majority of annual rainfall volume and pollutant load. Positive treatment continues for large infrequent events, however, such events have little impact on the average annual TSS removal as they represent a small percentage of the total runoff volume and pollutant load.

Design Methodology
Stormceptor is sized using PCSWMM for Stormceptor, a continuous simulation model based on US EPA SWMM. The program calculates hydrology using local historical rainfall data and specified site parameters. With US EPA SWMM's precision, every Stormceptor unit is designed to achieve a defined water quality objective. The TSS removal data presented follows US EPA guidelines to reduce the average annual TSS load. The Stormceptor's unit process for TSS removal is settling. The settling model calculates TSS removal by analyzing:
• Site parameters
• Continuous historical rainfall data, including duration, distribution, peaks & inter-event dry periods
• Particle size distribution, and associated settling velocities (Stokes Law, corrected for drag)
• TSS load
• Detention time of the system

Hydrology Analysis
PCSWMM for Stormceptor calculates annual hydrology with the US EPA SWMM and local continuous historical rainfall data. Performance calculations of Stormceptor are based on the average annual removal of TSS for the selected site parameters. The Stormceptor is engineered to capture sediment particles by treating the required average annual runoff volume, ensuring positive removal efficiency is maintained during each rainfall event, and preventing negative removal efficiency (scour). Smaller recurring storms account for the majority of rainfall events and average annual runoff volume, as observed in the historical rainfall data analyses presented in this section.

Rainfall Station			
State/Province	Ontario	**Total Number of Rainfall Events**	4819
Rainfall Station Name	OTTAWA MACDONALD-CARTIER INT'L A	**Total Rainfall (mm)**	20978.1
Station ID #	6000	**Average Annual Rainfall (mm)**	567.0
Coordinates	45°19'N, 75°40'W	**Total Evaporation (mm)**	2675.9
Elevation (ft)	370	**Total Infiltration (mm)**	4806.3
Years of Rainfall Data	37	**Total Rainfall that is Runoff (mm)**	13495.9

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

Drainage Area	
Total Area (ha)	0.724
Imperviousness %	77.0

Up Stream Storage	
Storage (ha-m)	Discharge (cms)
0.0000	0.0000
0.0000	0.0312
0.0066	0.0402
0.0132	0.0475
0.0198	0.0625

Water Quality Objective	
TSS Removal (%)	80.0
Runoff Volume Capture (%)	90.00
Oil Spill Capture Volume (L)	
Peak Conveyed Flow Rate (L/s)	62.50
Water Quality Flow Rate (L/s)	

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

Design Details	
Stormceptor Inlet Invert Elev (m)	
Stormceptor Outlet Invert Elev (m)	
Stormceptor Rim Elev (m)	
Normal Water Level Elevation (m)	
Pipe Diameter (mm)	
Pipe Material	
Multiple Inlets (Y/N)	No
Grate Inlet (Y/N)	No

Particle Size Distribution (PSD)

Removing the smallest fraction of particulates from runoff ensures the majority of pollutants, such as metals, hydrocarbons and nutrients are captured. The table below identifies the Particle Size Distribution (PSD) that was selected to define TSS removal for the Stormceptor design.

Fine Distribution		
Particle Diameter (microns)	Distribution %	Specific Gravity
20.0	20.0	1.30
60.0	20.0	1.80
150.0	20.0	2.20
400.0	20.0	2.65
2000.0	20.0	2.65

Site Name	Ottawa - 0.724ha

Site Details

Drainage Area

Total Area (ha)	0.724
Imperviousness %	77.0

Surface Characteristics

Width (m)	170.00
Slope %	2
Impervious Depression Storage (mm)	1.57
Pervious Depression Storage (mm)	4.67
Impervious Manning's n	0.015
Pervious Manning's n	0.25

Maintenance Frequency

Maintenance Frequency (months) >	12

Infiltration Parameters

Horton's equation is used to estimate infiltration

Max. Infiltration Rate (mm/hr)	76.2
Min. Infiltration Rate (mm/hr)	13.2
Decay Rate (1/sec)	0.00115
Regeneration Rate (1/sec)	0.01

Evaporation

Daily Evaporation Rate (mm/day)	2.54

Dry Weather Flow

Dry Weather Flow (lps)	0

Winter Months

Winter Infiltration	0

TSS Loading Parameters

TSS Loading Function	Build Up/ Wash-off

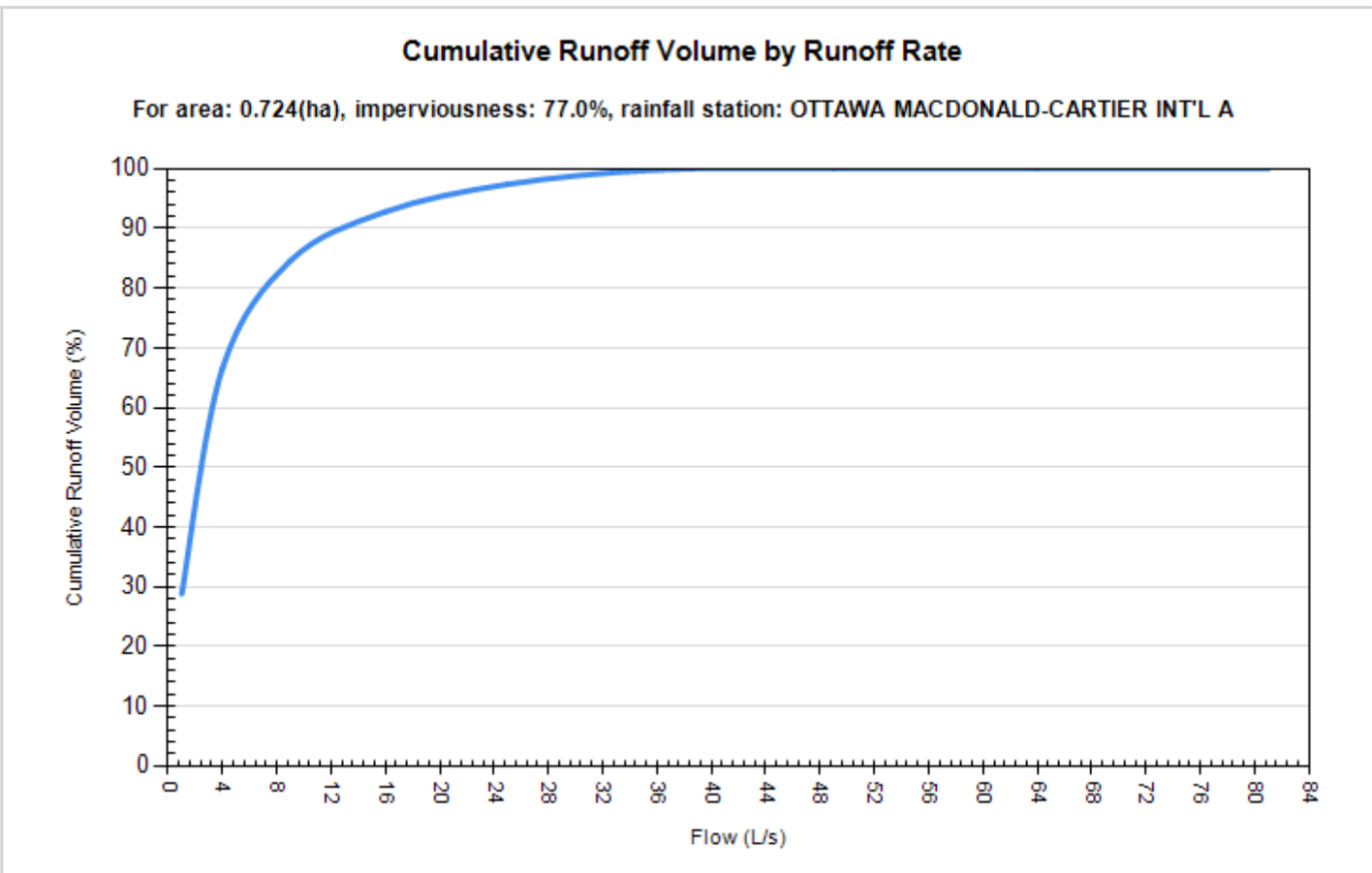
Buildup/Wash-off Parameters

Target Event Mean Conc. (EMC) mg/L	125
Exponential Buildup Power	0.40
Exponential Washoff Exponent	0.20

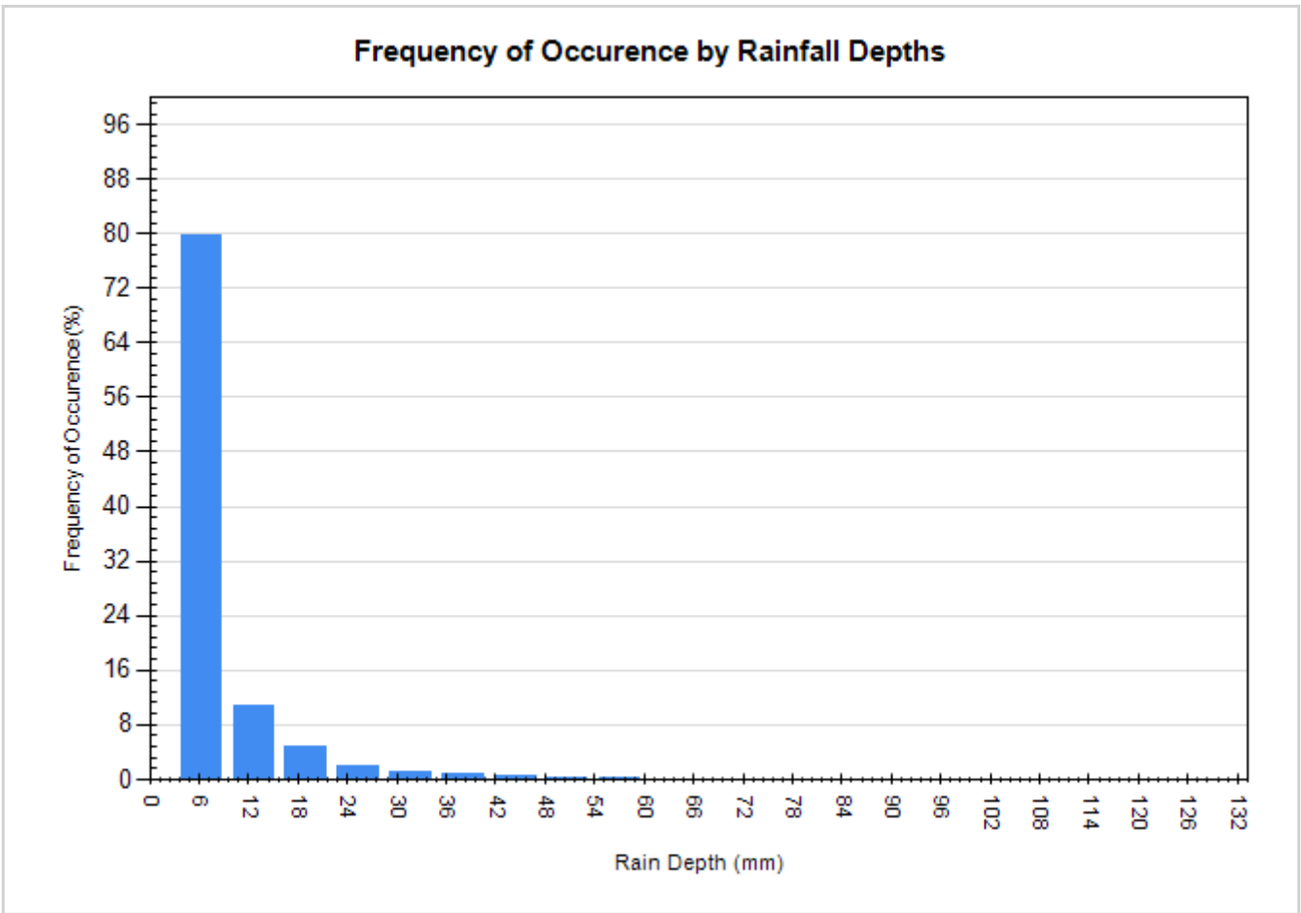
TSS Availability Parameters

Availability Constant A	0.05
Availability Factor B	0.04
Availability Exponent C	1.10
Min. Particle Size Affected by Availability (micron)	400

Cumulative Runoff Volume by Runoff Rate			
Runoff Rate (L/s)	**Runoff Volume (m³)**	**Volume Over (m³)**	**Cumulative Runoff Volume (%)**
1	28448	70213	28.8
4	65661	33000	66.6
9	83471	15193	84.6
16	91525	7135	92.8
25	96068	2593	97.4
36	98492	168	99.8
49	98660	0	100.0
64	98660	0	100.0
81	98660	0	100.0

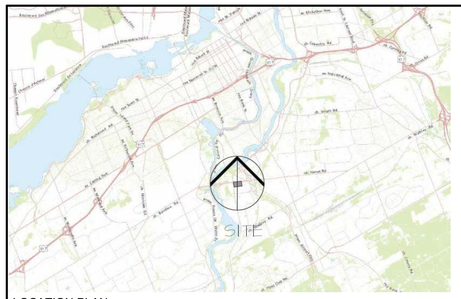


Rainfall Event Analysis				
Rainfall Depth (mm)	**No. of Events**	**Percentage of Total Events (%)**	**Total Volume (mm)**	**Percentage of Annual Volume (%)**
6.35	3843	79.7	5885	28.1
12.70	520	10.8	4643	22.1
19.05	225	4.7	3470	16.5
25.40	98	2.0	2144	10.2
31.75	58	1.2	1639	7.8
38.10	32	0.7	1118	5.3
44.45	24	0.5	996	4.7
50.80	9	0.2	416	2.0
57.15	5	0.1	272	1.3
63.50	1	0.0	63	0.3
69.85	1	0.0	64	0.3
76.20	1	0.0	76	0.4
82.55	0	0.0	0	0.0
88.90	1	0.0	84	0.4
95.25	0	0.0	0	0.0
101.60	0	0.0	0	0.0
107.95	0	0.0	0	0.0
114.30	1	0.0	109	0.5
120.65	0	0.0	0	0.0
127.00	0	0.0	0	0.0



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

DRAWINGS / FIGURES



LOCATION PLAN

SURVEY INFORMATION TAKE FROM:

TOPOGRAPHICAL PLAN OF BLOCKS B AND C
AND PART OF HODSON ROAD (AS CLOSED)
REGISTERED PLAN 787 AND PART OF LOTS 42 AND 43
REGISTERED PLAN 66
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SITE SUMMARY

PROPERTY ADDRESS:	770 BROOKFIELD ROAD	
ZONING:	GM. [155] F(1.5) S147, 148	
SITE AREA (ZONING SCH. 147)	24,655 m2	
SITE AREA (SURVEY)	24,655 m2	
PROPOSED USE:	APARTMENT BUILDING	
BUILDING FOOTPRINT: (ABOVE GRADE)	BLOCK A	= 2,024 m2
	BLOCK B	= 1,575 m2
	BLOCK E1	= 631 m2
	BLOCK E2	= 631 m2
	TOTAL:	= 4,891 m2

ZONING SUMMARY:

	REQUIRED	PROVIDED
RESIDENTIAL UNITS PHASE 1		426 UNITS
RESIDENTIAL UNITS PHASE 2		426 UNITS
TOTAL RESIDENTIAL UNITS PHASE 1+2		852 UNITS
FSI PHASE 1		1.3
FSI PHASE 2		1.8
TOTAL RETAIL AREA PHASE 1		
BLOCK E1		599.76m
BLOCK E2		599.76m2
TOTAL GFA		1,199.52 m2
FSI - BREAKDOWN FROM SPC APPLICATION: SITE AREA = 24,655.00 m2		
FSI PHASE 1		0.89
BLOCK A PHASE 1		14,488.00m2
BLOCK B PHASE 1		6,226.86m2
BLOCK E1 PHASE 1		599.76m2
BLOCK E2 PHASE 1		599.76m2
TOTAL GFA		21,914.38mm
FSI PHASE 2		0.84
BLOCK C PHASE 2		14,488.00m2
BLOCK D PHASE 2		6,226.86m2
TOTAL GFA		20,714.86
PHASE 1 + 2 TOTALS		
TOTAL GFA PHASE 1 + 2		42,629.24m2
TOTAL GFA PHASE 1+2		1.73
BUILDING HEIGHT:		27m

YARDS:

FRONT YARD: BROOKFIELD ROAD	3m MIN.	3m
REAR YARD	7.5m MIN.	20m
INTERIOR SIDE YARD:	3m MIN.	88.3m WEST 12.2m EAST

VEHICULAR PARKING:

		REQUIRED	PROVIDED
RESIDENTIAL PARKING PHASE 1		(MIN. 0.5/UNIT)	
TOTAL 426 UNITS MINUS FIRST 12 UNITS 426 - 12 = 414 UNITS		207 SPACES	207 SPACES
VISITORS PARKING 426 - 12 = 414 UNITS		(MIN. 0.2/UNIT) 83 SPACES	83 SPACES
RETAIL PARKING * CURRENT ZONING PROVISIONS (OTTAWA ZONING BY-LAW)		(MIN. 3.4/100m2)	
RETAIL GFA			
BLOCK A	541m2		
BLOCK E1	626m2		
BLOCK E2	626m2		
TOTAL PHASE 1	1,793m2	61 SPACES	61 SPACES
TOTAL PARKING		351 SPACES	351 SPACES

PARKING DISTRIBUTION

PARKING DISTRIBUTION PHASE 1	
PHASE 1 UNDERGROUND PARKING LEVEL	
P1 LEVEL PHASE 1	135 SPACES
SURFACE PARKING	216 SPACES
TOTAL PARKING	351 SPACES 351 SPACES

BICYCLE PARKING

	REQUIRED	PROVIDED
BICYCLE PARKING PHASE 1	MIN. 0.5/UNIT	
426 UNITS	213 SPACES	213 SPACES
RETAIL	1 / 1,500 m2 1.2 SPACES	2 SPACES
TOTAL PHASE 1	214.2 SPACES	215 SPACES

AMENITY

	REQUIRED	PROVIDED
BLOCK A 193 UNITS	1158 m2 (MIN. 6 m2/UNIT)	1,002 m2
BLOCK B 150 UNITS	900 m2 MIN. 6 m2/UNIT	346 m2 124 m2 (EXT.)
LANDSCAPE COURT YARD		1867 m2
TOTAL	2058 m2	3,339 m2

AREAS

Total: 39,751 m2
Basement - 7605 m2
L1 - 4900 m2
L2 - 5525 m2
L3 - 3825 m2
L4, L5, L8 - 3725 m2 (11175 m2 Total)
L7, L8, L9 2240m2 (6720 m2 total)

CANADA POST
ZONING
MC8 [399] h1, h2, h3 F(2.0) S135

BROOKFIELD HIGH SCHOOL ZONING I1A

HOBSON ROAD

BROOKFIELD ROAD

EGAN ROAD

RESTAURANT

BLOCK A
9 FLOORS
GFA = 19,612 SQM

BLOCK A
9 FLOORS

BLOCK E1
RETAIL LEVEL 1
GFA 627 SQM
AMENITY LEVEL 2
GFA 627 SQM

BLOCK E2
RETAIL LEVEL 1
GFA 627 SQM
AMENITY LEVEL 2
GFA 627 SQM

BLOCK B
6 FLOORS
GFA = 9,130 SQM

BACH. A
4 BED 3 BATH A3

P1 RAMP

AMENITY - LEVEL 1
GFA 102 SQM

LANDSCAPE COURTYARD
NOTE: REFER TO LANDSCAPE PLAN FOR ALL HARDSCAPE AND SOFTSCAPE DETAILS

770 BROOKFIELD PHASE 1 ZONING
GM1 [155] F (1.5) S147, 148

770 BROOKFIELD PHASE 2
BLOCK C

SNOW STORAGE ZONE

TOTAL SURFACE PARKING 216

ZONING
GM1 F(1.0)

ZONING
GM1 F(1.0)

ZONING
R10

SINGLE FAMILY HOMES

PLAZA

PHASE 2 BUILDING OUTLINE

EASEMENT INSTS. N681413 & N682735

ONE WAY DRIVEWAY ENTRANCE

TWO WAY DRIVEWAY ENTRANCE

LINE OF PROPOSED ROAD WIDENING

CONCRETE SIDEWALK AS PER CITY OF OTTAWA STANDARDS

3m WIDE ASPHALT MUP

EXISTING ROAD CURB

JOB BENCHMARK ELEVATION TOP OF SPINDLE=78.76

EXISTING ROAD / HARD SURFACING FOR EMERGENCY ROUTE

UNDERGROUND STORM STORAGE TANKS

DO NOT ENTER SIGN

NOTE: FIRE ACCESS ROUTE, MIN. OVERHEAD CLEARANCE OF 5m WITH DISTANCE OF 3m-15m AWAY FROM ENTRANCE DOORS

PEDESTRIAN LINK ABOVE (LEVEL 2 LINK)

LINE OF UNDERGROUND PARKING GARAGE PHASE 1

LINE OF PHASE 1 LIMIT

LINE OF UNDERGROUND PARKING GARAGE PHASE 1

GARBAGE PICKUP

GARAGE ACCESS

LOADING

FIRE ROUTE

LEVEL (2-9) ABOVE

EX. 300mmø WATERMAIN

EX. FH

EX. VB

EX. 200mmø WATERMAIN

BUILDING FOOTPRINT (LEVEL 1-3)

BUILDING FOOTPRINT (LEVEL 1-9)

0 5 10 20 m 50 m
GRAPHIC SCALE

1 A1.00 00-Site
SCALE: 1 : 300

K:\1\2018\ 4:03:57 PM

OWNER

ATLANTIS INVESTMENTS INC.

PROJECT MANAGER

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TEL (613) 836-0856 X 231

No.	Date	Revision

It is the responsibility of the appropriate contractor to check and verify all dimensions on site and report all errors and/or omissions to the engineer.

All contractors must comply with all

Do not scale drawings.

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E:mail@hobinarc.com
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HOBIN ARCHITECTURE

PROJECT
770 BROOKFIELD

770 BROOKFIELD, OTTAWA, ON.

DRAWING TITLE
SITE PLAN

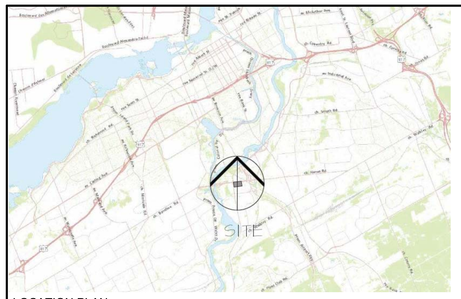
DRAWN	DATE	SCALE
S.H.	10/09/14	1 : 300

PROJECT 1741

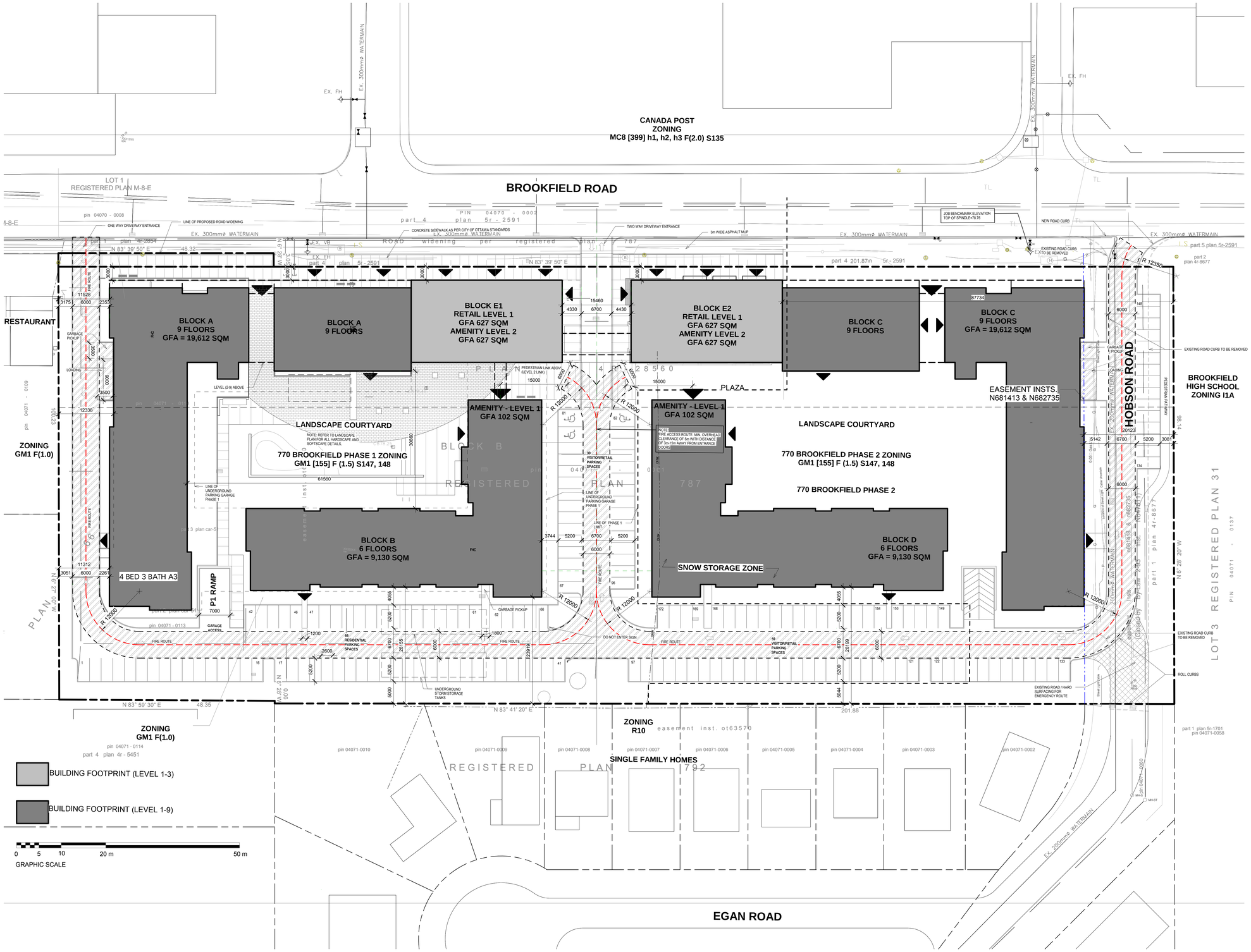
DRAWING NO. A1.00

REVISION NO. 8

ONTARIO ASSOCIATION OF ARCHITECTS
ROBERT J. HOBIN
LICENCE 3049



LOCATION PLAN



SURVEY INFORMATION TAKE FROM:

TOPOGRAPHICAL PLAN OF BLOCKS B AND C
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REGISTERED PLAN 787 AND PART OF LOTS 42 AND 43
REGISTERED PLAN 66
CITY OF OTTAWA

ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

SITE SUMMARY

PROPERTY ADDRESS:	770 BROOKFIELD ROAD	
ZONING:	GM. [155] F(1.5) S147, 148	
SITE AREA (ZONING SCH. 147)	24,655 m2	
SITE AREA (SURVEY)	24,655 m2	
PROPOSED USE:	APARTMENT BUILDING	
BUILDING FOOTPRINT: (ABOVE GRADE)	BLOCK A	= 2,024 m2
	BLOCK B	= 1,575 m2
	BLOCK E1	= 631 m2
	BLOCK E2	= 631 m2
	TOTAL:	= 4,891 m2

ZONING SUMMARY: PROVIDED

RESIDENTIAL UNITS PHASE 1	426 UNITS
RESIDENTIAL UNITS PHASE 2	426 UNITS
TOTAL RESIDENTIAL UNITS PHASE 1+2	852 UNITS
FSI PHASE 1	1.3
FSI PHASE 2	1.8
TOTAL RETAIL AREA PHASE 1	
BLOCK E1	599.76m
BLOCK E2	599.76m2
TOTAL GFA	1,199.52 m2
FSI - BREAKDOWN FROM SPC APPLICATION: SITE AREA = 24,655.00 m2	
FSI PHASE 1	0.89
BLOCK A PHASE 1	14,488.00m2
BLOCK B PHASE 1	6,226.86m2
BLOCK E1 PHASE 1	599.76m2
BLOCK E2 PHASE 1	599.76m2
TOTAL GFA	21,914.38mm
FSI PHASE 2	0.84
BLOCK C PHASE 2	14,488.00m2
BLOCK D PHASE 2	6,226.86m2
TOTAL GFA	20,714.86
PHASE 1 + 2 TOTALS	
TOTAL GFA PHASE 1 + 2	42,629.24m2
TOTAL GFA PHASE 1+2	1.73
	27m

YARDS:

FRONT YARD: BROOKFIELD ROAD	3m MIN.	3m
REAR YARD	7.5m MIN.	20m
INTERIOR SIDE YARD:	3m MIN.	88.3m WEST 12.2m EAST

VEHICULAR PARKING: PROVIDED

RESIDENTIAL PARKING PHASE 1 + 2 TOTALS		
RESIDENTIAL PARKING		336 SPACES
VISITORS PARKING		84 SPACES
RETAIL PARKING		
RETAIL GFA		
BLOCK A	541m2	3
BLOCK E1	626m2	4
BLOCK E2	626m2	4
BLOCK C PHASE 2	541m2	3
TOTAL RETAIL	2,334m2	14 SPACES
TOTAL PARKING		434 SPACES

PARKING DISTRIBUTION

PHASE 1+2 TOTAL PARKING DISTRIBUTION	
UNDERGROUND PARKING LEVELS	
P1 LEVEL PHASE 1	135
P1 LEVEL PHASE 2	127
SURFACE PARKING (*Total % of surface parking 39.6%)	172
TOTATL PARKING PHASE 1+2	434

BICYCLE PARKING

		REQUIRED	PROVIDED
BICYCLE PARKING PHASE 1	MIN. 0.5/UNIT		
426 UNITS	213 SPACES		213 SPACES
RETAIL	1 / 1,500 m2		
	1.2 SPACES		2 SPACES
TOTAL PHASE 1		214.2 SPACES	215 SPACES
BICYCLE PARKING PHASE 2	MIN. 0.5/UNIT		
426 UNITS	213 SPACES		213 SPACES
RETAIL	1 / 1,500 m2		
	1.2 SPACES		2 SPACES
TOTAL PHASE 2		214.2 SPACES	215 SPACES
BICYCLE PARKING PHASE 1+2	MIN. 0.5/UNIT		
852 UNITS	426 SPACES		426 SPACES
RETAIL	1 / 1,500 m2		
	2.4 SPACES		4 SPACES
TOTAL PHASE 1+2		428.4 SPACES	430 SPACES

AMENITY

	REQUIRED	PROVIDED
BLOCK A 193 UNITS	1158 m2 (MIN. 6 m2/UNIT)	1,002 m2
BLOCK B 150 UNITS	900 m2 MIN. 6 m2/UNIT	346 m2 124 m2 (EXT.)
LANDSCAPE COURT YARD		1867 m2
TOTAL	2058 m2	3,339 m2

AREAS

Total: 39,751 m2
Basement - 7605 m2
L1 - 4900 m2
L2 - 5525 m2
L3 - 3825 m2
L4, L5, L6 - 3725 m2 (11175 m2 Total)
L7, L8, L9 2240m2 (6720 m2 total)

OWNER
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NO.	DATE	REVISION

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HOBIN ARCHITECTURE

PROJECT
770 BROOKFIELD

770 BROOKFIELD, OTTAWA, ON.

DRAWING TITLE
SITE PLAN - MASTER

Drawn	DATE	SCALE
Author	10/11/18	1 : 300
		PROJECT # 1743
		DRAWING NO. A1.01

ONTARIO ASSOCIATION OF ARCHITECTS
DAVID J. HOBIN
LICENCE 3049

REVISION NO. 8

1 A1.01 00-Site - Master
SCALE: 1 : 300

6/1/2018 4:03:59 PM

TOPOGRAPHICAL PLAN OF

PART OF BLOCKS B AND C AND PART OF HOBSON ROAD (As Closed) REGISTERED PLAN 787 AND PART OF LOTS 42 AND 43 REGISTERED PLAN 66 CITY OF OTTAWA

Prepared by
ANNIS, O'SULLIVAN, VOLLEBEKK LTD.

NOVEMBER 20, 2003.

This plan was updated with the following revisions:
- November 7th, 2014 to reflect the removal of the two storey building formerly known as No. 770 Brookfield Road along with the area at the front and rear of the former building.
- January 8th, 2015 to show the location of underground locates surveyed December 24th, 2014.
- September 20, 2017, updated overhead wires, fences, pay meters, shed removed.

Scale 1 : 300

12 9 6 3 0 6 12 Metres

Metric

DISTANCES SHOWN ON THIS PLAN ARE IN METRES AND CAN BE CONVERTED TO FEET BY DIVIDING BY 0.3048

Oct 5/17
Date

E. H. Herweyer
Ontario Land Surveyor

Notes & Legend

Symbol		
L	Denotes	LIGHT STANDARD
TL	"	TRAFFIC LIGHT
UP	"	UTILITY POLE
	"	GUY WIRE
	"	BOLLARD
	"	DECIDUOUS TREE
	"	CONIFEROUS TREE
	"	SHRUB
ST	"	MAINTENANCE HOLE (STORM SEWER)
S	"	MAINTENANCE HOLE (SANITARY)
H	"	MAINTENANCE HOLE (HYDRO)
W	"	MAINTENANCE HOLE (WATER)
B	"	MAINTENANCE HOLE (BELL)
T	"	MAINTENANCE HOLE (TRAFFIC)
	"	MAINTENANCE HOLE (UNIDENTIFIED)
W	"	WATER VALVE
G	"	GAS VALVE
	"	CATCH BASIN
	"	FIRE HYDRANT
	"	TRAFFIC SIGN
×65.00	"	LOCATION OF ELEVATIONS
	"	PROPERTY LINE
C/L	"	CENTRELINE
T/L	"	TOP OF LID / GRATE
A/C	"	AIR CONDITIONER
— ST —	"	UNDERGROUND STORM SEWER
— S —	"	UNDERGROUND SANITARY SEWER
— W —	"	UNDERGROUND WATER
— P —	"	UNDERGROUND POWER
— G —	"	UNDERGROUND GAS
— B —	"	UNDERGROUND TELEPHONE

SITE AREA = 24655 sqm.

ELEVATIONS NOTES

1. ELEVATIONS SHOWN HEREON ARE REFERRED TO GEODETIC DATUM
2. IT IS THE RESPONSIBILITY OF THE USER OF THIS INFORMATION TO VERIFY THAT THE JOB BENCHMARK HAS NOT BEEN ALTERED OR DISTURBED AND THAT ITS RELATIVE ELEVATION AND DESCRIPTION AGREES WITH THE INFORMATION SHOWN ON THIS DRAWING.

UTILITY NOTES

1. VISIBLE UTILITIES WERE LOCATED IN THIS SURVEY. THIS DRAWING CANNOT BE ACCEPTED AS ACKNOWLEDGING ALL OF THE UTILITIES AND IT WILL BE THE RESPONSIBILITY OF THE USER TO CONTACT THE RESPECTIVE UTILITY AUTHORITIES FOR CONFIRMATION.
2. UNDERGROUND UTILITIES ARE DERIVED FROM FIELD LOCATES PERFORMED DECEMBER 2014.
3. A FIELD LOCATION OF UNDERGROUND PLANT BY THE PERTINENT UTILITY AUTHORITY IS MANDATORY BEFORE ANY WORK INVOLVING PROBING, EXCAVATING ETC.

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