Functional Servicing Report

Chick-fil-A

Type of Document:
Functional Servicing Report

Project Name:
Chick-fil-A Orleans

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BRM-23002042-H0

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1 Legal Notification

This Report was prepared by EXP Services Inc. for the account of Chick-fil-A.

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2 Introduction

EXP Inc. has been retained by Chick-fil-A to prepare a Functional Servicing Report (FSR) to assess the servicing requirements relating to the proposed development located at 4270 Innes Road in Orleans which is located in Ottawa, Ontario. For additional background information, please refer to **Appendix A**, **EXP Drawing A100**.

This Functional Servicing Report (FSR) identifies and presents the servicing requirements for the proposed project. This FSR includes municipal water, sanitary drainage, and stormwater management (SWM) services, prior to the detailed design being undertaken. The Report will outline the requirements for site servicing for the proposed development and determine the available existing and proposed municipal servicing for discharge of storm and sanitary flows and water servicing.

2.1 Site Description

2.1.1 Existing Site

The property under study is a 0.474 ha site located on the northeast corner of Innes Road and Tenth Line Road in Orleans, Ontario. The parking lot is bound by Innes Road to the north, Swiss Chalet to the east, an existing commercial development to the south, and another commercial area to the west. The existing commercial site located at 4270 Innes Rd, Orleans, directly immediately adjacent to the site is not part of this development.

The current site is a parking lot. See **Figure 1** for an aerial view of the existing site.

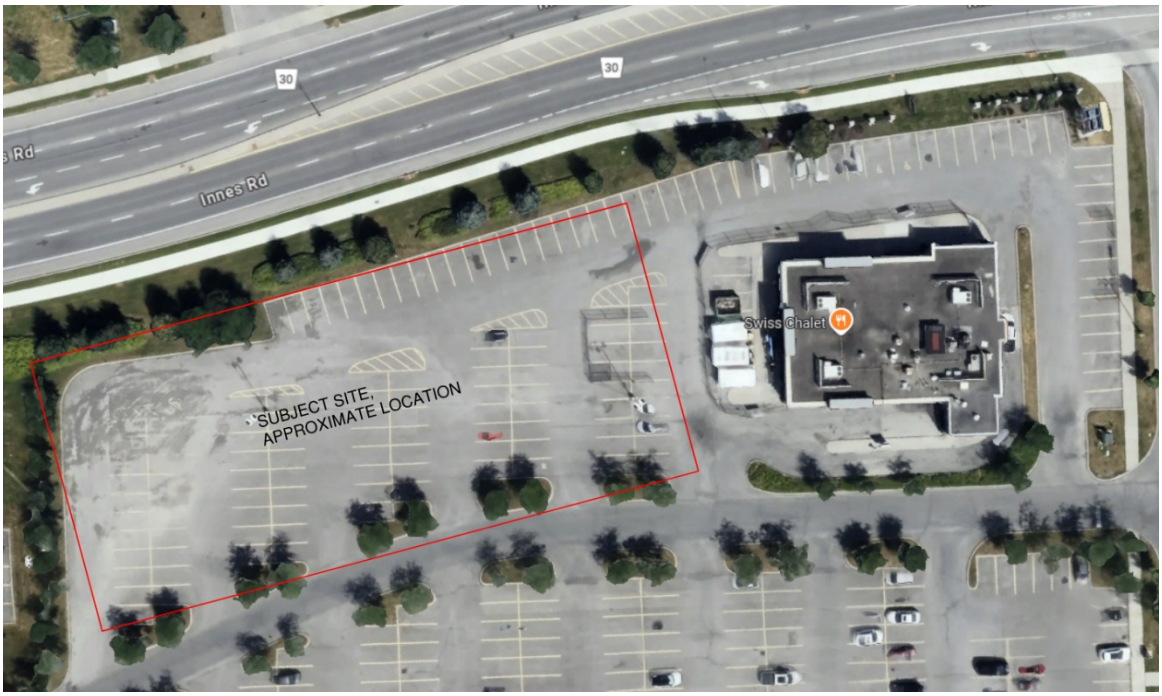

Figure 1: Existing Site

2.1.2 Proposed Site

The project entails the construction of a proposed Chick-fil-A accompanied by the necessary sidewalks, landscape areas, parking lot and drive aisles.

The proposed development involves the construction of a proposed Chick-fil-A at the east corner of the site and will consist of a parking lot, a 461.94 m^2 building, sidewalk, landscape areas, and drive thru. The existing infrastructure on the existing commercial development will be modified to meet the requirements of the new development. The existing services will be utilized in accordance with city comments, which include demonstrating the use of services and capacity within the internal system.

For more detailed information regarding the building and site location, please refer to the **EXP Drawing A100 - Site Plan** provided in **Appendix A**.

2.2 References

The following documents were referred to in the preparation of this report:

- City of Ottawa Sewer Design Guidelines, Second Edition, October 2012
- Comments on 4270 Innes Road, Orleans (Chick-Fil-A) Phase 1/2 Pre-Consultation Submission
- Technical Bulletin PIEDTB-2018-01
- City of Ottawa Water Design Guidelines, Section 4.2.2 of the Water Distribution Guidelines.
- Ontario Building Code or Fire Underwriter Surveys
- Technical Bulletin ISTB-2021-03
- Technical Bulletin ISTB-2018-02, Appendix I Table 1

3 Sanitary Sewer Servicing

3.1 Sanitary Sewer System

The proposed Chick-fil-A site at 4270 Innes Road, Orleans, Ontario will connect to the existing sanitary infrastructure within the existing commercial development. The sanitary sewage flow from the site will be directed to the existing SAN MH09 situated east, of the subject site. The inverts, size and slope of the existing sanitary service is to be confirmed on field by the contractor. The existing sanitary sewers, maintenance holes, as well as the proposed sanitary sewer arrangement for the Chick-fil-A Development are shown on **EXP Drawing PS100 – Site Servicing, EXP Drawing PS101 – Site Servicing and Drawing SS-01 – Servicing Plan by Stantec** within **Appendix B.**

Sanitary sewage outflow from the site is calculated using the current City of Ottawa Sewer Design Guidelines and Technical Bulletin PIEDTB-2018-01 as depicted in **Table 1** below. Sewage flows will be calculated based on use as a commercial site with an average design flow of **0.324 L/sec/ha** (28,000 L/gross ha/day) plus allowances for infiltration. Based on the site area of **0.474** hectares, the sanitary flow equates to **0.39 L/s**.

Table 1: Proposed Sanitary Design Criteria (City of Ottawa Standards)

Avg. Flow Rate	0.324	L/sec/ha
Peak Hourly Factor	1.5	Per Harmon Formula
Total Area	0.474	ha
Infiltration	0.33	L/s/ha

The Dry Weather proposed sanitary flow is depicted in **Table 2** below.

Table 2: Dry Weather Sanitary Flow

Type of Flow	Proposed Flow (L/s)
Average Domestic Flow (L/s)	0.324 L/sec/ha * 0.474 ha = **0.154 L/s**
Peak Domestic Flow (L/s)	0.154 L/s * 1.5 = **0.23 L/s**

The Wet Weather proposed sanitary flow is depicted in **Table 3** below.

Table 3: Wet Weather Sanitary Flow

Type of Flow	Proposed Flow (L/s)
Peak Domestic Flow (L/s)	0.23 L/s
Infiltration Flow (L/s)	0.33 L/sec/ha * 0.474 ha = **0.16 L/s**
TOTAL FLOW (L/s)	**0.39 L/s**

The sanitary sewage flow from the proposed Chick-fil-A site will discharge to the existing Sanitary Maintenance Hole 09 located east of the proposed Chick-fil-A.

3.2 Downstream Considerations

The Asset Management team at the City of Ottawa will analyze the system to ensure there is adequate residual capacity in the receiving and downstream wastewater system to support the proposed flow of **0.39 L/s** for the development. However, it is expected that there will be no negative downstream effects.

3.3 Proposed Sanitary Service

EXP proposes to service the new development with a new 200mm sanitary connection at 1.0% with a control maintenance hole within the site. This setup will include a grease interceptor and venting. The proposed connections to the building will be 150mm at a 1.0% slope. The sanitary service connection to the proposed building, will be designed to the Orleans Standards, as shown on **EXP Drawing PS100 – Site Servicing Plan**.

4 Water Supply and Appurtenances

4.1 Existing Water Supply

According to the survey conducted by JD BARNES on June 12, 2023, there is an existing 200mm watermain located east of the proposed restaurant. The existing watermain is shown on **EXP Drawing PS101 – Site Servicing and Drawing SS-01 – Servicing Plan by Stantec in Appendix B.**

4.2 Proposed Water Demand

The unit rate and peaking factors of water consumption, minimum pipe size and allowable pressure in line were established from the City of Ottawa Water Design Guidelines.

The pressures and volumes must be sufficient for peak hour conditions and under fire conditions as established by the City of Ottawa Standards. New water supply and distribution systems should maintain normal operating pressures between 345 kPa (50 psi) and 552 kPa (80 psi) during maximum daily flow. The maximum sustained operating pressure shall not exceed 552 kPa (81 psi). Minimum residual pressure at any hydrant shall not be less than 140 KPa (20 PSI).

4.2.1.1 Fire Flow

A detailed Fire Flow calculation has been prepared using the recommendation for the Fire Underwriters Survey as per City of Ottawa Technical Bulletin ISTB-2021-03. The fire flow calculation indicates that the recommended fire flow for this proposed development will be **6,000 l/min (100 litres/sec)**.

Calculations for the required domestic and fire flow demand are provided in **Appendix C**.

Currently, there is an existing class AA fire hydrant north of the proposed building for fire fighting purposes. The proposed building is 30 m unobstructed distance to the proposed fire department connection. Fire protection of the proposed building will be via the existing fire hydrant since the building is located within the 45 m range permitted by the Ontario Building Code; therefore, a private fire hydrant is not required. Refer to the **EXP Drawing PS100 – Site Servicing** within **Appendix B** showing the extent of proposed water servicing to be installed. Under proposed conditions, the existing fire hydrant is utilized.

As per City of Ottawa Technical Bulletin ISTB-2018-02, the combined flow of all contributing fire hydrants within 150 meters of the building must meet or exceed the required fire flow. Appendix I of the same bulletin is summarized in **Table 4.**

Table 4: Maximum Flow to be considered from a given hydrant (City of Ottawa, Technical Bulletin ISTB-2018-02)

Class	Distance (m)	Contribution (L/min)
AA	≤ 75	5,700
	> 75 and ≤ 150	3,800

The nearest existing Class AA fire hydrant is within 75 meters of the proposed building and can provide a flow of **5,700 L/min (95 L/s)**. There are three additional municipal Class AA fire hydrants within 150 meters of the proposed building, located within the existing commercial development. Each of these hydrants can individually contribute 3,800 L/min (63.3 L/s), summing up to a total of 11,400 L/min (190 L/s). The combined flow of all four contributing fire hydrants is **17,100 L/min (285 L/s)**, which exceeds the required fire flow of **6,000 L/min (100 L/s)**.

4.2.2 Demand Requirements

It is proposed that the site will be serviced via a new 50mm diameter water service for domestic flow, connected into the existing 200mm watermain located to the east of the existing Swiss Chalet. The proposed water service contains a water valve located at the property line.

Water demands for the proposed development were determined from the City of Ottawa Water Design Guidelines; the design criteria is summarized in **Table 6**.

Table 5: Proposed Water Distribution Design Criteria (City of Ottawa Water Design Guidelines)

Total Area	0.474	ha
Commercial Average Daily Demand	28,000	L/ha/day
Commercial Maximum Daily Demand	1.5 * Average Day	L/gross ha/day
Commercial Maximum Hour Demand	1.8 * Average Day	L/gross ha/day
Chick-fil-A Hours Open Hours	11	Hours

The total water demand for the site is estimated as the maximum daily water demand plus fire, resulting in a total demand of approximately (0.50 l/s + 100 l/s) = **100.50 L/s**. The total water demand was calculated in **Table 6**.

Table 6: Water Demand Calculations

Demand Type	Total Demand (L/s)
Commercial Average Daily Demand	((28,000 L/ha/day * 0.474 ha)/ 11 Hours) = **0.335 L/s**
Commercial Maximum Daily Demand	**0.50 L/s**
Commercial Maximum Hourly Demand	0.60 L/s
Fire Flow (FUS method)	**100 L/s**
Maximum Daily Demand + Fire Flow	**100.50 L/s**

Fire protection of the proposed building will be via the existing fire hydrant at the north of the site since the building is located within the 90 m range of the existing fire hydrant.

Refer to the **EXP Drawing PS100 – Site Servicing Plan** within **Appendix B**. showing the extent of proposed water servicing, to be installed.

4.3 Proposed Connection

As part of the proposed project, we plan to connect the new Chick-fil-A building to the existing water infrastructure. This connection will ensure that the building has access to the necessary water supply for its operations and can utilize the existing infrastructure efficiently.

The City of Ottawa's asset management team provided the boundary conditions for the downstream municipal watermain at the subject property. The peak hourly pressure demands for the proposed Connection 1 at the existing private water main were assigned to the upstream junction at Lanther Drive & Vantage Drive, off the public looped watermains, with a peak hour pressure of 54.5 psi. Refer to **Boundary Conditions 4270 Innes Road** within **Appendix D**. Based on these boundary conditions and the calculated headloss off the private watermain, the headloss calculation indicates a peak hour pressure of 53.04 psi at the building. The minimum requirement for maximum hourly demands is 40 psi. Therefore, there is sufficient pressure to service the proposed development. The calculated head loss calculations for the private water main can be found in **Appendix D**.

5 Stormwater Management

5.1 Pre-Development Hydrology

5.1.1 Existing Drainage

The subject site is currently an existing parking lot. It drains into an on-site catch basin, where the proposed restaurant will be built, and towards the parking lot driveways, leading to existing catch basins located south of the site within the existing commercial development. Refer to **EXP Drawing SWM100 - Pre-Development Drainage Plan within Appendix B**, as well as **Drawing SS-1 – Servicing Plan by Stantec.**

The existing storm sewer that drains this site is a private on site 450mm diameter STM, located south of the proposed site within the existing commercial development. The subject site is part of the Loblaws Properties Limited Innes Road development. According to **Drawing SS-1 – Servicing Plan by Stantec**, the site is designated to drain to the existing 1800mm diameter storm sewer located within the Innes Road Right of Way (RoW).

There is an Inlet Control Device (ICD) downstream at Existing STM MH108, which regulates the flow into the storm sewer system. Additionally, a Stormceptor is installed downstream of Existing STM MH108 to provide quality control for the site. Prior to the existing storm sewer that drains the subject site, there is an 825mm diameter concrete sewer.

The subject site falls within the **Ottawa River Watershed**.

5.1.2 External Drainage

Based on the existing topography, there are no external drainage areas draining to the subject property. Refer to **EXP Drawing SWM100 - Pre-Development Drainage Plan** within **Appendix B**.

5.2 Stormwater Management Analysis

The storm drainage system for the Chick-fil-A site collects water through a series of catch basins, roof drains, and catch basin manholes surrounding the existing building. According to the City of Ottawa requirements, the site must have an accessible storm sewer with a private storm main network internal to the site. As per these requirements, we are utilizing the existing storm infrastructure, and the storm flows from our site are then conveyed via the existing private on-site storm sewer system.

The proposed Chick-fil-A development is situated on what is currently an existing parking lot. Since the area is mostly hard surface in its current state and the proposed development will also be primarily hard surface, there will be no net increase in storm runoff generated by the site. There will be no negative impacts on the overall stormwater management systems. The existing drainage patterns at 4270 Innes Road will be improved to self-contain the site. Additionally, no additional flows will be directed to the existing municipal storm sewer systems beyond what they currently receive from the subject area. Control is provided downstream within the existing development, through an inlet control device at existing STM MH108 ensuring effective stormwater management.

The proposed restaurant development will reduce the total amount of stormwater runoff generated due to newly constructed landscaped areas. Please refer to the Post-Development Drainage plan, **EXP Drawing SWM200**, available in **Appendix B**.

5.3 Allowable Release Rate

The existing private on site 450mm diameter STM located south of our proposed restaurant has been designed to accommodate the stormwater flow from the subject site at a run-off co-efficient of 0.84.

Existing Contributing Drainage Area = 0.41 ha
Runoff Coefficient C = 0.84

Proposed Contributing Drainage Area = 0.43 ha
Runoff Coefficient C = 0.77

Due to grading modifications, a portion of the site that was previously landscaped and drained uncontrolled to the street will now be captured on-site. However, as shown in the storm calculations included in **Appendix E**, the overall flow from the subject site has decreased due to the increased landscape area.

The proposed development must meet the City of Ottawa's drainage standards. According to the City of Ottawa Pre-Con Comments, the minor and major system design requirements must control the 100-year post-development peak flow rate to match the 100-year pre-development peak flow rate, using a runoff coefficient of 0.5 or the existing coefficient, whichever is lower. All drainage must be contained on-site up to and including the stress test event (100-year + 20% event). Given our existing Inlet Control Device (ICD) downstream at Existing STM MH108, as shown in **Drawing SS-1 – Servicing Plan by Stantec**, and the improved site conditions, we expect meet the City of Ottawa requirements.

Since the area is mostly hard surface in its current state and the proposed development will also be primarily hard surface, there will be no net increase in storm runoff generated by the site. The addition of 348 square meters (m^2) of landscaped area ensures that the new development will generate less storm runoff than the existing site. The pervious area will increase from 346 m^2 to 694 m^2 with the proposed development. There will be no negative impacts on the overall stormwater management systems. The existing drainage patterns at 4270 Innes Road will be improved to self-contain the site. Furthermore, no additional flows will be directed to the existing municipal storm sewer systems beyond what they currently receive from the subject area.

The ICD was originally designed for a runoff coefficient of 0.84 for this portion of the overall site. However, we have improved the site conditions, resulting in a reduced runoff coefficient of 0.77. This improvement further ensures compliance with the City of Ottawa's drainage standards.

For a detailed breakdown of the pre- and post-development run-off coefficient, see **Calculation Sheet 1** and **Calculation Sheet 2** in **Appendix E,** as well as **Drawing SS-1 – Servicing Plan by Stantec** within **Appendix B** for the downstream ICD device.

5.4 Stormwater Quantity Management

Since the existing drainage pattern is being improved and post-development flows are controlled to be lower than pre-development flows, it is not anticipated that the proposed development will negatively impact the existing private downstream receiving system. We are utilizing the existing stormwater infrastructure on the site, including the current Inlet Control Device (ICD) and private sewer system, rather than proposing new infrastructure.

Stormwater quantity will be controlled through the existing ICD located at the downstream end of the private sewer system before it releases to the municipal sewers. This approach ensures that post-development flows from the site are managed effectively and controlled to the acceptable allowable release rate for this commercial

development. By leveraging the existing infrastructure, we are maintaining continuity and ensuring compliance with the City of Ottawa's drainage standards. As the proposed site has a lower runoff coefficient than the allocated runoff coefficient, no additional quantity controls are proposed.

5.5 Stormwater Quality Management

The stormwater quality control for the development will adhere to the City of Ottawa's stormwater management criteria:

- *Quality Control – Suspended Solids:*
  a) Provide enhanced level of protection (80%) for suspended soils removal.
  b) Demonstrate ISO 14034 Environmental Technology Verification (ETV) protocol for sizing OGS units.

This target is achieved through the existing stormwater management system, which includes an STC 6000 unit providing quality control. The design of the onsite storm sewer drainage system incorporates this stormwater quality treatment unit to ensure compliance with the City of Ottawa's standards. The proposed development features an increase in roof and landscaped areas, which enhances the overall stormwater quality.

As the proposed site has a lower runoff coefficient than the allocated runoff coefficient, no additional quantity controls are necessary. The increase in pervious areas, from 346 m² to 694 m², further contributes to reducing stormwater runoff. The existing STC 6000 unit will continue to provide effective quality control, ensuring that the stormwater management system meets all required standards.

The Stormceptor sizing considers our drainage area of 0.41 hectares with an initial runoff coefficient of 0.84. However, we have improved the site conditions, reducing the runoff coefficient to 0.77. The Stormceptor is currently installed at the location shown on **Drawing SS-1 – Servicing Plan by Stantec**, downstream of EX. STM MH108.

5.6 Storm Conveyance

Storm drainage for the subject site will be collected by a series catchbasins, roof drains and catchbasin manholes. Storm flows are then conveyed via the proposed storm sewer system to the existing private onsite storm sewer system.

The existing sewer connection is located within the existing parking lot entrance. The proposed grading will improve the existing drainage patterns to self-contain the site. As shown in the site grading and site servicing drawings located in **Appendix B** this site has been designed to integrate both minor and major storm systems. The overall site grading ensures that the existing drainage pattern on adjacent properties has not been altered and stormwater runoff from the subject development has been self-contained.

5.6.1 Minor System: Storm Sewer

The site has been graded to contain the stormwater from the site, and to direct it through a series of catchbasins located throughout the site and roof water leaders on the building. These catchbasins and roof drains flow into an underground storm sewer system (minor system). The underground storm sewer has been designed to accommodate the 5-year peak storm event based on City of Ottawa's Intensity Duration Frequency (IDF) curve with Time of Concentration of (Tc) 10 minutes, using Rational Method. Storm sewer sizing and gradients will maintain a minimum velocity of 0.9 m/sec and maximum 3.0 m/sec. The detailed design of the minor system is provided in **Calculation Sheet 3** in **Appendix E**.

5.6.2 Major System: Overland Flow

In the event of a major storm, defined as storms 100-year post-development peak flow rate leaving the site area to the 100-year pre-development peak flow rate, the outlet control provided in the system in the form of an Inlet Control Device will utilize the available storm sewer infrastructure by allowing the system to back up, thus providing the required storage. Outlet controls in the sewer system are designed to restrict the post-development flows exiting from the system to the 100-year predevelopment allowable release rate. Thus, effectively restricting the flows by detaining the water in the system to release it at an allowable release rate. This will ensure that it will not have any impact on downstream overland flow capacity, and the municipal sewers. The controlled release rates of stormwater are directed to a Stormceptor to ensure that runoff from the site is treated to the City of Ottawa water quality requirements before it is released from the site.

In events larger than the 100-year return storm, the site has been graded to include an overland flow route. This route allows the stormwater to overtop the local highpoints and flow overland and off-site existing commercial development, consistent with the existing overland flow route. The existing overland discharge point is towards Innes Road. The major overland flow routes are shown on **EXP Drawing SWM100**, and **SWM200** in **Appendix B**.

6 Conclusion

Implementation of the design outlined in this report will ensure that the site can be serviced and complies with the requirements of the reviewing authorities and is of acceptable quality both during and after construction. In summary:

- Type of development: Commercial Development
- The total development area is 0.474 ha.
- The site will discharge sanitary flows to the existing SAN MH09 situated east of the proposed restaurant. The proposed Wet Weather Sanitary Flow is 0.39 L/s.
- The proposed sanitary connection is 200mm diameter with slope of 1.0%.
- The average water daily demand is 0.335 L/s
- The maximum water daily demand: 0.50 L/s
- The maximum hourly daily demand: 0.60 L/s
- The required fire flow demand using the FUS Method is 100 L/s
- The combined flow of all four contributing fire hydrants is 285 L/s, which exceeds the required fire flow of 6,000 L/min (100 L/s).
- The total water demand for the site is estimated as the maximum day water demand plus fire, resulting in a total demand of approximately Maximum Daily Demand + Fire Flow= (0.50 l/s + 100 l/s) = 100.50 L/s.
- The maximum hourly daily demand: 0.60 L/s
- The headloss calculation indicates a peak hour pressure of 53.04 psi at the building, exceeding the minimum requirement of 40 psi for maximum hourly demands.
- Quantity Control is not required as we are using the existing Inlet Control Device, and we are discharging to the private on-site storm sewers, while improving existing conditions.
- Runoff quality treatment is considered, with the existing downstream STC 6000.

Appendix A
Site Plan

Appendix B
Engineering Drawings

Appendix C
Fire Flow Calculations

PROJECT NO. : BRM-23002042-H0
PROJECT NAME. : Chick-fil-A Orleans
Date: October, 2024

Calculation Sheet : 1

Fire Underwriters Survey (FUS) Calculations

Required Fire Flow Calculation

F = 220 x C x √A **L/min** *FUS Water Supply for Public Fire Protection, 1999*

F = Required Fire Flow
C = Construction Type Coefficient
A = Total Above-Ground Floor Area (m^2)

1 Estimate of Fire Flow (Baseline)

OBC Occupancy	Commercial
Foot Print	462 m^2
Number of Storeys	1

Level	Area (m^2)
1	461.94

Construction Class

Construction Class	Non Combustible
Coefficient	1.0

Total Area of Building

A=	462 m^2

Fire Flow

F= 220 * 1* √462
F= 4729
F= 5000 **L/min** *rounded to nearest 1000L/min, must be >2000 L/min*

2 Occupancy Charge

Contents	Free Burning
Charge	0.15

O= F * Occupancy Charge
O= 5000*-0.15
O= 750 **L/min** *no rounding*

3 Automatic Sprinkler Reduction

NFPA Sprinkler Standard	No	0%	0%
Standard Water Supply	No	0%	
Fully Supervised System	No	0%	

S= F * Sprinkler Reduction
S= 5000*0%
S= 0 **L/min** *no rounding*

4 Exposure Increase

Direction	Distance (m)	Charge	TOTAL
North	>45	0%	10%
East	29	10%	
South	>45	0%	
West	>45	0%	

max 75%

E= F * Exposure Charge
E= 5000*10%
E= 500 **L/min** *no rounding*

H Adjusted Fire Flow

Fa= F+O+E+S
Fa= 5000+750-0-500
Fa= 6250 L/min
Fa= 6000 **L/min** *rounded to nearest 1000L/min*

REQUIRED FIRE FLOW	**6000**	**L/min**
	100	**L/s**
	1585	**usgm**

Appendix D
Water Boundary Conditions Calculation

CFA Orleans - Private Watermain - PRESSURE LOSS CALCULATION

	Q = REQUIRED FLOW for FIRE PROTECTION (L/S)	Q = REQUIRED FLOW for DOMESTIC DEMAND (L/S)	D = NOMINAL PIPE DIAMETER (m)	L = LENGTH OF WATERMAIN (m)	TYPE	C VALUE	INSIDE DIAMETER (m)	WALL THICKNESS (m)	CROSS SECTIONAL AREA (m2)	V =FLOW VELOCITY (m/s)
Existing Private Watermain	n/a	0.6	0.200	192.0	PVC	110	0.200	0.006	0.031	0.02
Proposed Private Watermain	n/a	0.6	0.050	123.4	PVC	100	0.046	0.003	0.002	0.36

	START TOP OF PIPE ELEV (m)	END TOP OF PIPE ELEV (m)	STATIC HEAD (m)
Existing Private Watermain	85.70	85.63	0.07
Proposed Private Watermain	85.63	85.60	0.03

	MINOR HEAD LOSSES					
	200 mm PVC			50mm PVC		
	Existing Private Watermain			Proposed Private Watermain		
	Number	K	Sub Total K	Number	K	Sub Total K
Inlet Anti Vortex Plate		1.00	0.00		1.00	0.00
Pipe Contraction		0.25	0.00		0.25	0.00
Pipe Expansion		0.25	0.00		0.25	0.00
Strainer/Reducer		0.50	0.00		0.50	0.00
Standard 90d Bend	1	0.90	0.90	3	0.90	2.70
Standard 45d Bend		0.45	0.00		0.45	0.00
Standard 22.5d Bend		0.23	0.00		0.23	0.00
Standard 11.25d Bend		0.10	0.00	1	0.10	0.10
Long Radius Bend, 45d / 90d		0.50	0.00		0.50	0.00
Tee - flow through run		0.60	0.00		0.60	0.00
Tee - flow through branch	1	1.80	1.80		1.80	0.00
Gate Valve	1	0.40	0.40		0.40	0.00
300mm to 400mm Pipe Expansion		0.20	0.00		0.20	0.00
Backflow Preventor		1.20	0.00	1	1.20	1.20
Meter		5.00	0.00	1	5.00	5.00
Drain Valve	1	0.40	0.40		0.40	0.00
Check Valve		4.00	0.00		4.00	0.00
Pipe Exit		1.00	0.00		1.00	0.00
K TOTALS			3.50			9.00

	H = STATIC HEAD = HIGHEST SYSTEM ELEV - PIPE CONNECTION ELEV (m)	HL1 = FITTINGS FRICTION HEAD LOSS = (K TOTAL) (V)**2/2G (m)		HL2 = PIPE WALL FRICTION HEAD LOSS = 6.78 (L)/(D)**1.1655 *(V/C)**1.85 (m)		HL3 = VELOCITY HEAD = (V)**2 / 2G (m)		H TOTAL = TOTAL DYNAMIC HEAD = H + HL1 + HL2 + HL3 (m)		SYSTEM PRESSURE LOSS (Kpa)	SYSTEM PRESSURE LOSS (psi)
Existing Private Watermain	0.07	0.000	n/a	0.00	n/a	0.00	n/a	0.07	n/a	0.70	0.10
Proposed Private Watermain	0.03	0.000	n/a	0.92	n/a	0.01	n/a	0.95	n/a	9.36	1.36

Provided Pressure at Connection 1 54.50 psi

Proposed Pressure at the Building 53.04 psi

Appendix E
Storm Water Management Calculation

PROJECT NO. :BRM-23002042-H0
PROJECT NAME. : Proposed Chick fil A, 4270 Innes Road in Orleans, Ottawa, Ontario
Date: January 2025

CALCULATION Sheet :1

Pre Development Site Hydrology

Drawing No. DP1

Land Type	Area, A		C	Total Area	A x C	Weighted C
	(m2)	(ha)		(ha)		
Hardsurface	3733.8	0.373	0.90	0.408	0.3	0.84
Landscape	345.84	0.035	0.20		0.007	

Total Area	0.41	ha
Weighted Runoff Coefficient, C	0.84	

Run off Calculation (using Modified Rational Method):

Q = C_i * C * i * A / 360 cms

C = Runoff Coefficient
i = Rainfall intensity (mm/hr) [City of Ottawa IDF]
A = Watershed area (ha)

Time of Concentration, T_c	10.00	min

IDF Eqn : $i = A / (B + T)^{C}$

A, B & C Parameter for IDF Curve

Year	A =	B =	C =
2	732.951	6.20	0.81
5	998.071	6.05	0.814
10	1174.184	6.01	0.816
25	1402.884	6.02	0.819
50	1569.58	6.01	0.82
100	1735.688	6.01	0.82

Pre Development Peak Flows:

YEAR	Rainfall	Intensity Peaking	Flows	
	mm/hr	Factor, C_i	m3/sec	L/Sec
2	76.81	1.00	0.073	73.17
5	104.19	1.00	0.099	99.26
10	122.14	1.00	0.116	116.36
25	144.69	1.00	0.138	137.84
50	161.47	1.00	0.154	153.83
100	178.56	1.00	0.170	170.11

PROJECT NO. :BRM-23002042-H0
PROJECT NAME. : Proposed Chick fil A, 4270 Innes Road in Orleans, Ottawa, Ontario
Date: January 2025

CALCULATION Sheet : 2

Peak Flow Calculations

Refer to SWM200 for Catchment ID

Catchment ID	Land Use	Area, A (ha)	Runoff Coeff C	Total Area (ha)	A x C	Weighted C	Notes
201	Impervious	0.046	0.90	0.046	0.042	0.90	Proposed Development Area-Considered in analysis
	Pervious	0.000	0.20		0.000		
202	Impervious	0.084	0.90	0.094	0.075	0.82	Proposed Development Area-Considered in analysis
	Pervious	0.010	0.20		0.002		
203	Impervious	0.002	0.90	0.021	0.002	0.27	Proposed Development Area-Considered in analysis
	Pervious	0.019	0.20		0.004		
204	Impervious	0.031	0.90	0.031	0.028	0.90	Proposed Development Area-Considered in analysis
	Pervious	0.000	0.20		0.000		
205	Impervious	0.056	0.90	0.088	0.050	0.64	Proposed Development Area-Considered in analysis
	Pervious	0.032	0.20		0.006		
206	Impervious	0.098	0.90	0.114	0.088	0.80	Proposed Development Area-Considered in analysis
	Pervious	0.016	0.20		0.003		
207	Impervious	0.034	0.90	0.034	0.031	0.90	Proposed Development Area-Considered in analysis
	Pervious	0.000	0.20		0.000		

Storm Peak Flow Controlled Area:

Total Area (Catchment 201-206)	0.43	ha
Weighted Runoff Coefficient, C	0.77	

Run off Calculation (using Modified Rational Method):

$Q = C_i * C * i * A / 360$ cms

C = Runoff Coefficient
i = Rainfall intensity (mm/hr.) [City of Ottawa IDF]
A = Watershed area (ha)

Time of concentration, T_c	10.00	min

IDF Eqn : $i = A / (B + T)^C$

A, B & C parameter for IDF Curve

Year	A =	B =	C =
2	732.95	6.20	0.81
5	998.071	6.05	0.814
10	1174.184	6.01	0.816
25	1402.884	6.02	0.819
50	1569.58	6.01	0.82
100	1735.688	6.01	0.82

Storm Peak Flow Controlled Site Areas:

YEAR	Rainfall	Intensity Peaking	Flows	
	mm/hr.	Factor, C_i	m3/sec	L/sec
2	76.81	1.00	0.071	70.87
5	104.19	1.00	0.096	96.14
10	122.14	1.00	0.113	112.71
25	144.69	1.00	0.134	133.51
50	161.47	1.00	0.149	149.00
100	178.56	1.00	0.165	164.76

PROJECT NO. :BRM-23002042-H0

PROJECT NAME. : Proposed Chick fil A, 4270 Innes Road in Orleans, Ottawa, Ontario

Date: January 2025

Q=0.0028*C*I*A (cms)
C : RUNOFF COEFFICIENT
I : RAINFALL INTENSITY
I=A / (t + B) ^ C
A : AREA (ha)

Minimum Velocity 0.90 m/sec
Max Velocity 3.00 m/sec
Mannings Coefficient 0.013

[City of Ottawa IDF]
For Yr: A = 998.071
B = 1174.184
C = 0.814

CALCULATION Sheet :3

Prepared by: Khadija Jawwad
Checked by: Kate Logan, P.Eng.
Last Revised: 1/15/2025

Sub Catchment ID	MAINTENANCE HOLE FROM	MAINTENANCE HOLE TO	LENGTH (m)	INCREMENT C	INCREMENT A	INCREMENT CA	TOTAL CA	FLOW TIME (min) TO	FLOW TIME (min) IN	I -year (mm/h)	TOTAL Q (cms)	S (%)	D (mm)	Q FULL (cms)	V FULL (m/s)	Sec. Time (min)	Accum. Time (min)	Perc. Capacity (%)	**Storage (m3)**
Area - 205	PROP CB01	EX. CBMH105B	9.70	0.64	0.088	0.06	0.06	10.00	0.15	3.14	0.001	1.00	**200**	0.0328	1.04	0.15	10.15	2%	0.30
Area - 207	PROP. CB02	PROP. MH02	28.44	0.90	0.034	0.03	0.03	10.00	0.45	3.14	0.000	1.00	**200**	0.03	1.04	0.45	10.45	1%	0.89
Area - 201	Building	PROP. MH02	9.74	0.90	0.046	0.04	0.07	10.00	0.11	3.14	0.001	2.00	**200**	0.05	1.48	0.11	10.11	1%	0.31
	PROP. MH02	EX. CBMH105A	21.30	0.00	0.000	0.00	0.07	10.45	0.43	3.14	0.001	0.64	**200**	0.03	0.84	0.43	10.88	2%	0.67
Area - 202	PROP. CB04	PROP. CBMH03	24.80	0.82	0.094	0.08	0.08	10.00	0.40	3.14	0.001	1.00	**200**	0.03	1.04	0.40	10.40	2%	0.78
Area - 203	PROP. CBMH03	PROP. CBMH02	37.00	0.27	0.021	0.01	0.08	10.40	0.84	3.14	0.001	0.50	**200**	0.02	0.74	0.84	11.23	3%	1.16
Area - 204	PROP. CBMH02	PROP. CBMH05	18.10	0.90	0.031	0.03	0.11	11.23	0.41	3.14	0.001	0.50	**200**	0.02	0.74	0.41	11.64	4%	0.57
Area - 206	PROP. CBMH05	EX. CBMH105A	34.20	0.80	0.114	0.09	0.20	11.64	0.59	3.14	0.002	0.50	**300**	0.07	0.97	0.59	12.23	3%	2.42

7.10