Servicing and Stormwater Management Report: The Landing on Main (1364-1370 Stittsville Main Street)

Stantec Project No. 160401727

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Table of Contents

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

1.0 INTRODUCTION

Stantec Consulting Ltd. has been commissioned by Bayview Stittsville Inc. to prepare the following servicing and stormwater management (SWM) report in support of a site plan control application for the development of a new four (4) storey Mixed Use building, surrounding site works, and parking areas located within the properties known municipally as 1364, 1368, and 1370 Stittsville Main Street. The properties are located along Stittsville Main Street in the City of Ottawa and have been unoccupied by residential dwellings since approximately 2016.

The subject property is approximately 0.51 ha in area containing no existing structures and consisting primarily of grassed areas and trees. The architect (Mataj Architects Inc.) has prepared a proposed site plan to support the site plan control application (see **Appendix B**). The site plan proposes 71 units, a total of 87 surface parking spaces, and commercial space on the ground level. The new building will be serviced via the existing municipal water, stormwater and wastewater mains on Stittsville Main Street.

Figure 1 : Key Plan

1.1 OBJECTIVE

This servicing and stormwater management report has been prepared to demonstrate that the existing municipal infrastructure servicing the project site is sufficient to meet the servicing requirements of the development while adopting the most suitable stormwater management approach that complies with the City of Ottawa guidelines and applicable environmental laws required for the site plan control application.

Criteria and constraints provided by the City of Ottawa in previous consultations as well as existing site conditions have been used as a basis for the design and the preparation of this report. Specific elements and potential development constraints to be addressed are as follows:

- **Potable Water Servicing**
    - Estimate water demands for the proposed redevelopment which will be serviced by an existing 406 mm diameter ductile iron watermain fronting the site along Stittsville Main Street.
    - Watermain servicing for the development is to provide average day, maximum day and peak hour demands (i.e., non-emergency conditions) at pressures within the acceptable range of 50 to 80 psi (345 to 552 kPa).
    - Under fire flow (emergency) conditions with maximum day demands, the water distribution system is to maintain a minimum pressure greater than 20 psi (140 kPa).
- **Wastewater Servicing**
    - Estimate wastewater flows contributed by the development and demonstrate that the new building can be adequately serviced by the existing 300 mm diameter PVC sanitary sewer on Stittsville Main Street.
- **Stormwater Management and Servicing**
    - Determine the stormwater management storage requirements to meet the allowable release rate.
    - To establish that the predevelopment impervious ratio for the site is not being increased and therefore existing stormwater management is not impacted by the development.
    - Post-development 100-year peak flows controlled to the pre-development 5-year release rate with a runoff coefficient of C=0.35 and concentration time of 10 mins.
- Prepare a grading plan in accordance with the proposed site plan and existing grades.

Drawing SSP-1 in **Appendix F** shows the general arrangement and details of the proposed services on the site.

2.0 REFERENCES

Documents referenced in preparation of this Servicing and stormwater management report for 1364-1370 Stittsville Main Street include:

- Geotechnical Investigation – Proposed Seniors' Residence – 1364, 1368, and 1370 Stittsville Main Street, Ottawa, ON, Houle Chevrier Engineering, May 25, 2015.
- Subsurface Investigation Report (53-BSI-R1) – 1364, 1368 and 1370 Stittsville Main St., Ottawa, ON, K2S 1V4, Yuri Mendez Engineering, June 20, 2022.
- City of Ottawa Sewer Design Guidelines, 2nd Edition, City of Ottawa, October 2012.
- City of Ottawa Design Guidelines – Water Distribution, 1st Edition, Infrastructure Services Department, City of Ottawa, July 2010.
- Technical Bulletin ISDTB-2014-02 Revision to Ottawa Design Guidelines – Water, City of Ottawa, May 2014.
- Technical Bulletin PIEDTB-2016-01 Revisions to Ottawa Design Guidelines – Sewer, City of Ottawa, September 2016.
- Technical Bulletin ISTB-2018-01 Revision to Ottawa Design Guidelines – Sewer, City of Ottawa, March 2018.
- Technical Bulletin ISTB-2018-02 Revision to Ottawa Design Guidelines – Water Distribution, City of Ottawa, March 2018.
- Technical Bulletin ISTB-2021-03 Revision to Ottawa Design Guidelines – Water Distribution, City of Ottawa, August 2021.

3.0 POTABLE WATER SERVICING

3.1 BACKGROUND

The subject site is located within the City of Ottawa's 3W pressure zone. The site will be serviced by a proposed connection to the 406 mm diameter DI watermain fronting the site on Stittsville Main Street. There are also existing hydrants within proximity of the subject site including a hydrant adjacent to the site fronting Holy Spirit Catholic School, and on the southwest corner of the Beverly Street-Stittsville Main Street intersection. It is anticipated that potable water demand and emergency fire flow requirements for the site will be met by the existing infrastructure.

3.2 WATER DEMANDS

3.2.1 Domestic Water Demands

Water demands were calculated using the City of Ottawa Water Distribution Guidelines (2010) to determine the typical operating pressures to be expected at the building (see detailed calculations in **Appendix A.1**). A demand rate of 280 L/cap/day was applied for the population of the proposed site per technical bulletin ISTB 2021-03. The average daily (AVDY) residential demand was estimated with population densities as per City of Ottawa Guidelines; density of 1.4 persons per one-bedroom apartment and 2.1 persons per two-bedroom apartment.

A demand of 28,000 L/ha/day was applied to the 458 m^2 communal amenity space. Maximum day (MXDY) demands were determined by multiplying the AVDY demands by a factor of 2.5 for residential areas and by a factor of 1.5 for amenity areas. Peak hourly (PKHR) demands were determined by multiplying the MXDY demands by a factor of 2.2 for residential areas and by a factor of 1.8 for amenity areas. The estimated demands are summarized in **Table 3.1** below.

Table 3.1: Estimated Water Demands

Demand Type	Population	Area (m^2)	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
Residential	132	-	0.43	1.07	2.35
Amenity Space	-	458	0.01	0.02	0.04
Total Site:	132	-	**0.44**	**1.09**	**2.39**

Based on these results, it is expected that only one private water service connection to the building will be required which will adequately provide potable water supply to the development.

3.2.2 Fire Flow Demands

Fire flow requirements were estimated using the Office of the Fire Marshal (OFM) Guideline (1999) which provides guidance in evaluating fire protection water supply in additions to existing buildings in line with part 3 of the Ontario Building Code (OBC). Office of the Fire Marshal (OFM) methodology is based on the building construction type, building classification according to OBC, water supply coefficient, total building volume, property line exposure distances, and availability of a fire safety plan.

$$\mathbf{Q = KVS_{tot}}$$

Q =	Volume of water required (L)
V =	Total building volume (m^3)
K =	Water supply coefficient from Table 1
$\mathbf{S_{tot}}$ **=**	Total of spatial coefficient values from property line exposures on all sides as obtained from the formula $S_{tot} = 1.0 + [S_{side1} + S_{side2} + S_{side3} + S_{side4}]$

As provided by the architect, it was assumed that the building is sprinklered and of Group C occupancy constructed with combustible materials without fire resistance ratings. The proposed connection is shown in **Drawing SSP-1** in **Appendix F**. The OBC/OFM calculations for the building are included in **Appendix A.2**. The initial boundary conditions request to the City was based on a fire flow demand of 9,000 L/min (150 L/s), the highest demand specified under OBC requirements.

Alternatively, as requested by City of Ottawa staff, fire flow requirements were also estimated using Fire Underwriters Survey (FUS) and determined to be approximately 24,000 L/min (400.0 L/s). The FUS estimate is based on a building of wood frame construction. Additionally, it is anticipated that the building will be sprinklered, with final sprinkler design to conform to the NFPA 13 standards. Detailed fire flow calculations per the FUS methodology are provided in **Appendix A.2**. Further consultation with the City of Ottawa will be required to determine a reasonable fire flow requirement for the proposed development given the large discrepancies between methodologies and the differences of interpretation in the guidelines. Correspondence with the City has been provided in **Appendix A.3**.

3.2.3 Boundary Conditions

Boundary condition was provided by the City of Ottawa. During the maximum day demand with fire flow of 24,000 L/min, the resulting head is 149.6 m, equivalent to 45.4 psi at water main system near the junction point at a fire hydrant in front of the future building. The boundary condition has been used in a water distribution model to determine the residual pressure on Stittsville Main Street.

3.2.4 Hydrant Test

Fire hydrant testing in the field has been conducted on the hydrant and the results are shown in **Table 3.3**. Hydrant Flow test data has been provided in **Appendix A.4**.

Table 3.3: Fire Hydrant Testing Result

Pressure (psi)	Flow (GPM)	Flow (L/s)
56	0	0
53	919	57.98
51	1193	71.86

The equation for determining available fire flow at 20 psi based on hydrant flow results is:

$$Q_R = Q_F \times (h_r \div h_f)^{0.54}$$

where:

Q_R = Flow predicted at the desired residual pressure, gpm

Q_F = Total flow measured during the test, gpm

h_r = Pressure drop to the desired residual pressure, psi

h_f = Pressure drop measured during the test, psi

The resulting available flow at the hydrant at 20 psi is 2,479.8 GPM or 9,398.5 LPM (156.6 L/s).

3.2.5 Multi-Hydrant Water Network Analysis

A water distribution system model was built by EPANET2 module in PCSWMM and was used to analyze that the water main system can provide water demands and meeting minimum pressure requirement. The servicing pipe will be sized at 150 mm in diameter connecting the existing 406 mm water main in front of the building on Stittsville Main Street. The model includes three fire hydrants along the street, all within 105 m of the site. The closest one is in front of the site on the other side of the street. The distances between the site and the fire hydrants are shown in **Table 3.2**. As discussed, the new building will be equipped with sprinkler system, and it is estimated that the sprinkler system will draw 3,218 L/min water flow during a fire event. The net total fire flow demand at the fire hydrants will be down to 20,782 L/min and it will be split equally to the three fire hydrants at 6,928 L/min.

Table 3.2: Distribution Fire Flow Demand into Model

Location	Distance to Building (m)	Fire Flow Demand (L/min)	Fire Flow Demand (L/s)
Northwest Fire Hydrant	104.5	6,927.5	115.46
Front Fire Hydrant	28.2	6,927.5	115.46
Southeast Fire Hydrant	69.4	6,927.5	115.46
On-Site Sprinkler System	Local	3,217.6	53.63
Total		**24,000.0**	**400.00**

The model was tested by putting maximum daily demand and sprinkler system demand at the site and the net fire flow equally split to the three fire hydrants. The minimum required pressure is 14 m of head

(equivalent to 20 psi) in the entire system. The model result indicates the minimum pressure point occurs at the southeast fire hydrant with 15.86 m of head (22.55 psi). Therefore, the system can provide sufficient fire flow while maintaining the minimum pressure. Minor loss coefficients have also been added throughout the model to account for hydraulic losses. Model results can be found in **Appendix A.5**.

It can be seen that pressure levels are maintained and that the available flow at 2- psi measure in the field (156.6 L/s) is higher than what is required by the model at each hydrant (115.5 L/s).

4.0 WASTEWATER SERVICING

4.1 BACKGROUND

An existing 300 mm diameter PVC sanitary sewer fronts the site on Stittsville Main Street. This sanitary sewer collects wastewater from the existing buildings along Stittsville Main Street. The new development will be serviced via a new 200 mm dia. sanitary service internal to the property before reaching the ultimate 300 mm PVC sanitary outlet with a connection at the existing sanitary manhole fronting the site (Ex. SAN MH290). **Drawing SSP-1** in **Appendix F** shows the proposed wastewater service connection for the site.

4.2 DESIGN CRITERIA

As outlined in the City of Ottawa Sewer Design Guidelines and the MECP's Design Guidelines for Sewage Works, the following criteria were used to calculate estimated wastewater flow rates and to size the sanitary sewers:

- Minimum Velocity – 0.6 m/s (0.8 m/s for upstream sections)
- Maximum Velocity – 3.0 m/s
- Manning roughness coefficient for all smooth wall pipes – 0.013
- Minimum size – 200mm dia. for residential areas
- Average Wastewater Generation – 280L/cap/day
- Maximum Peak Factor – 4.0 (Harmon's)
- Extraneous Flow Allowance – 0.33 l/s/ha (conservative value)
- Manhole Spacing – 120 m
- Minimum Cover – 2.5m

4.3 PROPOSED SERVICING

The proposed site will be serviced by gravity sewers which will direct the wastewater flows (approx. 1.7 L/s with allowance for infiltration) to the proposed 300 mm diameter sanitary sewer on Stittsville Main Street. The proposed drainage pattern is detailed on **Drawing SSP-1**. A sanitary sewer design sheet for the proposed service lateral is included in **Appendix C.2.** A backwater valve is to be installed on the proposed sanitary service within the site to prevent any surcharge from the downstream sanitary sewer from impacting the proposed property.

5.0 STORMWATER MANAGEMENT

5.1 OBJECTIVES

The goal of this stormwater servicing and stormwater management (SWM) plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed development, to meet the criteria established during the consultation process with City of Ottawa and Mississippi Valley Conservation Authority (MVCA), and to provide sufficient details required for approval and construction.

Drawing SD-1 shows the drainage condition of the existing site. The majority of the site has a sloping tendency toward the south, while the portion of the site fronting Stittsville Main Street drains toward the street and east. Existing buildings have been demolished.

5.2 SWM CRITERIA AND CONSTRAINTS

Criteria were established by combining current design practices outlined by the City of Ottawa Design Guidelines (2012), and through consultation with City of Ottawa staff. The following summarizes the criteria, with the source of each criterion indicated in brackets:

General

- Use of the dual drainage principle (City of Ottawa).
- Wherever feasible and practical, site-level measures should be used to reduce and control the volume and rate of runoff (City of Ottawa)
- Assess impact of 100-year event outlined in the City of Ottawa Sewer Design Guidelines on major & minor drainage system (City of Ottawa)

Storm Sewer & Inlet Controls

- Size storm sewers to convey 5-year storm event under free-flow conditions using City of Ottawa I-D-F parameters (City of Ottawa).
- Proposed site to discharge to the existing 600mm diameter storm sewer within the Stittsville Main Street at the northern boundary of the subject site (City of Ottawa).
- All stormwater runoff from the site up to and including the 100-year storm event to be stored on site and released into the minor system at a maximum discharge equivalent to the 5-year storm predevelopment release rate to Stittsville Main Street at a maximum runoff coefficient of 0.5.
- 100-year Storm HGL to be a minimum of 0.30 m below building foundation footing (City of Ottawa).
- 80% TSS removal for the site for water quality control
- Storage to accommodate infiltration capture to allow total infiltration of 262 mm per year

Surface Storage & Overland Flow

- Building openings to be a minimum of 0.30m above the 100-year water level (City of Ottawa)
- Maximum depth of flow under either static or dynamic conditions shall be less than 0.30m (City of Ottawa)
- Provide adequate emergency overflow conveyance off-site (City of Ottawa)

Other criteria considered in the SWM design are described in Section 5 of the Ottawa Sewer Design Guidelines (October 2012) including all subsequent technical bulletins.

5.3 STORMWATER MANAGEMENT DESIGN

The intent of the stormwater management plan presented herein is to mitigate any negative impact that the proposed development will have on the existing storm sewer infrastructure, while providing adequate capacity to service the proposed buildings, parking and access areas. The proposed stormwater management plan is designed to detain runoff on site and within subsurface storage to ensure that peak flows after construction will not exceed the allowable site release rate detailed below.

The Modified Rational Method was employed to assess the rate and volume of runoff generated during post-development conditions. The site was subdivided into subcatchments (subareas) tributary to stormwater controls as defined by the location of inlet control devices. A summary of subcatchment areas and runoff coefficients is provided in **Appendix C** and **Drawing SD-2** indicates the stormwater management subcatchments.

5.3.1 Allowable Release Rate

Based on consultation with City of Ottawa staff, post-development allowable peak flows, up to the 100-year event, are to be controlled to the pre-development 5-year peak flow levels. Excess stormwater is to be restricted on-site using control measures. The selection of runoff coefficient is the smaller of 0.5 and the value representing the pre-development condition. The existing site condition is vacant with a runoff coefficient of 0.2. A runoff coefficient of 0.35 was used for the site based on the impervious areas that existed on the properties prior to the demolition of the on-site dwellings. Additionally, a time of concentration for the development area was calculated using Kirpich's equation and was found to be less than the minimum time of concentration of 10 minutes. Therefore, a time of concentration of 10 minutes was used as per the City's requirements provided during pre-consultation.

The development target release rate for the site area has been determined using the rational method based on the criteria above. Peak flow rates have been calculated using the rational method as follows:

$$Q = 2.78\,(C)(I)(A)$$

Where:

$Q = peak\ flow\ rate, L/s$

$C = site\ runoff\ coefficient$

$I = rainfall\ intensity, mm/hr\ (per\ City\ of\ Ottawa\ IDF\ curves)$
$A = drainage\ area, ha$

$$5 - year\ Intensity\ (mm/hr) = \frac{998.071}{(10 + 6.053)^{0.814}} = 104.19\ mm/hr$$

$$Q = 2.78(0.35)(104.19 mm/hr)(0.51\ ha) = \mathbf{51.7\ L/s}$$

Therefore, the post-development peak flows up to the 100-year storm event must be controlled to **51.7 L/s**.

Table 5.1: Target Release Rate

Design Storm	Target Flow Rate (L/s)
5-Year Event (Pre-development Conditions)	51.7

5.3.2 Site Storage Requirements

To meet the restrictive stormwater release criteria for the proposed development, rooftop storage will be used to promote stormwater detention on building roof tops and reduce the peak outflow from the site. Additionally, a stormwater cistern is proposed in conjunction with ICDs within selected upstream catchbasins to control flows and promote surface ponding for the applicable storm events (5-year to 100-year events). The proposed ICD schedule, ponding areas, and underground storage tank details are specified in **Drawing SD-2**.

A PC-SWMM model was built to model the proposed storm sewers and it is used to estimate the required inlet control sizing and roof/subsurface storage configuration.

5.3.2.1 Rooftop Storage

It is proposed to control stormwater on the building rooftops by installing restricted flow roof drains. The MRM analysis assumes that both roofs will be equipped with standard Watts Model R1100 Accuflow Roof Drains.

Watts Drainage “Accutrol” roof drain weir data has been used to calculate a practical roof release rate and detention storage volume for the rooftops. It should be noted that the “Accutrol” weir has been used as an example only, and that other products may be specified for use, provided that the total roof drain release rate is restricted to match the maximum rate of release indicated in **Table 5.2**, and that sufficient roof storage is provided to meet (or exceed) the resulting volume of detained stormwater. Proposed drain release rates have been calculated based on the Accutrol weir setting at various opening sizes. Calculation Tables has been provided in Appendix D. Storage volume and controlled release rate are summarized in **Table 5.2:**

Table 5.2: Roof Control Area

Area ID	Design Storm	Roof Drain	Depth (mm)	Discharge (L/s)	Volume Stored (m^3)	Drawdown Time (hr)
R101A	5-Year	3-Notch 75% Open & 3-Notch Fully Open	119	8.38	36	3.8
	100-Year		150	10.41	72	4.8
R101B	5-Year	1-Notch 25% Open	104	0.80	1	3.0
	100-Year		137	0.90	3	3.1
R101C	5-Year	1-Notch 25% Open	103	0.79	1	3.0
	100-Year		136	0.90	3	3.1
R101D	5-Year	1-Notch Closed	56	0.32	0	0.2
	100-Year		104	0.32	0.19	0.5

The total roof area of the proposed building is approx. 2,000 m^2 with 80% (1,600 m^2) of the roof area assumed to be available for storage, the roof area imperviousness ratio of 0.99 was used to calculate the runoff coeeficent for the roof area as C = 0.90. The roof area drains are specified as shown in **Table 5.2**, and have been designed to optimize the maximum allowable ponding depth of 0.15m as per the Ontario Building Code. Drain drawdown times for the 100-year storm event are also shown in **Table 5.2.**

5.3.2.2 Surface Storage

Surface storage over catchbasins will be utilized during storm events to help adequately control flows and achieve the target allowable release rate for the proposed development. It is proposed that inlet control devices (ICDs) be installed within specified catchbasins to promote ponding in designated areas. Ponding areas and the ICD schedule are specified in **Drawing SD-2** and **Table 5.3** outlines the surface storage potential within specified subcatchments. This design has ensured that no surface ponding will occur during the 2-year storm event.

Table 5.3: 5-Year and 100-Year Surface Storage Requirements

CB ID	Design Storm	ICD Type	Controlled Release (L/s)	Volume Available (m^3)	Volume Stored (m^3)
CB 102B	5-Year	83 mm Orifice	16.68	13.4	1
	100-Year		17.16	13.4	7
CB 102D	5-Year	90 mm Orifice	9.46	0.9	0.25
	100-Year		17.34	0.9	0.73
CB 103A	5-Year	Vortex LMF 80	6.67	16.1	1
	100-Year		6.78	16.1	6
CB 103B	5-Year	Vortex LMF 80	7.19	17.7	2
	100-Year		7.28	17.7	8

The total available volume for surface storage within the site is approximately 48 m^3. In the 5-year storm event, 5 m^3 of water will be stored above the catchbasins on the surface within the parking area, and in the 100-year storm event 22 m^3 of restricted flow will be stored above the catchbasins. Additionally, an ICD Vortex LMF 45 has been implemented in CB 102C in order to protect the stormwater system in the 100-year event from large flows although none are expected based on grading.

5.3.2.3 Subsurface Storage

An underground stormwater tank is proposed to store run-off from within the site area via a series of catchbasins, which will control and direct flows to the underground storage tank. The underground storage will accommodate both active stormwater storage and infiltration stormwater storage (discussed in **section 5.3.5**). Preliminary sizing has been provided for the infiltration storage however it is ultimately dependent on infiltration field testing which will be completed in the future (see **section 5.3.5** for more information).

An estimated active storage volume of 79 m^3 is proposed to attenuate peak flows from these areas for release at a controlled flow rate from the tank of 9.89 L/s and 16.46 L/s in the 5-Year and 100-Year events, respectively. The proposed stormwater tank would be sufficient to meet the desired target release rate for the site. The subsurface stormwater storage tank invert elevation was set higher than the obvert of the storm sewer on Stittsville Main Street in order to avoid backwater effects on the outlet orifice and backfilling of the storage; the tanks were also set 1 m above above the measured groundwater levels to avoid reduction in storage capacity due to groundwater elevations.

As seen in **Drawing SD-2**, generic specifications are provided for the subsurface storage however a specific product is not selected, as the infiltration testing mentioned earlier still needs to be completed and will affect product selection. For the purposes of generating a storage curve for use in the PCSWMM model, a configuration of 30 Stormtech SC-740 storage chambers was used, with the knowledge that this will likely change after infiltration testing results are available. However, the storage curve (see **Appendix D.1**). This demonstrates however that the required active underground storage can be accommodated in this area.

Controlled release rates and storage volumes required are summarized in **Table 5.4**.

Table 5.4: Subsurface Storage

Storm Return Period	Area ID	Design Head (m)	Discharge (L/s)	Orifice Type	$V_{required}$ (m^3)
5-year	L103A, L103B, L103C, L102A, L102B, L102C, L102D	0.64	9.90	90 mm Orifice ICD	44
100-year		1.25	16.46		79

5.3.2.4 Uncontrolled Release

Due to grading restrictions, three subcatchment areas have been designed to sheet flow uncontrolled as determined by the site grading design and the natural topography. The UNC-3 catchment area discharges off-site uncontrolled to the adjacent Stittsville Main Street ROW. The UNC-1 and UNC-2 catchment areas will discharge off-site uncontrolled to the adjacent south-east property. The amount of flow to the adjacent property will be less than that in pre-development conditions since most of the area will be redirected to the proposed drainage system. Moreover, runoff from UNC-2 will be directed by finished grade along the northeast property line to ROW, as shown in **Drawing GP-1**. Peak discharges from uncontrolled areas have been considered in the overall SWM plan and the target release rate has been satisfied by overcontrolling the discharge rates throughout the rest of the site.

Table 5.5 summarizes the estimated uncontrolled storm release rates during the 5-year and 100-year storm events.

Table 5.5: 5-Year and 100-Year Peak Uncontrolled (Non-Tributary) Release Rates

Area ID	Area (ha)	5-Year Event Discharge (L/s)	100-Year Event Discharge (L/s)
UNC-1	0.034	7.19	15.18
UNC-2	0.0064	0.43	2.02
UNC-3	0.020	5.14	9.62

5.3.3 Results

The maximum discharge flow of the entire site was obtained by adding the hydrographs of total uncontrolled flow and the controlled flow from model simulation result. The maximum discharge flow will be 47.5 L/s during the 100-year storm event. **Table 5.6** demonstrates that the proposed stormwater management plan provides adequate attenuation storage to control post-development flows to below the target ate.

Table 5.6: Summary of Total 5 and 100-Year Event Release Rates

Summary To Outlet	5-Year Peak Discharge (L/s)	100-Year Peak Discharge (L/s)
Total	**28.5**	**47.5**
Target	**51.7**	**51.7**

5.3.4 Water Quality

It is required that 80% of the total suspended solids (TSS) to be captured before discharging to the existing storm main, according to correspondence with the Mississippi Valley Conservation Authority (MVCA). An oil-grit separator treatment system within the site will be implemented and Contech's Stormceptor will be used for this purpose. Using a fine particle size distribution and based on the 100-year storm event discharge rate at 28.65 L/s to the storm main, Stormceptor model STC 750 will achieve 85% TSS removal, exceeding the minimum required TSS removal level. The detailed Stormceptor sizing report is included in **Appendix D.7**.

While Contech Stormceptor STC 750 has been specified the objective is to demonstrate the ability to meet the water quality requirement. Other treatment systems with equivalent TSS removal capability might be used in later development stage.

MVCA has also asked that temperature mitigations be considered since flows ultimately discharge to Poole Creek. It is anticipated that the underground storage space and granular material will provide a large surface contact area and a detention time that will allow the water to exchange heat with the storage media and lower overall water temperature.

5.3.5 Annual Infiltration Capture

MVCA has indicated that the development site needs to target a total infiltration of 262 mm per year, according to the Carp River Subwatershed Study.

The City of Ottawa receives an average annual rainfall of 567 mm, based on 37-year rainfall record from 1967 to 2003 at the Ottawa Macdonald–Cartier International Airport. The 262 mm depth will account for 46% of the annual rainfall during the record time. 46.3% of recorded storm depths were 12.7 mm or smaller for this period (the rainfall event analysis can be found in **Appendix D.7** – in the Stormceptor sizing report). If all of the storms of this size and smaller were captured, the annual infiltration target could be met.

Based on this analysis, a 15 mm infiltration volume target (greater than the 12.7 mm depth) has been selected, resulting in a required 75 m^3 of storage from the 0.5 ha site. Combined with the active storage requirement of 79 m^3, the total underground storage will be 154 m^3. The infiltration storage will be set below the invert of the outgoing pipe at 116.3 m.

The actual soil infiltration rate at the site has not yet been measured however a geotechnical engineer is being tasked with performing this work in the near future. The existing geotechnical report has characterized site soils as silty sand, silty sand and gravel, and sand. Typical literature values for saturated hydraulic conductivity for sand is 120 mm/hr and for loamy sand is 30 mm/hr (*Rawls, W.J. et al., (1983). J. Hyd. Engr., 109:1316*). Over a bed area of 180 m^2, infiltration of 30 mm/hour would take 13.9 hours to infiltrate 75 m^3 of storage. It is therefore anticipated that the site soils have the capacity for adequately infiltrating within a 48-hour drawdown period, reducing the likelihood of spilling from the infiltration storage during a back-to-back storm event.

Stormwater Management

It is estimated that the footprint area provided for the underground storage will be about 180 m^2 with a height of 1.7 m (between 115.8 m and 117.5 m as the minimum bedding elevation above groundwater elevation and maximum storage water depth without surface flooding, respectively). The available underground storage space will be about 306 m^3. While some of this will likely be lost to material from the eventually-selected storage chambers, the available volume is still well in excess of the 154 m^3 required and is intended to demonstrate that the bed area and volume can be achieved within the designated space on **Drawing SD-2**. The site will have adequate storage space to capture both the restricted flow and the infiltration volume.

6.0 SITE GRADING AND DRAINAGE

The proposed development site measures approximately 0.51 ha in area and in the present consists of grassed area with some trees. The site slopes from southwest to northeast, with grades at property corners varying by approximately 1.6 m across the site. Overland flow is generally being directed to the adjacent Stittsville Main Street ROW. A detailed grading plan (see **Drawing GP-1**) has been provided to satisfy any stormwater management requirements and provide for minimum cover requirements for storm and sanitary sewers where possible. Existing grades at the rear of the property have been maintained. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

The subject site maintains emergency overland flow routes for flows deriving from storm events in excess of the maximum design event to the existing Stittsville Main Street ROW as depicted in **Drawing GP-1.** The site grading plan maintains the general drainage pattern of the existing condition site and matches all perimeter grades.

7.0 UTILITIES

As the subject site lies within a developed residential community, Hydro, Bell, Gas and Cable servicing for the proposed development should be readily available. It is anticipated that existing infrastructure will be sufficient to provide a means of distribution for the proposed site. Exact size, location and routing of utilities, along with determination of any off-site works required for redevelopment, will be finalized after design circulation.

8.0 APPROVALS

An Environmental Compliance Approvals (ECAs) under the Ontario Water Resources Act will likely be required by the Ontario Ministry of Environment, Conservation and Parks (MECP) for the underground storage chambers. However, an ECA is not expected to be required for the proposed sewers as they will be approved under the building code act and the entirety of the site is maintained under one ownership.

The Mississippi Valley Conservation Authority (MVCA) will need to be consulted in order to obtain municipal approval for site development. A Requirement for a MECP Permit to Take Water (PTTW) may be required and can be confirmed by the geotechnical consultant at the time of application

9.0 EROSION CONTROL DURING CONSTRUCTION

In order to protect downstream water quality and prevent sediment build up in catch basins and storm sewers, erosion and sediment control measures must be implemented during construction. The following recommendations will be included in the contract documents and communicated to the Contractor.

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Provide sediment traps and basins during dewatering works.
7. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
8. Schedule the construction works at times which avoid flooding due to seasonal rains.

The Contractor will also be required to complete inspections and guarantee the proper performance of their erosion and sediment control measures at least after every rainfall. The inspections are to include:

- Verification that water is not flowing under silt barriers.
- Cleaning and changing the sediment traps placed on catch basins.

Refer to **Drawing ECDS-1** for the proposed location of silt fences, straw bales, and other erosion control measures.

10.0 GEOTECHNICAL INVESTIGATION

Several geotechnical investigations have been conducted within the subject site and the information has been summarized in the following sections. In 2015, a geotechnical report was provided by Houle Chevrier Engineering, and most recently an updated investigation was provided in April 2022 by Yuri Mendez Engineering.

10.1 2015 GEOTECHNICAL INVESTIGATION

Houle Chevrier Engineering was commissioned in 2015 to conduct a geotechnical investigation for a proposed 4-storey residential building to be located at 1364-1370 Stittsville Main Street in the City of Ottawa. The objective of the geotechnical investigation was determining the subsoil and groundwater conditions at this site by means of borehole analysis as well as to provide geotechnical recommendations pertaining to design of the proposed development including construction considerations which may impact the design. A geotechnical investigation was completed for the subject site by Houle Chevrier Engineering on May 25, 2015. The report summarizes the existing soil conditions within the subject area and provides construction recommendations. For details which are not summarized below, please see the original geotechnical report included in **Appendix E.1**.

Subsurface soil conditions within the subject site were determined from five (5) boreholes which were completed in May 2015. The boreholes were advanced to depths ranging from about 2.4 to 6 metres below the ground surface and all boreholes were terminated on practical refusal on or within inferred bedrock. Well screens were installed in two (2) of the boreholes (15-3B and 15-4) to measure groundwater levels. Topsoil fill material was encountered from the surface in three (3) of the boreholes and ranged in thickness from about 0.05 to 0.08 m. In general, the fill material consisted of topsoil fill material and crushed stone, then by brown, grey-brown, and dark grey-brown silty sand, silty sand and gravel, and sand ranging in thickness from about 0.5 to 2.3 meters. Inferred bedrock was encountered at between 2.4m to 6 m, however it should be noted that the auger refusal can occur on cobbles/boulders and may not necessarily represent bedrock.

Groundwater levels were found to range from 2.6 m to 3.9 m below the ground surface and are subject to seasonal fluctuations.

No grade-raise restrictions for the proposed building foundation were recommended for the subject site and a MOECC Permit to Take Water is not expected to be required.

The minimum pavement structure considered acceptable for the parking areas are provided in **Table 10.1** below.

Table 10.1: Recommended Pavement Structure – Parking Areas

Thickness (mm)	Material Description
50	Superpave 12.5 (Traffic Level A or B)
150	OPSS Granular A base
300	OPSS Granular B Type II Subbase

For areas to be used by heavy truck traffic (i.e. access roads, loading bays, and truck parking areas) the acceptable pavement structures are provided in **Table 10.2.**

Table 10.2: Recommended Pavement Structure – Heavy Truck Access Lane

Thickness (mm)	Material Description
90	Hot Mix Asphaltic Concrete (40 mm Superpave 12.5 Traffic Level B over 50 mm Superpave 19.0 (Traffic Level B))
150	OPSS Granular A base
400	OPSS Granular B Type II Subbase

10.2 2022 SUBSURFACE SITE INVESTIGATION

Yuri Mendez Engineering (YME) was commissioned to conduct a Subsurface Investigation for 1364-1370 Stittsville Main St. and issue recommendations for a proposed 4-storey apartment building development. The report (53-BSI-R1) was prepared on June 20, 2022 and describes the subsurface conditions within the site boundaries. In addition, the report acknowledges and responds to the first submission comments provided by the City of Ottawa. The geotechnical report can be found in **Appendix E.2**. It was submitted to the City under separate cover and has since been reviewed by City staff, who have provided comments. Responses to Geotechnical Comments are provided in **Appendix E.3**.

Subsurface soil conditions within the subject site were determined from six (6) boreholes which were completed on March 28, 2022. The boreholes were advanced to depths ranging from 1.88 to 5.97 meters below the ground surface and all boreholes were terminated on practical auger refusal on or within inferred bedrock suggesting that bedrock depths increase from the back of the property at 2 m depth to the front at roughly 6 m. The soil profile primarily consists of dense well graded sand and gravel. Groundwater levels were measured in standpipes installed in BH4 (WL=114.8m) and BH6 (WL=114.8m) and the groundwater table was found to be at a depth of 2.65 and 3.2 meters, respectively. BH6 is the closest borehole to the proposed underground stormwater storage location. The bottom of the chambers for the underground storage is set at 115.8m, 1 m above the groundwater levels observed. If seasonal fluctuations in groundwater levels reached the level of the underground storage, the local groundwater table would be drawn down by the sewer outlet. The groundwater levels may also reflect the surface water level conditions in Poole Creek.

Geotechnical Investigation

As specified by YME, the general quality of the near surface undisturbed soil to serve as the foundation for the pavement structure are assumed to be fair as defined in the AASHTO guide. Tables 3, 4, and 5 within Appendix D of the Geotechnical report (53-BSI-R1) should be referenced to select the pavement structure for each traffic class on fair soils encountered at the site.

A Permit to Take Water (PTTW) is required for pumping from excavations exceeding 400 cubic meters per day. As specified in the report, given the size of the proposed excavations within the site and the soil conditions assessed, pumping from excavations it is not expected to exceed the threshold of 400 cubic meters per day and the requirement of a PTTW may not apply to the proposed development. Metered outlets must be maintained and recorded throughout construction as proof and confirmation that the OWRA regulations are adhered to.

11.0 CONCLUSIONS

11.1 WATER SERVICING

It is expected that the existing 406 mm diameter water distribution network within Stittsville Main Street can sufficiently support the proposed development's domestic demands. Upon receipt of the boundary conditions for the existing distribution system and a modeling analysis of a multi-hydrant firefighting scenario, the calculated domestic demands and the FUS fire flow demand of 24,000 L/min for the subject site can be met. The existing watermain on Stittsville Main Street has sufficient capacity to sustain the required domestic and emergency fire flow demands.

11.2 WASTEWATER SERVICING

An existing 300 mm diameter PVC sanitary sewer fronts the site on Stittsville Main Street. The proposed development will be serviced through the internal plumbing of the building which will outlet to a new single 200 mm diameter sanitary lateral complete with backwater valve, proposed to serve the entire site, with a sanitary connection to the existing sanitary MH fronting the site (SAN MH 290).

11.3 STORMWATER SERVICING AND MANAGEMENT

The stormwater management plan provided can effectively control on-site runoff and meet the target allowable release rate. Roof storage, surface storage, and underground storage will be utilized to provide additional detention benefits by controlling the expected post-development 100-year storm run-off from the proposed development area to the 5-year pre-development runoff release rate. The ultimate storm outlet will be the 600 mm diameter stormwater network along Stittsville Main Street, eventually discharging to Poole Creek. A Stormceptor is provided to meet the 80% TSS removal water quality requirement. Infiltration volume storage is provided below the active storage volume in the underground storage area to capture storms 15 mm and smaller, meeting the 262 mm/year infiltration target. Detention and attenuation in the underground storage areas will provide temperature mitigation before discharge to Poole Creek.

11.4 GEOTECHNICAL CONSIDERATIONS

A geotechnical investigation was conducted by Houle Chevrier Engineering in 2015 and by Yuri Mendez Engineering in 2022 to determine the subsurface properties of the site, including groundwater elevations. The proposed underground stormwater storage tanks are set higher than the measured groundwater depths. A set of recommendations are provided in the updated report as geotechnical guidance for the design and construction.

11.5 GRADING

The proposed development site measures approximately 0.51 ha in area and consists of grassed area and trees. The site grading and drainage will be maintained as much as possible and will not be adversely impacted by the proposed development.

11.6 UTILITIES

The site is within a residential neighbourhood and currently serviced by existing utilities providing natural gas and fibre optics telecommunication services. The site is expected to be serviced through connections to these existing services.