REPORT
PROJECT NO: 125599

CIVIL DESIGN BRIEF
715 MIKINAK ROAD, OTTAWA, ON

Prepared for Ottawa Community Housing
by IBI Group
November 22, 2021

Table of Contents

Table of Contents (continued)

Table of Contents (continued)

Table of Contents (continued)

1 INTRODUCTION

IBI Group Professional Services (Canada) Inc. has been retained by Ottawa Community Housing to provide civil engineering design services for the proposed site development. In 2011, Canada Lands Company (CLC), bought and took ownership of about 125 ha of the former CFB Rockcliffe air base site. The acquisition of the decommissioned base by CLC offers the opportunity today to reconnect this site back into the urban fabric of the City and create a highly desirable mixed-use community for approximately 10,000 residents. CLC completed a Community Design Plan (CDP) in 2015. In support of the CDP, there were numerous supporting documents including the “Former CFB Rockcliffe Master Servicing Study” (MSS), August 2015, prepared by IBI Group. That report provided a plan for provision of major infrastructure needed to support the proposed development.

The proposed project site is approximately 1.22 ha located at civic address 715 Mikinak Road within the City of Ottawa, where it is bounded by Mikinak Road to the south, Hemlock Road to the north, Barielle-Snow Street to the west and Michael Stoqua Street to the east as illustrated in Figure 1.

The proposed site development consists of three mid-rise mixed-use apartment buildings together with on-site parking spaces, landscape amenities and two site entrance along the east side of the property.

The primary objective of this report is to examine the existing conditions of the site and present the proposed conditions suitable for the proposed development in accordance with the various requirements and control design criteria specified by regulatory agencies such as the City of Ottawa, The Ministry of Environment, Conservation and Parks (MECP) and Rideau Valley Conservation Authority (RVCA).

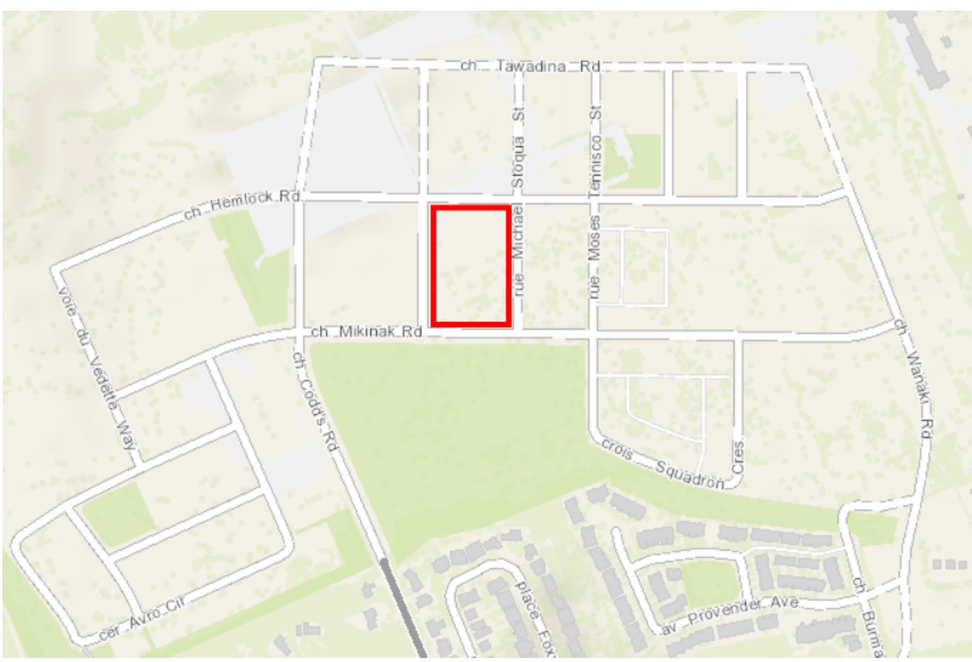

Figure 1 - Site Location

1.1 Guidelines and Standards

The evaluation takes into consideration the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), and the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01, the June 2018 Technical Bulletin ISTB-2018-04, October 2019 Technical Bulletin 2019-01, and the July Technical Bulletin 2019-02.

It also considers the City of Ottawa Water Distribution Design Guidelines (OWDDG), and the 2010 Technical Bulletin 2010-02, the 2014 Technical Bulletin 2014-02, and the 2018 Technical Bulleting 2018-02.

All specifications are as per current City of Ottawa standards and specifications, and Province of Ontario (OPSS/D) standards and specifications.

1.2 Pre-Consultation Meeting

Notes of the meeting are provided in **Appendix E**. There were no engineering concerns flagged in this meeting. The City of Ottawa Servicing Study Checklist has also been included in **Appendix E**.

1.3 Environmental Issues

There are no environmental issues related to the site development, as all environmental concerns were dealt with as part of CLC's subdivision approval. The site development has been previously cleared and graded throughout the subject lands. There are no existing watercourses or drainage features associated within the site.

1.4 Geotechnical Concerns

Paterson Group was retained by Ottawa Community Housing to prepare a geotechnical report to provide site analysis of the overall condition of the site. Based on the geotechnical report, its been noted that there were no particular design concerns for this development.

1.5 Reference Reports

The design considerations for the proposed site servicing and stormwater management design takes into consideration the following documents and is included in the Appendix E for review and reference:

- Former CFB Rockcliffe Master Servicing Study, prepared by IBI Group
- Design Brief, Wateridge Village Phase 1B, prepared by IBI Group
- Wateridge Phase 1B Developer's Checklist, prepared by Aquafor Beech Ltd.
- Geotechnical Investigation, Proposed Residential Buildings, prepared by Paterson Group

2 WATER DISTRIBUTION

2.1 Existing Conditions

Existing watermains are located along the north, east, south and west of the subject site. There is an existing 300mm dia. watermain along Hemlock Road and Mikinak Road and 200mm dia. along Michael Stoqua Street and Barielle-Snow Street.

There are two existing municipal hydrants which are located along Barielle-Snow Street and Hemlock Road that are in close proximity to the subject site. Both existing hydrants are within 45m to the proposed Siamese connection for Building A and B.

According to the CFB Rockcliffe MSS, the Rockcliffe site is located in the City of Ottawa's Montreal Road Pressure Zone (MRPZ). The MRPZ is located on elevated lands with the City's Pressure Zone E1.

2.2 Proposed Water Design Criteria

2.2.1 Water Demands

It is understood that the proposed three buildings will be equipped with a sprinkler system. The proposed services for the buildings have therefore been sized to provide domestic water uses. The Watermain Demand Calculation Sheet in **Appendix B** illustrates a total of 491 population per unit which is a total contribution from all three buildings. The unit population density and consumption rates are taken from Tables 4.1 and 4.2 of the Ottawa Design Guidelines – Water Distribution and are summarized as follows:

- Pop. Studio / 1 Bedroom — 1.4 (COO) / 1.5 (OCH) person per bedroom
- Pop. 2 Bedroom — 2.1 (COO) / 3.0 (OCH) person per bedroom
- Pop. 3 Bedroom — 3.1 (COO) / 4.5 (OCH) person per bedroom
- Average Day Demand — 280 l/cap/day
- Peak Daily Demand — 875 l/cap/day
- Peak Hour Demand — 1,925 l/cap/day

2.2.2 System Pressures

The 2010 City of Ottawa Water Distribution Guidelines states that the preferred practice for design of a new distribution system is to have normal operating pressures range between 345 kPa (50 psi) and 552 kPa (80 psi) under maximum daily flow conditions. Other pressure criteria identified in the guidelines are as follows:

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi).
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 140 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system in unoccupied areas shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code the maximum pressure should not exceed 552 kPa (80 psi) in occupied areas. Pressure

reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.2.3 Pipe Size and Connection

For the proposed buildings A, B & C, a 150mm diameter PVC DR18, C900 / AWWA watermain pipe have been selected to provide domestic water for all three buildings. There are two separate watermain tie-in connections for the subject site which are both located on the east of the property along Michael-Stoqua Street. The first proposed watermain connection is located along the north east entrance of the site while the second proposed watermain connection is located at the south east entrance of the site. The two proposed watermain will connect to the existing 200mm diameter watermain. Reference for the proposed watermain network is illustrated in the Servicing Plan - CU1101 included in **Appendix A.**

2.2.4 Hydrants

The existing watermain infrastructure is available along all side roads of the site. Existing hydrants have also been noted to be available within close proximity to the proposed three buildings. Based on the proposed fire protection for the site development, all three buildings are equipped with sprinkler systems. The sprinkler systems will be supplied via Siamese connections along the exterior wall of all three buildings. The proposed locations of the Siamese connections have been determined to be within 45m of the nearest existing hydrant in the area. The illustration of the existing hydrant in reference to the Siamese connections distances are illustrated in the Servicing Plan CU1101 which is included in **Appendix A**.

Since the perimeter of Building C cannot be fully covered from the nearest existing hydrant, a proposed hydrant has been added to the proposed water system to demonstrate that the proposed building will meet fire code requirements. Refer to Servicing Plan – CU1101 in **Appendix A.**

2.2.5 Fire Flow Rate

The site consists of three multi storey apartment blocks. A Fire Underwriters Survey (FUS) calculation has been completed for all buildings. The calculation results for fire flow are summarized below according to the FUS calculation which is also included in **Appendix B**.

BUILDING	FIRE FLOW DEMAND (L/MIN)	FIRE HYDRANT (<76M)	FIRE HYDRANT (<152M)	AVAILABLE FIRE FLOW PER TABLE 18.5.4.3 OF ISTB 2018-02 (L/MIN)
A	11,000	4	4	37,852
B	13,000	4	3	34,067
C	7,000	5	3	39,745

To summarize the nature of the surrounding fire hydrants in the area of the subject site, there is 1 proposed 150mm diameter hydrant within the site development to supplement the requirements for Building C and 5 existing fire hydrants located within 45m of the perimeter of Building A & B. A total of 6 existing hydrants are available and located within 90m range of the site. Refer to Servicing Plan CU1101 in **Appendix A** for detailed locations of the existing fire hydrants which illustrates a 45m radius to the proposed site development.

The required fire flow for each proposed building has been calculated in accordance with City of Ottawa Technical Bulletin ISTB-2018-02. The resulting fire flow requirements and the existing hydrants within proximity to the proposed site development demonstrates and will provide sufficient fire flow demands with adequate required pressures for the proposed site.

2.2.6 Boundary Conditions

The site development's boundary conditions for Wateridge Village is at the Codd's and Burma Roads connection locations for Phase 1. The boundary conditions are for existing conditions; future conditions are to be derived from the Master Servicing Study.

A copy of the boundary conditions is included in **Appendix B** and summarized as follows:

	Codd's Road	Burma Road
Max HGL (Basic Day)	147.1 m	147.1 m
Peak Hour	147.0 m	147.1 m
Max Day + Fire (13,000 l/min Fire Flow)	139.5 m	140.2 m
Max Day + Fire (10,000 l/min Fire Flow)	140.0 m	140.4 m

According to CFB Rockcliffe MSS, excerpt from section 4.4.4 Phasing "*under existing Basic Day and Max Day conditions, without any modifications at the Brittany Drive or Montreal Pumping Stations with respect to the discharge HGL, the areas included in Phase 1A are anticipated to experience pressures in the range of approximately 72 – 89 psi. the maximum pressures observed exceed the 80-psi threshold and would require pressure reduction measures. This further illustrates that if the HGL discharge at the pump stations is note regulated to a maximum of 143m, the majority of the development will experience pressure greater than 80 psi*"

The proposed site developments water pressure system has been reviewed according to CFB Rockcliffe MSS, excerpt from section 4.4.1 Basic Day Demands "*It is noted that a number of the service areas in the development lands are expected to exceed 550 kPa (80 psi) and therefore will require pressure reduction as per the Ontario Building Code requirements. The extent of this area is shown in **Figure 4.7**. and includes all lands below approximately 91m in elevation at a maximum discharge HGL of 174 MRPS.*

*However, if the maximum HGL at MRPS is reduced to a maximum of 143m, the areas within the development experiencing high pressures can be reduced. This would result in lands with elevations lower than 87m to experience pressures above 80 psi as oppose to elevations lower than 91m (discharge head of 147m at MRPS). A pressure distribution map is shown in **Figure 4.8** with MRPS operating at a maximum discharge HGL of 143m."*

Based on the illustration on Figure 4.8 referenced from CFB Rockcliffe MSS, it indicates that the proposed site development is within the area which could experience a pressure range of 70-80 psi. According to this pressure range, the site development will not require a pressure reduction measures.

3 WASTEWATER DISPOSAL

3.1 Existing Conditions

Canada Lands Company completed a Community Design Plan (CDP) in 2015. To support that plan, a number of technical reports were prepared including the 'Former CFB Rockcliffe Master Servicing Study, August 2015 (MSS). That report recommended that the existing combined sewers on the subject site be abandoned in favour of dedicated sanitary and storm sewer systems.

In particular, the MSS recommended that future wastewater flow from Phase 1B be directed to the Codd's Road Shaft. Accordingly, wastewater flows from the subject site will be designed to outlet to that location. Phase 1A design included the new connection to that shaft and the Phase 1B sanitary sewer will connect to the Phase 1A system. **Figure 5.1** from CFB Rockcliffe MSS illustrates the connections.

The existing sanitary sewers located along Barielle-Snow Street is a 250mm diameter sanitary sewer pipe which drains southerly to the existing 250mm sanitary sewer in Mikinak Road. General sewage flows from this location is ultimately directed to Codd's Road Shaft.

3.2 Verification of Existing Sanitary Sewer Capacity

Existing sanitary sewer capacity have been confirmed for both proposed tie-in location along Barielle Snow Street and Michael Stoqua Street. Based on the Sanitary Sewer Design Sheet prepared for the Former CFB Rockcliffe, both existing sanitary sewers have sufficient capacity to accommodate the proposed flows generated from the 3 buildings within the site development. The available capacity for Barielle Snow and Michael Stoqua demonstrates flow availability of 46.37 L/s and 48.11 L/s respectively. Reference to the Sanitary Sewer Design sheet used for verification is included in **Appendix C**.

3.3 Proposed Sewers

All on-site sewers have been designed to City of Ottawa and MOE design criteria which include but are not limited to the below listed criteria. A copy of the sanitary sewer design sheet is included in **Appendix C** which demonstrate the population densities and sanitary sewer pipe size selection.

3.3.1 Design Flow

Average Residential Flow	-	280 l/cap/day
Peak Residential Factor	-	Harmon Formula
Infiltration Allowance	-	0.33 l/sec/Ha
Minimum Pipe Size	-	200mm diameter

3.3.2 Population Density

Pop. Studio / 1 Bedroom	1.4 (COO) / 1.5 (OCH) person per bedroom
Pop. 2 Bedroom	2.1 (COO) / 3.0 (OCH) person per bedroom
Pop. 3 Bedroom	3.1 (COO) / 4.5 (OCH) person per bedroom

3.3.3 Proposed Wastewater Plan

Sanitary Sewer Design calculation has been completed for the proposed three buildings within the site development. A reference of the calculated flows is provided in **Appendix C**. The proposed sanitary sewer design proposes two connection to the municipality's sanitary sewer system where the two connections has been permitted by the City of Ottawa. According to the Servicing Plan drawing – CU1101, the proposed sanitary outlet for Building C will be connected to the existing 250mm sanitary sewer pipe along Michael Stoqua Street. Verification of the available capacity has been confirmed, therefore proposed flows from Building C will not negatively impact existing sanitary sewer system downstream.

The nature of the proposed sanitary sewer design for Building B will be flowing through Building A. Within Building A, a proposed heat recovery system will receive sanitary flows from the incoming wastewater from Building B. Ultimately, the end process for the wastewater will outlet from the westerly portion of Building A and drain to the existing sanitary sewer system along Barielle Snow Street. Additionally, due to the existing depth of the existing sanitary sewer system along Barielle Snow Street, the proposed tie-in manhole will require an external drop structure manhole to prevent exceeding the maximum pipe gradient.

Verification of the available capacity has been confirmed, therefore proposed flows from Building A & B will not negatively impact existing sanitary sewer system downstream. The Sanitary Sewer Design Sheet from CFB Rockcliffe Wateridge Village Phase 1B have been used as a supporting document and has been provided in **Appendix C** for reference use.

4 STORMWATER MANAGEMENT

4.1 Existing Conditions

CLC completed the servicing report, "Former CFB Rockcliffe Master Servicing Study" in 2015. The MSS Report recommends a series of local and trunk storm sewers to collect runoff from Phases 1 and 2 and route those flows to the Eastern Facility. The Phase 1 design followed the recommendations of the MSS report, including construction of the large diameter sewers, which outlet to the Eastern Stormwater Management Facility; the Eastern Stormwater Management Facility and outlet to the Ottawa River. The Phase 1B storm sewers connect to the downstream Phase 1 sewer system.

4.2 Objective

The purpose of this evaluation is to prepare the dual drainage design, including the minor and major system, for the development of the subject site. The design includes the assignment of orifice control devices, on-site storage and maximum depth of surface ponding. The evaluation takes into consideration the City of Ottawa Sewer Design Guidelines (OSDG) (October 2012), the February 2014 Technical Bulletin ISDTB-2014-01, the September 2016 Technical Bulletin PIEDTB-2016-01 and the June 2018 Technical Bulletin ISTB-2018-04.

4.3 Design Criteria

The stormwater system was designed following the principles of dual drainage, making accommodations for both major and minor flow.

Some of the key criteria include the following:

- Design Storm — 2 & 5 year return (Ottawa)
- Modified Rational Method Sewer Sizing
- Initial Time of Concentration — 15 minutes
- Runoff Coefficients
  - Landscaped Areas — C = 0.25
  - Landscaped Area with Pathway/Roof — C = 0.50 - 0.65
  - Permeable Paver Stones — C = 0.60
  - Building and Roof Area — C = 0.90
  - Parking Area and Driveway — C = 0.90
- Pipe Velocities — 0.80 m/s to 3.0 m/s
- Minimum Pipe Size — 250 mm diameter
(200 mm CB Leads
150 mm Building Services)
- Minimal allowable slopes

DIAMETER (MM)	SLOPE (%)
250	0.43
300	0.34
375	0.25
450	0.20
525	0.16
600	0.13
675	0.11

- Minimum depth of cover of 2.0 m
- 100-year Hydraulic Grade Line (HGL) separation to be greater than 0.30 m from the underside of footings

4.4 Methodology

The existing and proposed design flows for the property were calculated using the Modified Rational Method, as described in the MTO Drainage Management Manual (MTO 1997). In order to delineate drainage areas, the existing topographic survey and proposed grading plan were used.

In order to evaluate the quantity of storm runoff, a minor storm event and a major storm event (i.e. 100-year storm) were analyzed to quantify the stormwater runoff of the site. The minor storm event intensity duration equation is used:

$$i_{(Minor\ Storm)2yr} = \frac{732.951}{(t_c + 6.199)^{0.810}}, \quad t_{c\ (hour)}$$

$$i_{(Minor\ Storm)5yr} = \frac{998.071}{(t_c + 6.053)^{0.814}}, \quad t_{c\ (hour)}$$

The major storm event is based on the 100-year storm events and based on the following equation:

$$i_{(100\ Yr)} = \frac{1735.688}{(t_c + 6.014)^{0.820}}, \quad t_{c\ (hour)}$$

4.5 Drainage Design

The drainage system proposed for the subject site will accommodate both major and minor stormwater runoff. Minor and major flow from the subject site will be conveyed through the proposed storm sewer network where it will be attenuated in various storage locations.

The proposed subject site has been designed to provide adequate stormwater attenuation volume storage. The proposed SWM also adheres to the requested design objectives based on the Pre-Application to prevent stormwater ponding within the proposed site during the 2-yr minor storm event. For detailed calculation of the required volume storage is available for review as illustrated in **Appendix D.**

4.5.1 Water Quality Control

The design takes into consideration the August 2015 Master Servicing Study, where any runoff from the site, as with all future developments in CFB Rockcliffe, should include water quality end pipe treatment.

With the design intent to provide water quality control, runoff flows from the development site will provide a level of treatment through the proposed bioswales. Ultimately the end of pipe treatment will consist of one Stormceptor or approved equivalent before discharging treated runoff into the storm sewer system on Michael Stoqua Street. The results of the long-term performance analysis indicate that Stormceptor is capable of capturing and treating annual runoff from the development and providing 82% of average annual total suspended solids (TSS) removal efficiency. The water quality control criteria, therefore, can be satisfied under the proposed stormwater management plan.

4.5.2 Stormceptor STC-2000®

In consistent with the design principle outlined for CFB Rockcliffe Master Servicing Study, the minor and major stormwater runoff generated from the development site will be treated through one Stormceptor for water quality control. According to the technical design guideline, the Stormceptor Model STC-2000 is selected to be installed to provide water quality protection, considering a development area of 1.22 ha with the weighted runoff coefficient of 0.71. See **Appendix D** For sizing details.

For effective water quality treatment, the Stormceptor must be maintained by the property owner regularly. Stormceptor MHs must be maintained and cleaned once a year under normal conditions. The required frequency varies depending on amount of sediment generated from the development site. It is recommended that initial maintenance should be annually. Actual maintenance frequency be increased or reduced according to site conditions (if the unit is filling up with sediment much quicker than projected, maintenance may be required semi-annually; once the development site has stabilized, maintenance may only be required once in two/three years). The maintenance, however, should be performed immediately once sediment depth in the Stormceptor MH reaches 225 mm or depending on the to the Stormceptor Owner's Manual.

Maintenance of the Stormceptor manhole is conducted using vacuum trucks. No entry into the unit is required for maintenance in most cases, and it is recommended that confined space entry protocols must be followed if entry to the Stormceptor unit is required. The need for maintenance is determined easily by inspecting the unit from the surface. The depth of oil in the unit can be determined by inserting a dipstick in the oil inspection/cleanout port. Similarly, the sediment depth can be measured from surface without entry into the unit through a dipstick tube equipped with a ball valve. This tube would be inserted through the riser pipe.

Oil is removed through the oil inspection/cleanout port and sediment is removed through the riser pipe. Alternatively, oil could be removed from the 24 inches (600 mm) opening if water is removed from the lower chamber to lower oil level below the drop pipes.

The following procedure should be taken when cleaning out the Stormceptor:

- Check for oil through the oil cleanout port.
- Remove any oil separately using a small portable pump.
- Decant the water from the unit to the sanitary sewer, if permitted by the local regulating authority, or into a separate containment tank.
- Remove the sludge from the bottom of the unit using the vacuum truck.
- Re-fill the Stormceptor with water where required by the local jurisdiction.

Disposal of materials from Stormceptor is like that of other best management practices. Normally, sediment removed from a Stormceptor manhole will not be contaminated to the point that it would be classified as hazardous waste. However, all sediment which is removed from the Stormceptor manhole should be tested to determine best disposal option. The Ontario Ministry of Environment sediment disposal requirements must be consulted for information pertaining to exact parameters and acceptable levels for various disposal options. The petroleum waste products collected in the Stormceptor (oil/chemical/fuel spills) should be removed by a licensed wastewater management company.

4.5.3 Water Quantity Control

For the purpose of water quantity control, the post-development runoff flows from the entire development site will be conveyed to and attenuated through a various storage volume. The proposed site development has been designed with 25% reduction based on the pre-development site condition which have been applied to both minor and major storm events.

The general goal for the subject site is to attenuate the stormwater runoff where it will be conveyed via high points and slope gradings to be directed towards the low points. Primarily, the low points within the subject site are in the parking lot area. The main low points where majority of runoff will be captured via proposed bio-swales.

It should be noted that there is also stormwater runoff accumulation within the building roof tops, however the volume is minimal and controlled purposely to provide timed roof drains to slow the water flow. Due to the design condition of the roof top and the proposed solar panels, the runoff accumulation from the roof top are not intended to be used for stormwater management attenuation.

In addition to water quantity, parking stall areas are intended to provide additional volume storage. Permeable paver stones are proposed for the parking stalls which will have storage capabilities due to the depth of the river rocks beneath each parking stalls. Within the given area and the proposed depth of the river rock material, the total volume will provide 30% voids, therefore allowing a storage volume for stormwater runoff.

Further to the proposed stormwater storage volume within the subject site, the parking lot area will also serve as ponding site to accommodate the major storm event. Once the stormwater network becomes full, an orifice plate located at the outlet manhole (STM MH3 & MH7) will only allow the restricted calculated volume runoff to be discharged into the existing 600 mmØ sewer along Michael Stoqua Street. The calculation for the restricted rate provided for the orifice plate is included in **Appendix D.** In the event where the proposed stormwater system is utilized and the parking lot maximum ponding depth have been reached, the excess flow will cascade along the south east entrance of the site and an emergency overflow will be directed into the municipalities storm system. The required storage volume calculations for the subject site is included in **Appendix D**.

Based on the proposed site plan, the total uncontrolled area has been calculated with a combined flow rates of 8.6 L/s based on the 100-year storm event. The flow generated from the uncontrolled areas have been designed to drain towards the existing nearby catch basins storm systems. Refer to Figure SWM 2 – Post Development in **Appendix D** for the detailed storm drainage catchment area plan for the site.

4.5.4 Orifice Plate

As part of the stormwater system and to restrict the flow based on pre-development conditions, an orifice plate is proposed at the outlet MH (STM MH3 & MH7). The orifice plate will limit the 100-year post-development design runoff peak discharge from the development site prior to discharging to the municipality's storm water system. A reference for the sizing of the Orifice Plan is included in **Appendix D.**

4.5.5 Minor Rainfall Events

The 2yr storm event has been calculated and included in the Storm Sewer Design Sheet. Additionally a summary analysis in the table below was also completed to ensure no surface ponding will occur on private parking area and drive isle. The 2yr rainfall event calculation in the table for minor event volumes amount to a total flow of 131 L/s, therefore based on this flow, a required detention volume of approximately 70m³ will be stored in the proposed detention storage via permeable pavers and bioswales within the site development.

According to the 5yr storm event, calculation illustrates that a total flow of 177 L/s will occur within the site development. The total required attenuation volume for the 5yr event amounts to 115m³. There is partial available storage of 180m³ that can attenuate the required volume immediately within the permeable paver and the bioswales. These volumes amount to 108m³ & 72m³ respectively. Therefore, the 5yr storm event demonstrates that stormwater ponding within the parking lot will not occur due to the availability of proposed storage.

MINOR EVENT VOLUMES						
tc=15 min	**Q (L/s)**	**C**	**I (mm/hr)**	**A (ha)**	**Vol. Required (m³)**	**Vol. Provided (m³)**
2YR	131	0.75	61.77	1.05	74	374
5YR	177	0.75	83.56	1.05	117	374

4.5.6 Major Rainfall Events

The 100yr major rainfall event has been reviewed to ensure water level must not touch any part of the building envelope and to remain below the lowest building opening that is in proximity of the overland flow route or ponding area. Based on the peak volume required of 257m³ a stress test with additional 20% will amount to a volume requirement of 308m³. While the total volume provided is 374m³ the stress test with the additional 20% can be accommodated without touching any part of the building envelope. In addition, should the total volume provided becomes full, the emergency flow route will overtop along the entrance of the site and continue to flow towards the road and drain to the nearest catch basin. A Ponding Plan has been prepared to illustrate the elevation and volume of the proposed storage capacity. Refer to **Appendix A** – CD1103 - Ponding Plan.

4.5.7 High Water Level

Based on the calculated flows from the 5yr and 100yr storm event, detention volumes were able to be defined within the proposed site development. Its been determined that the minor storm event will require a total storage volume of 115m³ from a 15min rainfall duration. Due to the available detention storage from the multiple attenuation system, the volume storage within the permeable pavers and bioswales will provide sufficient accommodation for the minor rainfall event without creating a water ponding along the parking lot surface.

The calculated peak flow based on the major rainfall event have been determined to be 303 L/s during the 15min storm duration. However, the stormwater sewer design demonstrate that the modified rational method will require peak detention volume of 257m³. The total attenuation volume provided from the site development amounts to a total of 374m³. Reaching the total maximum volume will consist of water ponding within the 3 bioswales and continue to rise up to a total depth of 0.28m. At this depth, an elevation of 88.80 will provide the full potential of all detention storage within the site.

4.5.8 Storm Hydraulic Grade Line

The existing HGL was reviewed for the Wateridge Village at Rockcliffe Phase 1B along Michael Stoqua Street. The hydraulic grade line values are presented in the table below for the following existing storm manholes. To confirm that the infiltration chambers within the bioswales and to ensure that there would be no severe flooding or negative effects against the existing manhole HGL, a comparison of the lowest invert elevation of the bioswales are reviewed. The ex. storm system HGL values at Michael Stoqua demonstrates that it is not greater than 0.3m below compared to the lowest invert elevation of the bioswales, therefore proposed site condition will not negatively affect the conditions within the city's storm system. Refer to **Appendix D** for the Wateridge Village Phase 1B Drawing – Michael Stoqua Street.

	BIOSWALE 1	BIOSWALE 2	BIOSWALE 3	EX. ST MH210 HGL	EX. ST MH211 HGL
INFILTRATION INVERT	87.20	87.25	87.33	86.43	85.94

4.5.8.1 Minor Storm HGL

The analysis provided from the HGL Sewer Design Sheet included in **Appendix D** demonstrates that the 5yr storm even will not create a surcharge condition along the proposed pipes for the site development. In addition, the tie-in location at the city's storm sewer system has also been reviewed. The HGL minor storm event has been confirmed to have no surcharge conditions.

4.5.8.2 Major Storm HGL

The outcome of the results for the 100yr storm event provided from the HGL Sewer Design Sheet demonstrates that a minor surcharge is evident towards the downstream manhole at STM MH8 – STC MH1. The next downstream location is located at the tie-in, HGL results demonstrates a surcharge of 80mm. Further, review has been completed along the city's storm sewer which demonstrates a negative surcharge during the 100yr storm event. Based on these findings, the proposed site development's HGL during the 100yr storm event demonstrates that the HGL within the city's storm sewer system has the capability of receiving flow's from the proposed site without impacting the existing storm system or creating a negative impacts downstream.

5 GEOTECHNICAL CONSIDERATIONS

Paterson Group, the geotechnical consultant was retained to prepare a report for the proposed residential site development. The objective of the investigation is to report the following:

- Determine the subsurface material, groundwater conditions, provide analysis of the field investigation and laboratory sample results.
- Provide geotechnical recommendations pertaining to the overall design development of the site.

The report titled: Geotechnical Investigation, Proposed Residential Buildings 715 Mikinak Rd. Ottawa, ON, prepared for Ottawa Community Housing provides the following recommendations pertaining to:

- Site Grading
- Pavement Structure Design
- Underground Piping Construction
- Ground Water Control
- Grade Control / Excavation Slopes

Overall, the general recommendations from the geotechnical report have been taken into consideration during the design process of the site development. A copy of the complete report is included in **Appendix E.**

5.1 Foundation Drainage

A foundation drainage plan with a proposed 150mm subdrain pipe is recommended by Paterson Group.

The plan illustrates the proposed drainage for each building's foundation footing perimeter. One common storm outlet will be provided as an outflow which will drain to the proposed storm pipe connection from the building and flows to be directed towards the bioswale.

Refer Drawing CM1101 in **Appendix A** which illustrates the location of weeping tile drainage for the proposed buildings.

6 SOURCE CONTROLS

6.1 General

On site level or source control management of runoff will be provided in order to demonstrate quality control for the subject lands. Such controls or mitigative measures are proposed for the development not only for final development but also during construction and build out. Some of these measures are:

- flat lot grading;
- vegetation planting; and
- infiltration galleries for groundwater recharge.

6.2 Lot Grading

In accordance with local municipal standards, the parking lot, pathways and the depressed driveways will be graded between 0.5% and 6.0%. Most landscaped area drainage will be directed into the bioswale/bioswale drainage system and connects to the storm sewer system. Typical swales will have slopes larger than 2.0%, or 1.5% with subdrains. Copies of the grading plans have been included in **Appendix A.**

6.3 Roof Drain

For the proposed three buildings, stormwater runoff accumulated from the roof will eventually drain internally and will be directed to be captured via storm pipes provided for each of the proposed buildings. Each building has been directed to drain to each bioswale where it will be attenuated and promote infiltration to the native soils.

6.4 Low Impact Development

The City of Ottawa and CLC have agreed to pursue phased stormwater management demonstration projects for the former CFB Rockcliffe using LID Best Management Practices (BMPs). CLC's goal is for the development to be a model community for LID.

For the proposed site development, various LID measures have been included to support the CFB Rockcliffe MSS.

6.4.1 Pervious Landscape Area Drainage

As an approved LID Best Management Practices, bioswale are widely used as a stormwater management solution to treat stormwater runoff which is also capable of storage volume attenuation. The proposed bioswale for the site development will be located along the parking areas. The bioswale area will be the low point region within the subject site to promote infiltration runoffs. Below each proposed bioswale contains a level of various media which will promote water quality treatment through filtration, settling, absorption and infiltration at a slow release rate to the conveyance network. The cross-section detail of the bioswale is included in **Appendix A.**

6.4.2 Permeable Pavement

Permeable pavement will be used along the parking stall area which are typically suitable for applications to assist with drainage management and is often used as LID stormwater solution designed to control stormwater volume as well as convey stormwater runoff from one point to another.

For this project, the objective of the permeable pavement is mainly to allow surface runoff from the site development to infiltrate through the voids, which has a porosity of 30%. The cross-section detail of the permeable pavement is included in the Detail Sheet CD1102 which is included in **Appendix A.**

6.5 Building Envelope

The surrounding building envelope for the three proposed building locations have 15cm vertical clearance from finish ground elevation to finished floor elevation. The exceptions in particular are the door entrances to the buildings where the vertical clearance of 15cm will require to be ramped to provide smooth transitions for barrier free clearance routes.

From a storm ponding perspective, all building entrances for all three buildings will not be affected from the rising high-water level should a major storm event occurs. An illustration of the Ponding Plan included in **Appendix A** demonstrates that during a major storm event a ponding elevation within the parking lot would have a maximum depth elevation of 0.28m. The extent of the ponding also illustrates that its distance away from any door entrances. It should also be noted that should rising water level continues, an emergency flow route along the site entrance will relief the rising water level.

7 CONVEYANCE CONTROLS

7.1 General

Besides source controls, the site development also proposes to use several conveyance control measures to improve runoff quality. These will include:

- flat vegetated swales;
- catchbasin and maintenance hole sumps;
- area drain basin; and
- permeable pavers.

7.2 Flat Vegetated Swales

The proposed site development will make use of relatively flat vegetation within the bioswales where possible to encourage infiltration and runoff treatment.

7.3 Catch Basins

All catchbasins within the development, will be constructed with minimum 600 mm deep sumps. These sumps trap pollutants, sand, grit and debris which can be mechanically removed prior to being flushed into the minor pipe system. Both rear yard and street catchbasins will be fabricated to OPSD 705.010 or 705.020. All storm sewer maintenance holes servicing local sewers less than 900 mm diameter shall be constructed with a 300 mm sump as per City standards.

7.4 Area Drain Basin

An area drain Basin are proposed along each of the bioswales. The purpose of the area drain is to serve as an emergency inlet at the low elevations should the proposed curb cut-outs create blockages and ice jams during the thaw season. The proposed area drains are also capable of trapping pollutants, sand, grit and debris which can be mechanically cleaned due to the sump availability of the drain basin. Refer to Details 2 drawing CD1102 in **Appendix A.**

8 SEDIMENT AND EROSION CONTROL PLAN

8.1 General

The following erosion and sediment controls are proposed for implementation during construction to minimize erosion potential and soil migration from the site to adjacent lands/receiving waters:

- Install silt fence at the downslope side of disturbed areas along the perimeter of the development site, prior to the start of construction.
- Install stone mud mats at all construction entrances.
- Stockpile topsoil at designated locations and stockpiles shall be contained by silt fences on the downslope side.
- Temporary swales with check dams are to be constructed prior to the beginning of site grading.

- The accumulated silt shall be removed from all sediment control devices as required during construction and disposed in the locations approved by the City and the Conservation Authority.
- All exposed soils are to be stabilized and vegetated as soon as possible using seed and mulch application on 100 mm of topsoil, as directed by the engineer.
- Additional erosion/sediment controls may be required on site as determined by the engineer.
- No construction activity/machinery shall intrude beyond the silt fence or property limit. All construction vehicles shall enter and leave the site via the designated entrances.
- All regraded areas that are not occupied by building facility, roads, sidewalks, driveways, parks, and other services shall be covered by 100 mm topsoil and sodded/seeded immediately after completion of final grading operations, as directed by the engineer.
- All temporary erosion and sediment controls must be installed prior to the commencement of site grading, must be inspected on a regular basis and after every rainfall event, and must be cleaned and maintained as required to prevent the migration of sediment from the site.
- All temporary erosion and sediment controls must be removed after construction once the development site has been stabilized to the City's satisfaction.
- All areas disturbed by erosion or sediment control devices are to be restored with 100 mm topsoil and sodded/seeded after construction.
- The contractor shall keep public roadways free of debris during construction. Any material tracked from the site shall be promptly removed from roadways at the contractor's expenses.
- All material and workmanship shall conform to the current OPSD and standards endorsed by the City, the Conservation Authority and other regulatory agencies.
- The contractor is responsible to locate and protect all existing utilities and municipal services and make arrangements with utility companies prior to construction.
- All excavations shall be in accordance with the Ontario "Occupational Health and Safety Act", and other federal and provincial regulations related to construction projects

8.2 Trench Dewatering

During construction of municipal services, any trench dewatering using pumps will be discharged into a filter trap made up of geotextile filters and straw bales similar in design to the OPSD 219.240 Dewatering Trap. These will be constructed in a bowl shape with the fabric forming the bottom and the straw bales forming the sides. Any pumped groundwater will be filtered prior to release to the existing surface runoff. The contractor will inspect and maintain the filters as needed including sediment removal and disposal and material replacement as needed.

8.3 Bulkhead Barriers

At the first manhole constructed immediately upstream of an existing sewer, a ½ diameter bulkhead will be constructed over the lower half of the out letting sewer. This bulkhead will trap any sediment carrying flows, thus preventing any construction –related contamination of existing sewers. The bulkheads will be inspected and maintained including periodic sediment removal as needed.

8.4 Seepage Barriers

These barriers will consist of both the Light Duty Straw Bale Barrier as per OPSD 219.100 or the Light Duty Silt Fence Barrier as per OPSD 219.110 and will be installed in accordance with the sediment and erosion control drawing. The barriers are typically made of layers of straw bales or geotextile fabric staked in place. All seepage barriers will be inspected and maintained as needed.

8.5 Surface Structure Filters

All catchbasins, and to a lesser degree manhole, convey surface water to sewers. However, until the surrounding surface has been completed these structures will be covered to prevent sediment from entering the minor storm sewer system. Until landscape areas are sodded or until streets are asphalted and curbed, all catchbasins and manholes will be equipped with geotextile filter socks. These will stay in place and be maintained during construction and build until it is appropriate to remove them.

8.6 Stockpile Management

During construction of any development similar to that being proposed both imported and native soils are stockpiled. Mitigative measures and proper management to prevent these materials entering the sewer systems is needed.

During construction of the deeper municipal services, water, sewers and service connections, imported granular bedding materials are temporarily stockpiled on site. These materials are however quickly used up and generally before any catchbasins are installed. Street catchbasins are installed at the time of roadway construction and rear yard catchbasins are usually installed after base course asphalt is placed.

Contamination of the environment as a result of stockpiling of imported construction materials is generally not a concern since these materials are quickly used and the mitigative measures stated previously, especially the use of filter fabric in catchbasins and manholes help to manage these concerns.

The roadway granular materials are not stockpiled on site. They are immediately placed in the roadway and have little opportunity of contamination. Lot grading sometimes generates stockpiles of native materials. However, this is only a temporary event since the materials are quickly moved off site.

The construction of this development will involve a substantial rock blasting, breaking, and crushing operation. Given the existing topography, a substantial cut and fill operation is required to construction and development that meets City Standards. As part of this operation, materials will be manipulated onsite, and provided the sediment and erosion control measures are in place, are generally inconsequential to the surrounding environment.

9 ROADS AND NOISE ATTENUATION

Vehicular access to the proposed site development is provided by 2 private entrances. Both are located on Michael Stoqua Street.

Environmental noise study has been completed for the site development. Measures and recommendations shall refer to Noise Report – 715 Mikinak Road, Ottawa, ON, prepared by IBI Group .

10 APPROVALS AND PERMIT REQUIREMENTS

10.1 City of Ottawa

The City of Ottawa reviews all development documents including this report and working drawings. Upon completion, the City will approve the local watermains and eventually issue a Commence Work Notification.

10.2 Province of Ontario

The Ministry of Environment, Conservation and Parks (MECP) Environmental Compliance Approval is not required for the subject development.

10.3 Conservation Authority

Since no watercourses are impacted by the proposed development, no permits will be required from the local Conservation Authority (Rideau Valley Conservation Authority). Correspondence letter from RVCA has been included in **Appendix E** for reference use.

10.4 Federal Government

There are no federal permits, authorizations or approvals needed for this development.

11 CONCLUSIONS AND RECOMMENDATIONS

The material in this report reflects IBI Group's judgement considering the information available to it at the time of preparation and completion of this report. Should the above information not be accurate or current or changed, it will be necessary to reconfirm the findings of this report. Any use which a Third Party makes of this report, or any reliance or decisions to be made based on it for other than its intended purpose, are the responsibility of such Third Party. IBI Group accepts no responsibility for damages, if any, suffered by any Third Party as a result of decisions made or actions based on this report.

Water, wastewater and stormwater systems required to develop 715 Mikinak Road will be designed in accordance with MECP and City of Ottawa's current level of service requirements.

Final detail design will be subject to governmental approval prior to construction, including but not limited to the following:

- Site Plan Approval: City of Ottawa
- Water Card Data

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