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Wateridge Village
Municipal Servicing and Stormwater Management
Feasibility Study Report

Prepared by: Design Works Engineering Ltd.

Prepared for: WestUrban Developments

DW Project Number: 2021630

Date: January 11, 2023

Revision: 1

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Table of Contents

1. Introduction ... 3
1.1 Existing Conditions ... 4
1.2 Proposed Development ... 5
1.3 Permit and Approval Requirements ... 5
1.4 Geotechnical Consideration ... 6
2 References ... 6
3 Water Distribution ... 6
3.1 Water Servicing Criteria ... 6
3.2 Proposed Water Servicing ... 7
4 Sanitary Sewer ... 8
4.1 Design Criteria ... 8
4.2 Proposed Sanitary Sewer Servicing ... 9
4.3 Sanitary Capacity Analysis ... 9
5 Stormwater Management ... 10
5.1 Stormwater Management Design Criteria ... 10
5.2 Peak Storm Flow Rates ... 11
5.3 Existing Drainage Conditions ... 11
5.4 Proposed Stormwater Design ... 11
5.5 Low Impact Development (LID) Practices ... 13
6 Erosion and Sediment Control ... 15
7 Conclusion ... 16

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List of Tables

Table 1-1: Proposed Development Surface Breakdown 5

Table 3-1: Summary of Water Demand 8

Table 3-2: Available Fire Flow at Hydrants 8

Table 4-1: Wastewater Flow per Design Brief 9

Table 5-1: Proposed Development Surface Breakdown 12

Table 5-2: Post-Development Surface Type Breakdown and Runoff Coefficients 12

Table 5-3: Required Stormwater Storage Volume 13

List of Appendices

Appendix A – Domestic and Fire Water Demand Calculation Sheets

Appendix B – Sanitary System Calculation Sheets

Appendix C – Stormwater Calculation Sheets

1. Introduction

Design Works Engineering Ltd. has been retained by WestUrban Developments Ltd. to prepare a Site Servicing and Stormwater Management report for their residential project located at 1050 Tawadina Road, Wateridge Village, Ottawa, Ontario as shown in Figure 1. The site is encompassed by Tawadina Road to the North, Michael Stoqua Street to the East, a future development and Hemlock Road to the South, and Barielle Snow Street to the West. Presently, the site is vacant and located on the former CFB Rockcliffe air base site. The surrounding roads and underground services for the site have been constructed. The land has been zoned for a Mid-Rise Mixed Use.

The proposed development consists of the construction two 9-storey residential buildings with one level of underground parkade. The buildings located northwest and southeast are labelled as Building A and Building B respectively. Building A and Building B consist of 144 units and 110 units respectively, offering a total of 146 1-bedroom units and 108 2-bedroom units. This equates to an estimated occupancy of 432. This Municipal Servicing and Stormwater Management Feasibility Study Report shall identify and analyze the impact of the proposed development to municipal storm, sanitary, and water services available for the site.

This report shall be an analysis of the following:

- Analyze the impact of the proposed development to existing municipal infrastructure systems.
- Identify City of Ottawa criteria with respect to storm, sanitary and water servicing including the stormwater management criteria for the development of the site.
- Estimate the storm, sanitary, and water demands of the proposed development.
- Investigate the capacity of the existing municipal watermains and sewers.
- Provide recommendation and description of stormwater management strategy for the site with respect to quantity control, quality control, and water balance.
- Provide a site servicing strategy for the site.

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Figure 1 – Site Location

1.1 Existing Conditions

The proposed development site is identified as Parcel 1 of Block 11 within Phase 2B of the Wateridge development. The site is approximately 0.7179 ha in area and is presently vacant. The site is relatively flat and consists of grassland and granular surface. The site presently does not have any service connections. A summary of the existing sewer and water services encompassing the site are shown below.

Tawadina Road

- 400 mm diameter watermain
- 750 mm diameter storm sewer
- 250 mm diameter sanitary sewer

Barielle Snow Street

- 200 mm diameter watermain
- 525 mm diameter storm sewer
- 250 mm diameter sanitary sewer

Michael Stoqua Street

- 200 mm diameter watermain
- 375 mm diameter storm sewer
- 250 mm diameter sanitary sewer

1.2 Proposed Development

The proposed development consists of the construction of two 9-storey residential buildings. The buildings include a shared underground parkade consisting of 217 stalls. The buildings are separated by a walkway from the southwest to northeast direction. Building A is a 144 unit, 9-storey apartment building with a gross floor area of 11,318 m^2. Building B is a 110 unit, 9-storey apartment building with a gross floor area of 8,853 m^2. Vehicular access to the proposed building underground parkade will be provided via entrances located on Tawadina Road. Refer to the table below for detailed breakdown of the proposed site condition.

Table 1-1: Proposed Development Surface Breakdown

Proposed Land Use	Area (ha)
Asphalt / Concrete	0.1733
Building	0.3392
Unit Pavers	0.0455
Landscaping	0.1601
Total Site Area:	**0.7179**

1.3 Permit and Approval Requirements

The proposed development shall conform to all requirements set out by the Ontario Water Resources Act (OWRA) for both stormwater and sewage discharge.

Environmental Compliance Approval (ECA) requirements shall be discussed in subsequent submissions following discussion with the City of Ottawa.

The City of Ottawa must approve all engineering drawings and reports for the site plan control application prior to issuance of site plan control.

1.4 Geotechnical Consideration

A Geotechnical Investigation Report entitled *Proposed Mixed-Use Development Phase 2A & 2B* was prepared by Alston Associates, dated February 5, 2019, detailing geotechnical recommendations for the mixed-use development of Wateridge Village (Phase 2A and 2B). Following this investigation, a Geotechnical Investigation was prepared by Englobe Corp., dated October 11th, 2022, detailing geotechnical requirements for the subject site. The proposed design is compliant with the requirements set out in the forementioned reports.

2 References

The following technical design guidelines and standards were considered for site servicing design:

- City of Ottawa - Sewer Design Guidelines, October 2012
- City of Ottawa - Design Guidelines – Water Distribution, July 2010
- City of Ottawa - Servicing Study Guidelines for Development Applications, November 2009
- Former CFB Rockcliffe - Master Servicing Study, Revised June 2020
- Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing Memorandum, April 2022
- Geotechnical Investigation Report - Proposed Mixed-Use Development Phase 2A & 2B, Alston Associates, February 2019
- Geotechnical Investigation, Englobe Corp., October 11th, 2022
- Toronto and Region Conservation Authority (TRCA) & Credit Valley Conservation (CVC) Low Impact Development Stormwater Management Planning and Design Guide, 2010
- Ministry of Environment, Conservation and Park (MECP) Guidelines for the Design of Water Systems, 2008
- MECP Guidelines for the Design of Sanitary Sewage Systems, 2008
- MECP Stormwater Planning and Design Manual, 2003
- MTO Drainage Design Manual, 1997
- Ontario Building Code, 2010

3 Water Distribution

3.1 Water Servicing Criteria

The City of Ottawa's Design Guidelines – Water Distribution (2010) and Fire Underwriters Survey (FUS, 2020) guidelines were used to analyze the water demand from the proposed development.

The criteria are summarized as follows:

- Water demand used for watermain size selection should be sufficient to satisfy the greater of maximum day demand plus fire flow or peak hour demand
- Minimum pipe size of 150 mm

- Minimum pipe cover of 2 m
- Average domestic water demands of 280 liters per capita per day
- Peaking Factor, Maximum Residential Day Demand of 2.5
- Peaking Factor, Maximum Residential Hour Demand of 5.5
- A unit density for 1-bedroom and 2-bedroom of 1.4 PPU and 2.1 PPU, respectively
- A minimum pressure of 140 kPa (20 psi)
- A maximum residual pressure of 552 kPa
- An operating pressure under maximum daily flow of 345 – 552 kPa
- A minimum pressure during maximum hourly flow of 276 kPa (40 psi)
- For service area with a demand above 50,000 L/day, a minimum 2 feeds is to be provided to avoid service disruption

3.2 Proposed Water Servicing

The proposed development consists of 146 one-bedroom units and 108 two-bedroom units, equating to an estimated occupancy of 432. Two new 200 mm diameter connections will be installed to service both buildings, one connecting to the existing 400 mm diameter watermain on Tawadina Road and another connecting to the existing 200 mm diameter watermain on Michael Stoqua Street. The new connection will require a valve at the property line and a detector check valve inside the proposed mechanical room. The exact location, pressure and size of the connection shall be confirmed with the mechanical engineer during detailed design.

The site is surrounded by four existing fire hydrants, one located on Barielle Snow Street, two on Tawadina Road, and one on Michael Stoqua Street. The hydrants are spaced less than 90 m apart, meeting the requirement of Table 4.9 of the City of Ottawa - Design Guidelines – Water Distribution, July 2010.

Based on the City of Ottawa - Design Guidelines – Water Distribution, the required average daily demand is 1.40 L/s, the required maximum day demand is 3.50 L/s, and the peak hour demand is 7.70 L/s. Calculations for fire flows using the Fire Underwriters Survey (FUS) indicate a maximum required fire flow of approximately 316.67 L/s (19,000 L/min or 5,019.28 US GPM) for Building A and approximately 250.00 L/s (15,000 L/min or 3,962.59 US GPM) for Building B, based on a non-combustible construction with a sprinkler system designed to NFPA. Since the fire flow calculation for the Building A yields a higher demand, the required fire flow for Building A will be used in subsequent calculations. Refer to Appendix A for detailed water demand calculations.

As per Section 4.1, the water demand for the proposed development is the greater of maximum day demand plus fire flow or peak hour demand. Therefore, the maximum day demand plus fire flow demand (3.50 L/s + 316.67 L/s = 320.17 L/s = 19,210 L/min = 5,075 US GPM) is the governing requirement. Refer to Table 3-1 for the summarized water demand requirement.

According to the Master Servicing Study completed by IBI dated June 2020, Nodes N046 and N048 as shown in *Appendix C – Water Distribution System: Hydraulic Modeling Results* indicates the hydrant closest to the proposed connections for the site. The available fire flow for these two hydrants is also tabulated in the report. The available flow for nodes N046 and N048 at 20 psi is 26,690 L/min and 27,290 L/min as shown in Table 3-2, which is greater than the required domestic and fire demand of 19,210 L/min. Therefore, adequate water supply and pressure are available to serve the proposed development.

Table 3-1: Summary of Water Demand

Design Parameter	Demand (L/s)
Average Day	1.40
Maximum Day	3.50
Peak Hour	7.70
Fire Flow Building A	316.67
Fire Flow Building B	250.00
Total Water Demand*	320.17

***Total Water Demand calculated as the fire flow (higher of the two buildings) + maximum day flow (total of two buildings)**

Table 3-2: Available Fire Flow at Hydrants

Street Name	Available Fire Flow at 20 Psi (L/min)	Required Fire Flow (L/min)
Tawadina Road (N046)	26,690	19,000
Tawadina Road (N048)	26,290	

Moreover, based on the Block 11 – Parcel 1 Site Plan Submission Technical Memorandum prepared by IBI group dated November 23, 2022, the basic day pressures range from 551.6 kPa to 555.0 kPa on Tawadina Road; the peak hour pressures range between 498.8 kPa and 508.1 kPa; and the fire flows available during maximum day demand range between 462.6 L/s and 850.5 L/s. Since the peak hour pressure exceed 276 kPa as per City's criteria and the available fire flow exceeds the required fire flow rate of 320.17 L/s, the water distribution system surrounding the proposed development is adequate to support the proposed development.

4 Sanitary Sewer

4.1 Design Criteria

The City of Ottawa - Sewer Design Guidelines (2012) was used to analyze the sanitary demand from the proposed development. The City's criteria are summarized as follows:

- A unit density for 1-bedroom and 2-bedroom of 1.4 PPU and 2.1 PPU respectively.

- Average wastewater flow for residential occupancy of 280 liters per capita per day.
- Peaking factor for domestic wastewater flow is calculated by the Harmon Equation of [$M = 1+ (14/(4+(P/1000)^{0.5})$ *K].
- A minimum and maximum value of Harmon's peaking factor of 2.0 and 4.0, respectively.
- A Harmon correction factor of 0.8 for residential developments.
- A dry weather, wet weather, and a total infiltration rate of 0.05 L/s/ha, 0.28 L/s/ha, and 0.33 L/s/ha respectively.
- Sanitary sewers were sized using Manning's Equation of [$Q=(1/n)*A*R^{2/3}S^{1/2}$].
- Minimum Full Flow Velocity and Maximum Full Flow Velocity of 0.6 m/s and 3.0 m/s respectively.
- A minimum pipe size of 200 mm (150 mm for building service connections).

4.2 Proposed Sanitary Sewer Servicing

The proposed sanitary sewer connection is proposed to tie-in to the 250 mm sanitary sewer on Tawadina Road. The proposed sewer service shall be a 150 mm pipe at a 1% slope flowing at 15.9% capacity, which shall discharge via a sanitary control manhole at the property line. The proposed sanitary sewer service connection shall tie-in to the existing 250 mm sanitary sewer on Tawadina Road via a proposed manhole.

The estimated total peak sanitary flow for the proposed development is 5.00 L/s. Sanitary flow calculations for the pre-development and proposed development are shown in Appendix B.

Table 4-1: Wastewater Flow per Design Brief

Design Parameter	Value
Estimated Average Dry Weather Flow (L/s)	0.04
Estimated Peak Dry Weather Flow (L/s)	0.20
Estimated Peak Wet Weather Flow (L/s)	0.24
Harmon's Peaking Factor	3.4
Total Domestic Wastewater Flow (L/s)	4.77
Total Design Wastewater Flow (L/S)	5.00

4.3 Sanitary Capacity Analysis

The proposed development will result in an increase in sanitary flow to the 250 mm sanitary sewer along Tawadina Road and the downstream 250 mm sanitary sewer located on Barrielle Snow Street.

Based on the Master Servicing Study completed by IBI dated June 2020, MH312A shown in Figure 5.1 of *Appendix D – Wastewater Collection System: Supporting Information* is located directly downstream of the proposed development. Based on the Sanitary Sewer Design Sheets provided in *Appendix D –*

Wastewater Collection System: Supporting Information, MH312A has an available capacity of 10.91 L/s. As such, the available capacity of the existing sanitary sewer is sufficient to accommodate the additional wastewater flow of 5.00 L/s from the proposed development.

An updated analysis was completed by IBI Group to determine the ability of the existing sanitary sewer system to accommodate the proposed development and the results are included in the Block 11 – Parcel 1 Site Plan Submission Technical Memorandum dated November 23, 2022. Based on the analysis, the wastewater flows in the Tawadina Road sewer from MH303A to MH304A is 7.96 L/s, with a spare capacity of 23.06 L/s. The sewer downstream of the Tawadina Road sewer, along Barielle Snow Street, from MH304A to MH308A has a wastewater flow of 26.80 L/s, with a spare capacity of 12.93 L/s. As such, it is IBI Group's opinion that the existing sanitary sewers in Tawadina Road and Barielle Snow Street can accommodate the sanitary flow from the proposed development.

5 Stormwater Management

5.1 Stormwater Management Design Criteria

To ensure that the proposed development does not introduce excess flow into existing stormwater management infrastructure, the proposed development shall control stormwater discharge to be less than or equal to the allowable release rate as stated by the Master Servicing Study completed by IBI dated June 2020 and the subsequent Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing Memorandum dated April 2022. The stormwater management system proposed shall conform to both the quality and quantity control requirements. The subsequent sections provide estimates of the pre-development and post-development storm runoff volume and details of the proposed stormwater management system.

The stormwater management (SWM) plan for the proposed development shall conform the criterion and/or guidelines from the City of Ottawa Sewer Design Guidelines and MECP for the Design of Water Systems. A summary of the stormwater management criteria applied for this development is provided as follows:

- Water Quality Control: Provide long-term average removal of 80% of Total Suspended Solids (TSS).
- Design storm event of 1-in-2-year, 1-in-5-year, and 1-in-100-year storm shall be considered.
- Overland flow shall have a safe route for flows greater than 100-year storm events.
- A time of concentration and inlet time of 10 minutes were considered for calculations.
- A 25% growth factor is added to runoff coefficient for 100-year storm.
- A minimum pipe velocity 0.8 m/s.
- A maximum pipe velocity of 3.0 m/s.

5.2 Peak Storm Flow Rates

Peak flow rate can be calculated using the following equations:

Rational Formula: $Q = 2.78\ CiA\ (L/s)$

Where: $C =$ runoff coefficient;
$i =$ rainfall intensity (mm/hour); and
$A =$ site area (ha).

IDF Curve Equation: $i = [\frac{A}{Td+C^B}]$

Where: $A, B, C =$ regression constants for each return period;
$Td =$ Time of duration (min)

5.3 Existing Drainage Conditions

Based on the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing Memorandum dated April 2022, minor storm runoff from Parcel 1 of Block 11 has been designed to drain to Barielle Snow Street, with major flow tipping to Barielle Snow Street at Hemlock Road. Based on the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing Memorandum, the minor system capture by MH309 on Barielle Snow Street is limited to 195 L/s between 5- and 100-year design storm event and the required on-site storage is 43 m^3 up to the 100-year design storm event. Based on the Pre-Application Consultation Meeting Notes dated July 21, 2022, when underground storage is used, the City of Ottawa require that an average release rate equal to 50% of the peak allowable rate shall be applied to estimate the required volume. As such, the allowable release rate is limited to 97.5 L/s.

The site is graded southeast direction towards Barielle Snow Street with a mild slope less than 5% consisting of granular and grass surface.

5.4 Proposed Stormwater Design

The proposed development is split into three sub-catchments. Sub-Catchment 1 (SC#1) consist of the area outside of Building 1’s façade facing Barielle Snow Street and Tawadina Road, west of the proposed underground parkade entrance; Sub-Catchment 2 (SC#2) consist of the area outside of Building 1’s façade facing Tawadina Road, east of the proposed underground parkade entrance, and area outside of Building 2’s building façade. These two sub-catchments cannot be controlled and shall flow away from the proposed building and be directed to the surrounding municipal right-of-way. Stormwater runoff from these two sub-catchments will be captured by catchbasins along the surrounding municipal right-of-way.

Sub-Catchment 3 (SC#3) consists of the remaining of the proposed development site, consisting of the two proposed buildings, the central courtyard and the proposed surface parking. To ensure that the total peak runoff does not exceed the allowable release rate of the site, Sub-Catchment 3 shall be

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overcontrolled. Stormwater will be stored in the proposed cistern located in the underground parkade and release to the storm sewer along Barielle Snow Street via a control orifice.

The proposed development proposes five area drains at the center of the property that shall flow into the cistern located in the underground parkade for water quantity control. The overland flow shall be designed to inlet into the proposed area drains while ensuring ponding is below 0.3 m of the Building Finished Floor Elevation (FFE). Runoff produced by the roof shall be conveyed via roof drains into the infiltration chamber located at the southwest corner of the site for infiltration, erosion, and water quality LID Design Target. A breakdown of the surface conditions of the proposed development is presented in Table 5-1.

A 300 mm storm sewer is proposed at a 2% slope to connect into the existing MH309 on Barielle Snow Street, which is connected to the 525 mm diameter storm sewer flowing south along Barielle Snow Street.

Refer to the table below for detailed breakdown of the proposed site condition. The proposed site has a composite runoff coefficient of 0.76 and 0.85 for a 100-year storm. The stormwater management calculations, catchments, and plan are shown in Appendix C.

Table 5-1: Proposed Development Surface Breakdown

Surface Type	Area (ha)	C	C (100-year)
Asphalt / Concrete	0.1733	0.90	1.00
Building	0.3392	0.90	1.00
Landscaping	0.1601	0.25	0.31
Pavers	0.0455	0.90	1.00
Total	**0.7179**	**0.76**	**0.85**

The peak runoff for a 100-year storm for SC#1, SC#2, and SC#3 is 20.97 L/s, 30.92 L/s, and 249.63 L/s respectively. A summary of the surface breakdown for each catchment is shown in Table 5-2.

Table 5-2: Post-Development Surface Type Breakdown and Runoff Coefficients

Surface Type	Total Site Area		SC#1		SC#2		SC#3	
	Area (ha)	C	Area (ha)	C	Area (ha)	C	Area (ha)	C
Asphalt/ Concrete	0.1733	0.90	0.0370	0.90	0.0463	0.90	0.0900	0.90
Building	0.3392	0.90	-	-	-	-	0.3392	0.90
Landscaping	0.1601	0.25	0.0169	0.25	0.0515	0.25	0.0917	0.25
Pavers	0.0455	0.90	-	-	-	-	0.0455	0.90
Total	**0.7179**	**0.76**	**0.0539**	**0.70**	**0.0978**	**0.56**	**0.5563**	**0.79**

Based on the allowable discharge rate, the stormwater storage requirements for Sub-Catchment SC#3 at different storm events are summarized in Table 5-3. This storage shall be stored and controlled via the proposed cistern and orifice pipe located in the underground parkade.

Table 5-3: Required Stormwater Storage Volume

	Return Period			
	5-year	10-year	50-year	100-year
Required Storage Volume SC#3 (m^3)	44.83	59.79	95.79	134.24

Although the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing Memorandum dated April 2022 identified a required on-site storage of 43 m^3 for the 100-year design storm event, since the above calculation indicated a higher on-site storage requirement of 134.24 m^3, the higher value of 134.24 m^3 will be used for the stormwater storage requirements. Detail regarding the cistern and the orifice control will be provided in subsequent submissions.

The major system flow has been designed to be directed towards Barielle Snow Street, which shall flow south towards Hemlock Road. The major system flow from Hemlock Road will flow west onto Codd's Road then ultimately flow into the existing Park Dry Pond located south as shown in Appendix C.

5.5 Low Impact Development (LID) Practices

LID measures are proposed in accordance with the Wateridge Phase 2B LID Developer's Checklist as shown in Appendix D. The LID Design Target for Infiltration and Erosion is 4 mm applied over the full catchment area of 0.7179 ha; and the LID Design Target for Water Quality is a minimum of 15 mm applied over contributing impervious area. Based on the total site area of 0.7179 ha, the runoff volume from a 4 mm rainfall event over the entire catchment area equates to 28.72 m^3; Based on the impervious area of 0.5579 ha, the runoff volume from a 15 mm rainfall event over the impervious area of the site equates to 83.68 m^3.

Various LID lot-level controls were investigated to determine the suitability of the design for the proposed development as follows:

- **Green Roof:** Green roofs consist of a thin layer of vegetation and growing medium installed on top of a conventional flat roof, which can provide water balance and water quality benefit. According to Table 4.1: Low Impact Development (LID) Suitability Matrix by Land-Use in the Wateridge Phase 2B LID Developer's Checklist, green roofs for low and medium rise mixed use developments are poorly suited for this type of proposed development. Additionally, the installation of a green roof will incur significant cost to the proposed development as well as costs associated with long term maintenance and operation of the green roof. For these reasons, a green roof is not proposed for the development.

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- **Bioretention:** Bioretention is a vegetated stormwater practice that can capture, temporarily store, and treats stormwater runoff by passing it through engineered filter media. Although the bioretention cell can provide filtration for water quality treatment, since the underground parking garage will occupy the entirely of the proposed development area, infiltration of filtered water into native soils is not feasible. Therefore, the use of bioretention in the central courtyard to provide infiltration and erosion control is also not suitable for the proposed development.
- **Rainwater Harvesting:** Rainwater harvesting is a practice to intercept, divert, and store rainfall runoff to the proposed cistern for future use. According to Table 4.1: Low Impact Development (LID) Suitability Matrix by Land-Use in the Wateridge Phase 2B LID Developer's Checklist, rainwater harvesting is identified as a "Poor Suitability" LID lot-level control for this type of development. The installation of this system will incur significant cost to the development. Therefore, the use of rainwater harvesting is also not suitable for the proposed development.
- **Infiltration Chamber:** Infiltration chambers work exclusively to infiltrate stormwater into native soil. An infiltration chamber is proposed at the southwest corner of the proposed development. To prevent damage to building foundation, infiltration chambers are required to be setback by 4m away from the building foundation or, if 4m cannot be accommodated, to include an impermeable barrier proximal to the building side of the infiltration system. Moreover, based on the TRCA/CVC LID Stormwater Management Planning and Design Guide, the impervious drainage area to the area of infiltration system should be between 5:1 and 20:1. As such, based on the impervious area of 0.5579 ha, the area of the proposed infiltration system should be between 1115.7 m^2 and 278.9 m^2.

  Since the underground parking garage will occupy almost the entirely of the proposed development area in order to comply with the off-street parking regulation required by the City of Ottawa, it is not possible to provide 4m setback from the building foundation while providing the required footprint for the infiltration system. As such, waterproofing of the building foundation will be required. Based on project of similar nature in the vicinity of the proposed development, it is expected that the proposed development will require waterproofing with a thickness of approximately 1m. As such, the proposed infiltration system is designed to set back 2m away from the building foundation to allow for proper separation away from the waterproofing layer. Based on the above, it is expected that the proposed infiltration chamber will provide a minimum storage requirement of 83.68 m^3 with a footprint of approximately 288 m^2. Further design detail of the proposed infiltration chamber and the proposed developments hydrogeological condition will be provided in subsequent submissions.
- **Downspout Disconnection:** Downspout disconnection involves redirection of flow from downspouts to a pervious area in order to prevent stormwater from directly entering the drainage system or flowing across an impervious surface. The proposed development will install rainwater leaders directly into the proposed cistern to prevent water from flowing across

impervious surface. Water will be controlled within the proposed cistern to provide quantity control.

- **Permeable Pavements:** Permeable pavements can be used as an alternative to traditional impervious pavement for low traffic surface for infiltration into the underlying soil. However, since the underground parking garage will occupy the entirety of the proposed development area in order to comply with the City of Ottawa off-street parking requirements, water will not be able to infiltrate into native soil. Therefore, the use of permeable pavements is not suitable for the proposed development.

6 Erosion and Sediment Control

During construction, several control measures will be implemented to prevent the sediment suspended in storm runoff from discharging onto the adjacent private properties, roadways, and into the underground storm and sanitary system.

The measures to be used include silt fencing around the perimeter of the site, catch basin inlet protection via filter fabric, and mud mats. The following is a summary of the control measures that must be implemented during construction:

- Silt Fencing to be installed along all property lines where flow is exiting the construction site and surrounding soil stockpiles.
- Inlet socks shall be used as Catch Basin Inlet Protection for all catch basins installed on site and adjacent streets during construction.
- All exposed soil shall be stabilized with seed or mulch as soon as possible.
- No construction activity is to be done outside of the area enclosed by silt fences.
- All construction vehicles are to enter and exit the property at a designated location where mud mats are installed.
- All control measures are to be inspected weekly, after every storm event, and after any snowmelt event and should maintained within 24 hours of discovery of damage or major accumulation.

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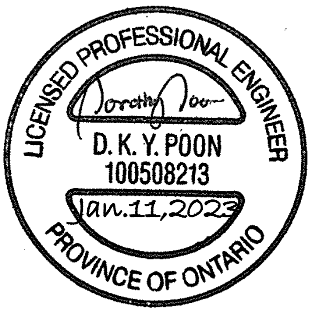
7 Conclusion

The report has been completed with the intention of being included in an overall package for Site Plan Control Application submission for the proposed development. This report should not be used for any other unauthorized uses. If any discrepancies or issues arise, please contact the undersigned.



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Appendix A

Domestic and Fire Water Demand Calculation Sheets

DesignWorks Engineering	Summary			
	Prepared:	B.B.	Page No.	A-01
	Checked:	D.P.		
Project: 1050 Tawadina Road, Waterigde Village, Ottawa	Proj. #	2021630		
	Date:	Oct 24, 22		

Fire Flow Building A

F =	19000	L/min
=	316.67	L/s
=	5019.28	US GPM

Fire Flow Building B

F =	15000	L/min
=	250.00	L/s
=	3962.59	US GPM

Domestic Flow Building 1/2

Maximum Daily Domestic Demand =	302400	L/min
=	3.50	L/s
=	55.48	US GPM

Total Water Demand

Total Demand Flow =	**320.17**	L/s
=	**19210.00**	L/min
=	**5074.76**	US GPM

* Largest Fire Flow From Both Buildings Dictated Total Water Demand

DesignWorks Engineering	Fire Flow Calculations		
	Prepared: B.B	Page No.	A-02
	Checked: D.P.		
Project: 1050 Tawadina Road, Waterigde Village, Ottawa	Proj. # 2021630		
	Date: Oct 24, 22		

Building A

Type of Construction: Non-Combustible

C= 0.8

Building Area

	Area (m^2)
For Construction Coefficient Less than 1.0	
Adjacent Floor Below	19395.0
Largest Floor	21080
Adjacent Floor Above	21057
Floor Area	31193
Total Number of Storey	9
Total GFA Above Ground	115719

Fire Flow (F1)

Fire Flow Formula, F=	220 x C x ($A^{0.5}$)	
=	31084.31	L/min
Round to nearest 1000 L/min =	31000	L/min

Type of Occupancy (F2)

Type of Occupancy =	Non-Combustible	
Adjustment Percentage =	-25%	
Occupancy Adjustment =	-7750	L/min
F2 =	23250	L/min

Sprinkler Adjustment (F3)

Automatic Sprinkler =	Yes	
Adjustment Percentage =	-40%	
Occupancy Adjustment =	-9300	L/min
F3 =	13950	L/min

Fire Separation (F4)

Separation Charge	Charge (%)	Separation (m)	Separation Range
North	0%	N/A	>30 m
South	20%	6.208	3.1 - 10 m
East	0%	N/A	>30 m
West	0%	N/A	>30 m
Total Separation Charge =	20%		
=	4650	L/min	

Total Fire Water Demand

Total Fire Water Demand =	18600	L/min
Round to nearest 1000 L/min =	**19000**	**L/min**
=	**316.67**	**L/s**
=	**5019.28**	**US GPM**

DesignWorks Engineering	Fire Flow Calculations			
	Prepared:	B.B	Page No.	A-03
	Checked:	D.P.		
Project: 1050 Tawadina Road, Waterigde Village, Ottawa	Proj. #	2021630		
	Date:	Oct 24, 22		

Building B

Type of Construction: Non-Combustible

C= 0.8

Building Area

	Area (m^2)
For Construction Coefficient Less than 1.0	
Adjacent Floor Below	13633.0
Largest Floor	13633
Adjacent Floor Above	12639
Floor Area	20201
Total Number of Storey	9
Total GFA Above Ground	86124

Fire Flow (F1)

Fire Flow Formula, F=	220 x C x ($A^{0.5}$)	
=	25014.92	L/min
Round to nearest 1000 L/min =	25000	L/min

Type of Occupancy (F2)

Type of Occupancy =	Non-Combustible	
Adjustment Percentage =	-25%	
Occupancy Adjustment =	-6250	L/min
F2 =	18750	L/min

Sprinkler Adjustment (F3)

Automatic Sprinkler =	Yes	
Adjustment Percentage =	-40%	
Occupancy Adjustment =	-7500	L/min
F3 =	11250	L/min

Fire Separation (F4)

Separation Charge	Charge (%)	Separation (m)	Separation Range
North	20%	6.2	3.1 - 10 m
South	0%	N/A	>30 m
East	0%	N/A	>30 m
West	0%	N/A	>30 m
Total Separation Charge =	20%		
=	3750	L/min	

Total Fire Water Demand

Total Fire Water Demand =	15000	L/min
Round to nearest 1000 L/min =	**15000**	**L/min**
=	**250.00**	**L/s**
=	**3962.59**	**US GPM**

DesignWorks Engineering	Domestic Water Demand			
	Prepared:	B.B	Page No.	A-04
	Checked:	D.P.		
Project: 1050 Tawadina Road, Waterigde Village, Ottawa	Proj. #	2022104		
	Date:	Oct 24, 22		

Fire Flow

Total GFA =	115719	m^2
Total Population =	432	persons
Average Day Consumption =	280	L/cap/day

Peaking Factor

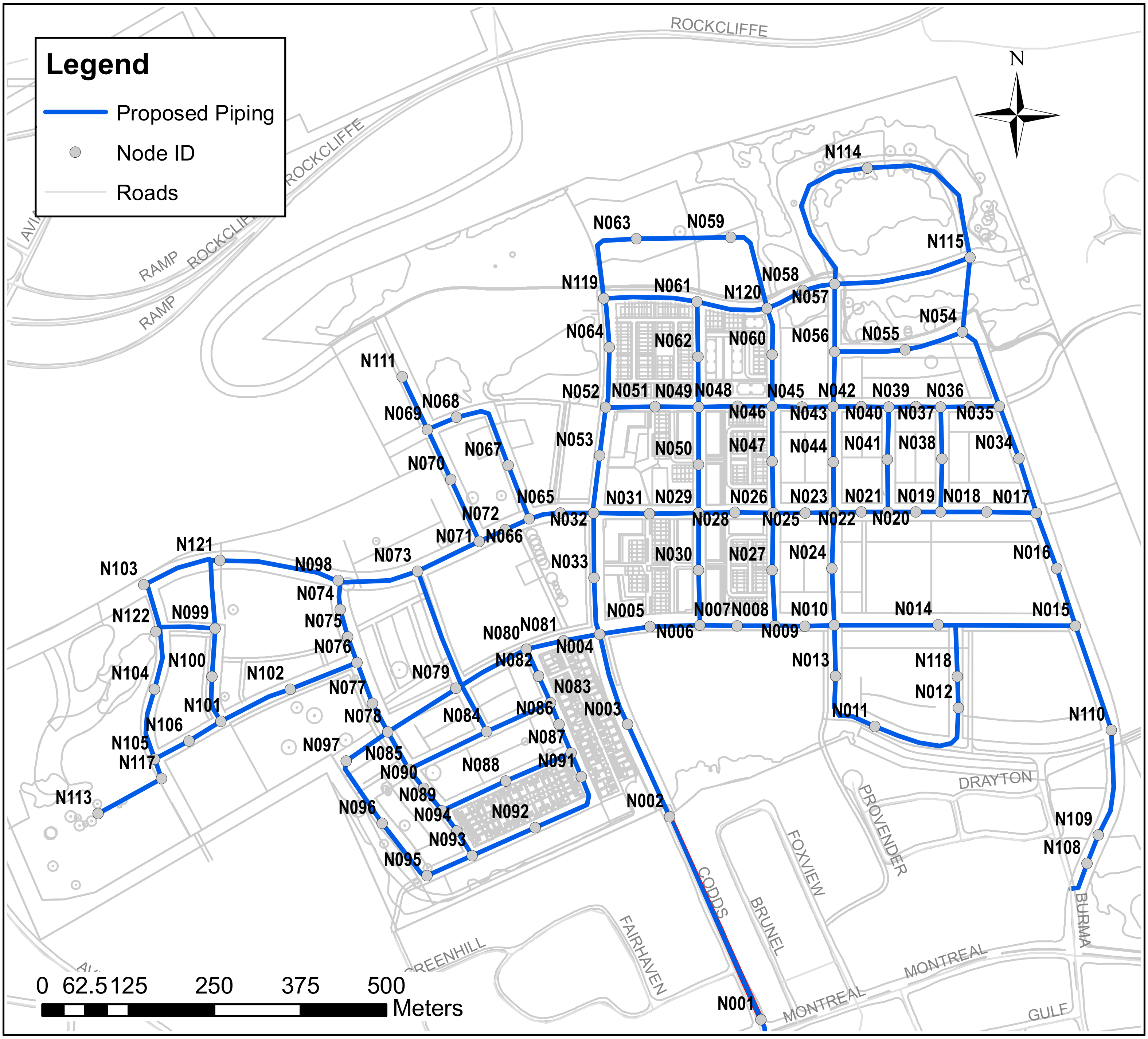
Max Day =	2.5
Peak Hour =	5.5

Total Water Demand

Average Domestic Water Demand =	**120960**	L/day
=	**1.40**	L/s
=	**22.19**	US GPM

Maximum Day Domestic Water Demand =	**302400**	L/day
=	**3.50**	L/s
=	**55.48**	US GPM

Peak Hour Domestic Water Demand =	**665280**	L/day
=	**7.70**	L/s
=	**122.05**	US GPM


Legend
Proposed Piping
Node ID
Roads
N
ROCKCLIFFE
RAMP
DRAYTON
PROVENDER
FOXVIEW
BRUNEL
CODDS
FAIRHAVEN
GREENHILL
MONTREAL
GULF
BURMA
0 62.5 125 250 375 500
Meters

BSDY & MXDY Analysis with MRPS at Max. Discharge HGL = 147m

	BSDY		MXDY	
ID	**Max Pressure (psi)**	**Min Pressure (psi)**	**Max Pressure (psi)**	**Min Pressure (psi)**
N001	62.99	55.65	62.98	56.39
N002	72.31	64.97	72.31	65.71
N003	82.44	75.08	82.43	75.82
N004	84.74	77.37	84.74	78.11
N005	84.90	77.53	84.90	78.27
N006	83.19	75.82	83.19	76.56
N007	83.19	75.82	83.19	76.55
N008	82.60	75.23	82.60	75.96
N009	83.18	75.81	83.18	76.55
N010	81.92	74.55	81.92	75.29
N011	81.21	73.84	81.21	74.58
N012	81.21	73.85	81.21	74.58
N013	81.93	74.56	81.93	75.30
N014	79.65	72.29	79.65	73.03
N015	78.06	70.72	78.06	71.46
N016	76.52	69.17	76.52	69.91
N017	75.83	68.46	75.83	69.20
N018	75.66	68.29	75.66	69.03
N019	76.21	68.83	76.20	69.57
N020	77.39	70.01	77.39	70.75
N021	77.85	70.47	77.85	71.21
N022	78.92	71.55	78.92	72.28
N023	80.58	73.20	80.58	73.94
N024	82.20	74.82	82.20	75.56
N025	82.28	74.90	82.27	75.63
N026	83.14	75.76	83.14	76.50
N027	84.13	76.76	84.13	77.49
N028	83.52	76.14	83.51	76.87
N029	83.61	76.23	83.60	76.96
N030	84.36	76.98	84.36	77.72
N031	84.15	76.77	84.15	77.51
N032	84.17	76.79	84.17	77.53
N033	84.68	77.30	84.68	78.04
N034	75.97	68.60	75.97	69.34
N035	76.76	69.39	76.76	70.13
N036	76.81	69.43	76.81	70.17
N037	76.88	69.50	76.88	70.24
N038	76.47	69.09	76.47	69.83
N039	77.31	69.93	77.31	70.67
N040	77.85	70.47	77.85	71.21
N041	78.20	70.82	78.20	71.56
N042	78.09	70.71	78.09	71.45
N043	78.22	70.85	78.22	71.58
N044	80.52	73.14	80.52	73.88
N045	79.72	72.34	79.72	73.08
N046	82.48	75.10	82.48	75.84
N047	81.99	74.61	81.99	75.35
N048	81.87	74.49	81.87	75.23
N049	82.03	74.65	82.03	75.38

ID	Static Demand (Lpm)	Static Pressure (psi)	Static Head (m)	Fire-Flow Demand (Lpm)	Residual Pressure (psi)	Available Flow at Hydrant (Lpm)	Available Flow Pressure (psi)
N043	0.20	78.2	147.0	13,000	56.9	24,887	20
N044	0.20	80.5	147.0	13,000	58.2	24,323	20
N045	0.20	79.7	147.0	13,000	58.3	25,466	20
N046	0.20	82.5	147.0	13,000	61.1	26,690	20
N047	0.20	82.0	147.0	13,000	53.4	19,004	20
N048	0.20	81.9	147.0	13,000	60.4	26,290	20
N049	0.20	82.0	147.0	13,000	60.5	26,368	20
N050	0.20	81.4	147.0	13,000	52.9	18,940	20
N051	0.20	82.1	147.0	13,000	60.6	26,315	20
N052	0.17	80.6	147.0	13,000	59.2	25,799	20
N053	0.17	82.8	147.0	13,000	61.4	26,838	20
N054	0.20	80.0	147.0	13,000	56.8	22,758	20
N055	0.20	80.1	147.0	13,000	49.1	18,127	20
N056	0.20	81.6	147.0	13,000	59.1	24,553	20
N057	0.20	86.8	147.0	13,000	64.2	26,500	20
N058	0.20	85.1	147.0	13,000	62.0	25,281	20
N059	0.20	79.6	147.0	13,000	39.9	15,951	20
N060	0.20	82.8	147.0	13,000	54.5	19,377	20
N061	0.20	82.3	147.0	13,000	58.8	23,498	20
N062	0.20	80.8	147.0	13,000	51.9	18,751	20
N063	0.20	83.7	147.0	13,000	43.5	16,420	20
N064	0.17	83.8	147.0	13,000	60.6	24,487	20
N065	0.17	84.1	147.0	13,000	61.4	25,452	20
N066	0.17	84.2	147.0	13,000	60.7	24,282	20
N067	0.17	82.5	147.0	13,000	44.8	16,782	20
N068	0.17	86.3	147.0	13,000	42.0	15,966	20
N069	0.17	87.4	147.0	13,000	43.6	16,196	20
N070	0.17	83.1	147.0	13,000	43.8	16,519	20
N071	0.17	85.8	147.0	13,000	61.5	24,009	20
N072	0.17	83.9	147.0	13,000	59.8	23,443	20
N073	0.17	88.3	147.0	13,000	63.7	24,562	20
N074	0.17	90.1	147.0	13,000	62.9	22,377	20
N075	0.17	90.4	147.0	13,000	47.0	16,638	20
N076	0.17	89.9	147.0	13,000	62.6	22,252	20
N077	0.17	88.0	147.0	13,000	61.8	22,691	20
N078	0.05	88.1	147.0	13,000	63.0	24,005	20
N079	0.05	87.3	147.0	13,000	63.0	24,596	20
N080	0.05	86.1	147.0	13,000	62.4	24,832	20
N081	0.05	85.5	147.0	13,000	62.8	25,988	20
N082	0.05	85.6	147.0	13,000	61.0	23,529	20
N083	0.05	85.6	147.0	13,000	60.8	23,337	20
N084	0.05	86.9	147.0	13,000	62.1	23,782	20
N085	0.05	87.7	147.0	13,000	62.6	23,773	20

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Appendix B

Sanitary System Calculation Sheets

DesignWorks Engineering	Land Use			
	Prepared:	D.P.	Page No.	C-01
	Checked:	H.B.		
Project: 1050 Tawadina Road	Proj. #	2021630		
Waterigde Village, Ottawa	Date:	Jan 11, 23		

EXISTING CONDITIONS:

Existing Land Use	Area (ha)
Total Site Area:	0.7179

PROPOSED DEVELOPMENT:

Proposed Land Use	Area (ha)
Total Site Area	
Asphalt / Concrete	0.1733
Building	0.3392
Pavers	0.0455
Landscaping	0.1601
Total Site Area	**0.7179**
Sub-Catchment #1	
Asphalt / Concrete	0.0370
Landscaping	0.0169
Sub-Catchment #1 Area	**0.0539**
Sub-Catchment #2	
Asphalt / Concrete	0.0463
Landscaping	0.0515
Sub-Catchment #2 Area	**0.0978**
Sub-Catchment #3	
Asphalt / Concrete	0.0900
Building	0.3392
Landscaping	0.0917
Pavers	0.0455
Sub-Catchment #3 Area	**0.5663**

DesignWorks Engineering	Composite "C" Calculation		
	Prepared: D.P.	Page No.	C-02
	Checked: H.B.		
Project: 1050 Tawadina Road Waterigde Village, Ottawa	Proj. # 2021630		
	Date: 11-Jan-23		

Pre-Development Composite Runoff Coefficient "C"

	Area (ha)	C
Total Site Area:	**0.7179**	**0.80**

*The runoff coefficient for this site development is based on Storm Drainage Area Plan by IBI Group, September 10th, 2019

Post-Development Composite Runoff Coefficient "C"

Sub-Catchment #1

Location	Area (ha)	C	C (100-yr)
Asphalt / Concrete	0.0370	0.90	1.00
Landscaping	0.0169	0.25	0.3125
Sub-Catchment #1 Area	**0.0539**	**0.70**	**0.78**
Imperviousness Percent:		68.7	

Sub-Catchment #2

Location	Area (ha)	C	C (100-yr)
Asphalt / Concrete	0.0463	0.90	1.00
Landscaping	0.0515	0.25	0.3125
Sub-Catchment #2 Area	**0.0978**	**0.56**	**0.64**
Imperviousness Percent:		47.3	

Sub-Catchment #3

Location	Area (ha)	C	C (100-yr)
Asphalt / Concrete	0.0900	0.90	1.00
Building	0.3392	0.90	1.00
Landscaping	0.0917	0.25	0.3125
Pavers	0.0455	0.90	1.00
Sub-Catchment #3 Area	**0.5663**	**0.79**	**0.89**
Imperviousness Percent:		83.8	

Total Site Area

Location	Area (ha)	C	C (100-yr)
Asphalt / Concrete	0.1733	0.90	1.00
Building	0.3392	0.90	1.00
Landscaping	0.1601	0.25	0.3125
Pavers	0.0455	0.90	1.00
Total Site Area	**0.7179**	**0.76**	**0.85**
Imperviousness Percent:		77.7	

DesignWorks Engineering	Pre-Development Peak Flow Rates Calculation			
	Prepared:	D.P.	Page No.	C-03
	Checked:	H.B.		
Project: 1050 Tawadina Road Waterigde Village, Ottawa	Proj. #	2021630		
	Date:	11-Jan-23		

Rational Formulae: Q = 2.78 CIA (L/s)

Site Area: 0.7179 ha
Time of Concentration: 10 minutes
Runoff Coefficient : 0.80 Pre-development condition

Rainfall Intensity: $intensity = \left[\frac{A}{(Td + C)^B}\right]$ (City of Ottawa Design Guidelines Sewers)

Return Period:	5-year	10-year	50-year	100-year
Rainfall Intensity (mm/hr):	104.19	122.14	161.47	178.56

Pre-Development Peak Flow Rate (L/s):

Return Period:	5-year	10-year	50-year	100-year
Total Site Peak Flow Rate (L/s):	166.36	195.01	257.81	285.09

Based on Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing Memorandum:
Allowable discharge rate into municipal storm sewer: 195 L/s

Since underground storage will be used for the proposed development, the City of Ottawa requires that an average release rate equal to 50% of the peak allowable rate shall be applied to estimate the required volume.
Actual allowable discharge rate into municipal storm sewer: 97.5 L/s

Since the stormwater from the Sub-Catchments #1 and #2 cannot be controlled due to site constraints, the stormwater discharge from the rest of the site will be overcontrolled, i.e. allowable discharge flow rates from the remaining sub-catchments areas:
Sub-Catchment #3 (overcontrolled): 56.23 L/s
Sub-Catchments #1 and #2 (100-year storm): 41.27 L/s

Overcontrolled discharge rate into municipal storm sewer:
56.23 L/s

Required Storm Service Connection:
Diameter: 300 mm
Slope: 2.00 %
Service Connection Capacity: 136.76 L/s
Percentage Full Flow: 41.11 %

DesignWorks Engineering	Post-Development Peak Flow Rates Calculation (Uncontrolled)			
	Prepared:	D.P.	Page No.	C-04
	Checked:	H.B.		
Project: 1050 Tawadina Road	Proj. #	2021630		
Waterigde Village, Ottawa	Date:	11-Jan-23		

Rational Formulae: Q = 2.78 CIA (L/s)

Total Site Area:	0.7179	ha
Runoff Coefficient :	0.76	Post-development
Time of Concentration:	10	minutes
Sub-Catchment #1 Area:	0.0539	ha
Runoff Coefficient :	0.70	Post-development
Runoff Coefficient (100-Year):	0.78	Post-development
Sub-Catchment #2 Area:	0.0978	ha
Runoff Coefficient :	0.56	Post-development
Runoff Coefficient (100-Year):	0.64	Post-development
Sub-Catchment #3 Area:	0.5663	ha
Runoff Coefficient :	0.79	Post-development
Runoff Coefficient (100-Year):	0.89	Post-development

Rainfall Intensity: $intensity = \left[\frac{A}{(Td + C)^B}\right]$ (City of Ottawa Design Guidelines Sewers)

Return Period:	5-year	10-year	50-year	100-year
Rainfall Intensity (mm/hr):	104.19	122.14	161.47	178.56

Post-Development Peak Flow Rate (L/s):

Return Period:	5-year	10-year	50-year	100-year
Sub-Catchment #1 Peak Flow Rate (L/s):	10.86	12.73	16.83	20.97
Sub-Catchment #2 Peak Flow Rate (L/s):	15.77	18.49	24.45	30.92
Sub-Catchment #3 Peak Flow Rate (L/s):	130.27	152.71	201.88	249.63

Based on City of Ottawa's Engineering - LID Developers Checklist, the LID Design Target required for Infiltration and Erosion Control shall be provided through lot-level and conveyance controls and shall infiltrate an equivalent volume of a 4 mm event applied to the full catchment area.

Site Area:	0.7179	ha
Runoff Coefficient :	0.76	Post-development site conditions

Runoff volume from 4mm rainfall event on site:

V = 0.718 x 10 x 4 =28.72 m^3

Based on City of Ottawa's Engineering - LID Developers Checklist, the LID Design Target required for Water Quality Control shall be provided through lot-level and conveyance controls and shall treat the runoff from a 15mm event through filtration, detention, evapotranspiration, dentention, and release and infiltration for contributing impervious area.

Impervious Area: 0.5579 ha

Runoff volume from 15mm rainfall event on site:

V = 0.558 x 10 x 15 =83.68 m^3

Since the water quality target shall include the required water balance (infiltration) target, the total LID Design Targets for the proposed development is equal to 83.68 m3.

Per the TRCA/CVC LID Planning and Design Guide (2010), Wiki Document, the impervious drainare area to the areas of each infiltration system shall be between 5:1 and 20:1.

Infiltration System Area (5:1):	=1115.7	m^2
Infiltration System Area (20:1):	=278.93	m^2

Based on the Yuri Mendez Engineering Subsurface Investigation Report for 1000 and 1050 Tawadina Road (June 2022), the rate of infiltration, percolation and permeability are as follows:

Pemeability Rate:	=1 x 10^{-5}	cm/s
Percolation Rate:	=40	min/cm
Infiltration Rate:	=30	mm/hr
(Applying a Safety Factor of 2.5)	=12	mm/hr

Infiltration Chamber:

Total Storage Volume:	=83.68	m^3
Footprint of Infiltration Pit:	=288.00	m^2
Drawdown Time Required:		
83.68 m3 / 288.00m2 / (12mm / 1000)	=24.2	hour

DesignWorks Engineering	Required Storage Calculation - SC#3 (5-Year Storm)			
	Prepared:	D.P.	Page No.	C-06
	Checked:	H.B.		
Project: 1050 Tawadina Road Waterigde Village, Ottawa	Proj. #	2021630		
	Date:	11-Jan-23		

Sub-Catchment #3 Drainage Area (ha) = 0.5663 ha
Sub-Catchment #3 Composite C = 0.79
Allowable Release Rate from SC#3 = 56.23 L/s
Return Period = 5 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
10	104.19	130.36	78.22	56.23	33.74	44.48
12	94.70	118.48	85.31	56.23	40.48	44.83
14	86.93	108.77	91.37	56.23	47.23	44.14
16	80.46	100.67	96.64	56.23	53.98	42.66
18	74.97	93.80	101.31	56.23	60.72	40.59
20	70.25	87.90	105.48	56.23	67.47	38.01
22	66.15	82.76	109.24	56.23	74.22	35.02
24	62.54	78.25	112.68	56.23	80.97	31.71
26	59.35	74.25	115.83	56.23	87.71	28.12
28	56.49	70.68	118.75	56.23	94.46	24.29
30	53.93	67.47	121.45	56.23	101.21	20.24
32	51.61	64.57	123.98	56.23	107.95	16.03
34	49.50	61.94	126.35	56.23	114.70	11.65
36	47.58	59.53	128.58	56.23	121.45	7.13
38	45.81	57.32	130.68	56.23	128.20	2.48
40	44.18	55.28	132.68	56.23	134.94	-2.26
42	42.68	53.40	134.57	56.23	141.69	-7.12
44	41.29	51.66	136.38	56.23	148.44	-12.06
46	39.99	50.04	138.10	56.23	155.18	-17.08
48	38.78	48.53	139.75	56.23	161.93	-22.18

Required Storage Volume = 44.83 m^3

DesignWorks Engineering	Required Storage Calculation - SC#3 (10-Year Storm)		
	Prepared: D.P.	Page No.	C-07
	Checked: H.B.		
Project: 1050 Tawadina Road Waterigde Village, Ottawa	Proj. # 2021630		
	Date: 11-Jan-23		

Sub-Catchment #3 Drainage Area (ha) = 0.5663 ha
Sub-Catchment #3 Composite C = 0.79
Allowable Release Rate from SC#3 = 56.23 L/s
Return Period = 10 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m³)	Release Rate (L/s)	Release Flow Volume (m³)	Required Storage Volume (m³)
10	122.14	152.82	91.69	56.23	33.74	57.95
12	110.96	138.83	99.96	56.23	40.48	59.48
14	101.82	127.40	107.02	56.23	47.23	59.79
16	94.21	117.87	113.16	56.23	53.98	59.18
18	87.76	109.80	118.58	56.23	60.72	57.86
20	82.21	102.86	123.43	56.23	67.47	55.96
22	77.39	96.83	127.81	56.23	74.22	53.59
24	73.15	91.53	131.80	56.23	80.97	50.83
26	69.40	86.84	135.46	56.23	87.71	47.75
28	66.05	82.65	138.85	56.23	94.46	44.39
30	63.05	78.88	141.99	56.23	101.21	40.78
32	60.33	75.48	144.92	56.23	107.95	36.97
34	57.85	72.39	147.67	56.23	114.70	32.97
36	55.60	69.56	150.25	56.23	121.45	28.80
38	53.53	66.97	152.69	56.23	128.20	24.49
40	51.62	64.59	155.01	56.23	134.94	20.07
42	49.86	62.38	157.20	56.23	141.69	15.51
44	48.23	60.34	159.29	56.23	148.44	10.85
46	46.71	58.44	161.29	56.23	155.18	6.11
48	45.29	56.67	163.20	56.23	161.93	1.27

Required Storage Volume = 59.79 m^3

DesignWorks Engineering	Required Storage Calculation - SC#3 (50-Year Storm)			
	Prepared:	D.P.	Page No.	C-08
	Checked:	H.B.		
Project: 1050 Tawadina Road	Proj. #	2021630		
Waterigde Village, Ottawa	Date:	11-Jan-23		

Sub-Catchment #3 Drainage Area (ha) = 0.5663 ha
Sub-Catchment #3 Composite C = 0.79
Allowable Release Rate from SC#3 = 56.23 L/s
Return Period = 50 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m^3)	Release Rate (L/s)	Release Flow Volume (m^3)	Required Storage Volume (m^3)
10	161.47	202.03	121.22	56.23	33.74	87.48
12	146.62	183.44	132.08	56.23	40.48	91.60
14	134.49	168.27	141.35	56.23	47.23	94.12
16	124.39	155.63	149.40	56.23	53.98	95.42
18	115.83	144.92	156.51	56.23	60.72	95.79
20	108.47	135.72	162.86	56.23	67.47	95.39
22	102.08	127.72	168.59	56.23	74.22	94.37
24	96.47	120.70	173.80	56.23	80.97	92.83
26	91.50	114.48	178.59	56.23	87.71	90.88
28	87.06	108.93	183.00	56.23	94.46	88.54
30	83.08	103.94	187.10	56.23	101.21	85.89
32	79.47	99.44	190.92	56.23	107.95	82.97
34	76.20	95.34	194.50	56.23	114.70	79.80
36	73.22	91.61	197.87	56.23	121.45	76.42
38	70.48	88.18	201.05	56.23	128.20	72.85
40	67.95	85.02	204.05	56.23	134.94	69.11
42	65.62	82.11	206.91	56.23	141.69	65.22
44	63.46	79.41	209.63	56.23	148.44	61.19
46	61.46	76.89	212.22	56.23	155.18	57.04
48	59.58	74.55	214.70	56.23	161.93	52.77

Required Storage Volume = 95.79 m^3

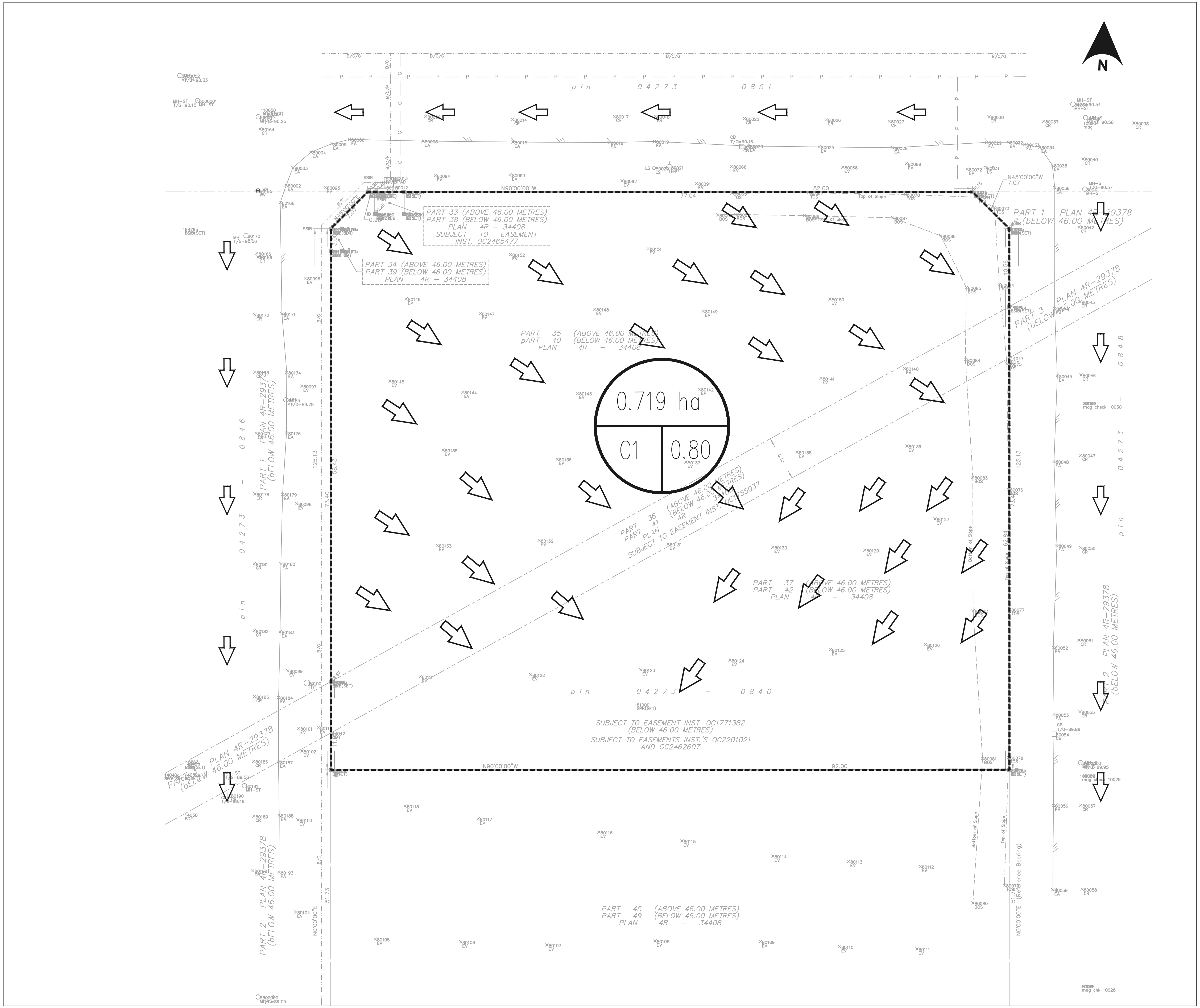
DesignWorks Engineering	Required Storage Calculation - SC#3 (100-Year Storm)		
	Prepared: D.P.	Page No.	C-09
	Checked: H.B.		
Project: 1050 Tawadina Road Waterigde Village, Ottawa	Proj. # 2021630		
	Date: 11-Jan-23		

Sub-Catchment #3 Drainage Area (ha) = 0.5663 ha
Sub-Catchment #3 Composite C = 0.89
Allowable Release Rate from SC#3 = 56.23 L/s
Return Period = 100 Year

Site storage Requirement:

Time (minutes)	Rainfall Intensity (mm/hr)	Peak Flow (L/s)	Storm Runoff Volume (m³)	Release Rate (L/s)	Release Flow Volume (m³)	Required Storage Volume (m³)
10	178.56	249.81	149.89	56.23	33.74	116.15
12	162.13	226.83	163.32	56.23	40.48	122.84
14	148.72	208.07	174.78	56.23	47.23	127.55
16	137.55	192.44	184.74	56.23	53.98	130.76
18	128.08	179.19	193.53	56.23	60.72	132.81
20	119.95	167.82	201.38	56.23	67.47	133.91
22	112.88	157.93	208.46	56.23	74.22	134.24
24	106.68	149.25	214.91	56.23	80.97	133.94
26	101.18	141.56	220.83	56.23	87.71	133.12
28	96.27	134.69	226.28	56.23	94.46	131.82
30	91.87	128.53	231.35	56.23	101.21	130.14
32	87.89	122.96	236.08	56.23	107.95	128.13
34	84.27	117.89	240.50	56.23	114.70	125.80
36	80.96	113.27	244.67	56.23	121.45	123.22
38	77.93	109.03	248.60	56.23	128.20	120.40
40	75.15	105.13	252.32	56.23	134.94	117.38
42	72.57	101.53	255.85	56.23	141.69	114.16
44	70.18	98.19	259.21	56.23	148.44	110.77
46	67.96	95.08	262.42	56.23	155.18	107.24
48	65.89	92.18	265.49	56.23	161.93	103.56

Required Storage Volume = 134.24 m^3



LEGEND:

	PROPOSED	EXISTING
STORM SEWER		
WATER LINE		
SANITARY SEWER		
PIPE FLOW DIRECTION		
STORM MANHOLE		
AREA DRAIN		
CATCH BASIN		
DOUBLE CATCH BASIN		
TRENCH DRAIN		
PIPE INSULATION		
SANITARY MANHOLE		
WATER HYDRANT		
WATER VALVE		
90° BEND		
45° BEND		
TEE FITTING		
PIPE CROSSING NUMBER		
BUILDING		
RETAINING WALL		
CONSTRUCTION LIMIT		
PROPERTY LINE		
R/W PLAN		

LABEL LEGEND:

T/G = TOP OF GRATE
CB = CATCH BASIN
DCB = DOUBLE CATCH BASIN
MH = MANHOLE
WTR = WATER SERVICE
FWTR = FIRE WATER SERVICE
AD = AREA DRAIN

OVERLAND FLOW DIRECTION

0.1860 ha — AREA OF CATCHMENT

SC#4 | 0.37 — SUB-CATCHMENT | RUNOFF COEFFICIENT

CATCHMENT AREA BOUNDARY

DesignWorks Engineering

P: 647 660 7117 **F:** 647 660 7117
Suite 2345 1 Adelaide Street East
Toronto, ON M5C 2V9
info@designworkseng.com
www.designworkseng.com

NOTES

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DO NOT SCALE THIS DRAWING.

BENCHMARK

ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO CITY OF OTTAWA VERTICAL BENCHMARK NO. 396 (01919680138), HAVING AN ELEVATION OF 95.06 METRES (CGVD28 GEODETIC DATUM).

IT IS THE RESPONSIBILITY OF THE APPLICANT TO COMPLY WITH THE SEWER USE BY-LAW AND OBTAIN ALL APPROVALS/PERMITS FROM TORONTO WATER - ENVIRONMENTAL MONITORING & PROTECTION UNIT FOR ANY PROPOSED TEMPORARY OR PERMANENT DISCHARGING OF GROUNDWATER INTO MUNICIPAL SEWER SYSTEMS AND WATER COURSES. THE APPLICANT IS ALSO RESPONSIBLE FOR COMPLYING WITH ALL APPLICABLE PROVINCIAL REQUIREMENTS AND OBTAINING NECESSARY APPROVALS AND/OR PERMITS FROM THE MINISTRY OF THE ENVIRONMENT AND CLIMATE WITH RESPECT TO ANY PROPOSED DEWATERING.

BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.

REVISIONS

No.	Comment	Date
1	ISSUED FOR CLC SUBMISSION	2022-10-21

SEAL

CLIENT

WestUrban Developments Ltd.

PROJECT

1050 TAWADINA ROAD

1050 TAWADINA ROAD
OTTAWA, ON K1K 4E4

PROJECT DETAILS

ENGINEER:	DOROTHY POON, P.ENG.
CHECKED BY:	D.P.
DRAWN BY:	B.B
DESIGN BY:	B.B.
PROJECT No.:	2021630
DATE:	OCTOBER 2022
SCALE:	1:250

DRAWING TITLE

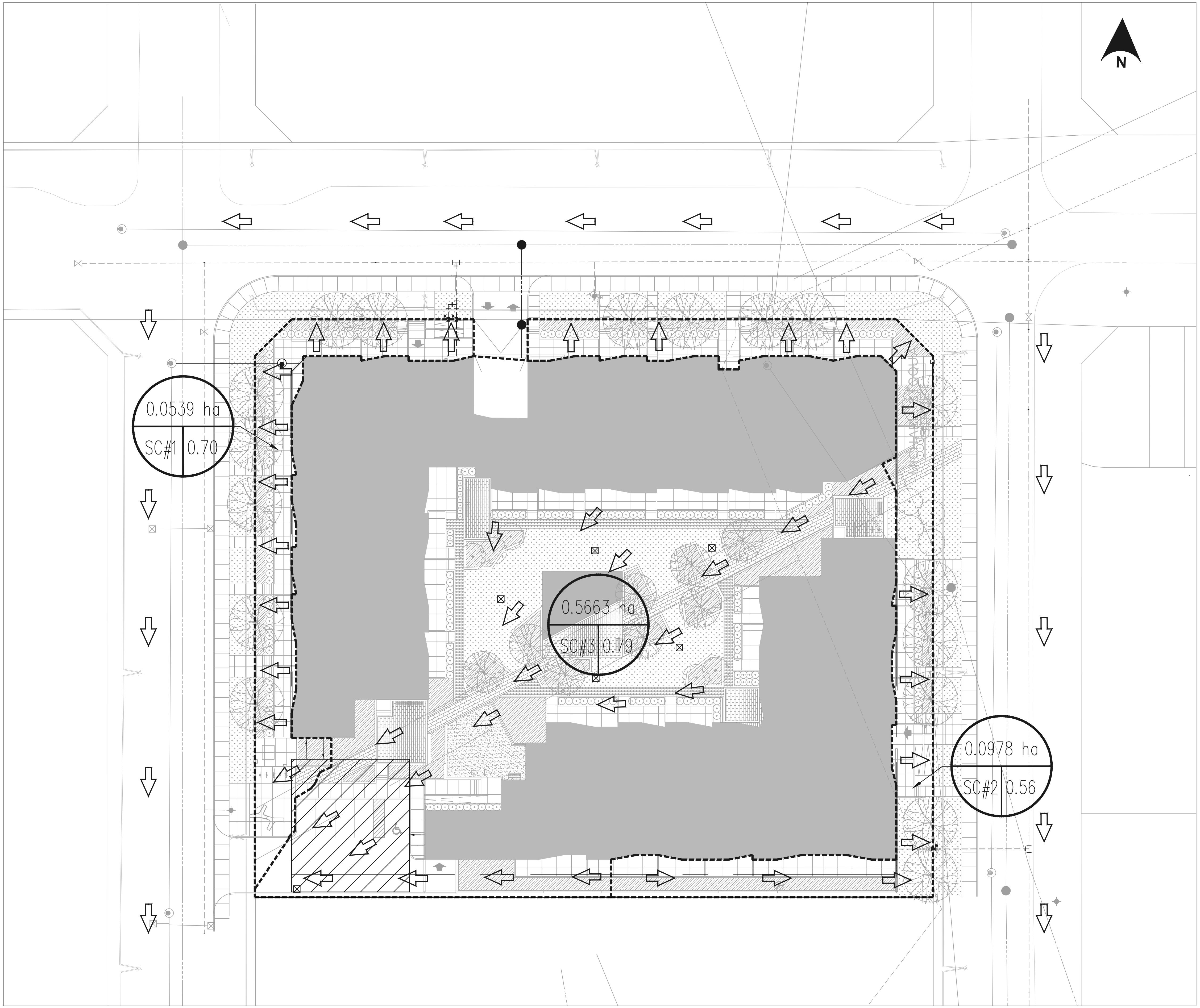
PRE-DEVELOPMENT DRAINAGE PLAN

DRAWING NO.

FIGURE 1

SHEET 1 / 2

K:\Projects\Engineering\2021\2021630 Waterridge Village, Ottawa - WestUrban\2. CIVIL ENGINEERING\2. CSD\2021630 - Contract Drawings Catchment.dwg (Printed: 10/24/2022 4:23 PM)



LEGEND:

	PROPOSED	EXISTING
STORM SEWER		
WATER LINE		
SANITARY SEWER		
PIPE FLOW DIRECTION		
STORM MANHOLE		
AREA DRAIN		
CATCH BASIN		
DOUBLE CATCH BASIN		
TRENCH DRAIN		
PIPE INSULATION		
SANITARY MANHOLE		
WATER HYDRANT		
WATER VALVE		
90° BEND		
45° BEND		
TEE FITTING		
PIPE CROSSING NUMBER		
BUILDING		
RETAINING WALL		
CONSTRUCTION LIMIT		
PROPERTY LINE		
R/W PLAN		

LABEL LEGEND:

T/G = TOP OF GRATE
CB = CATCH BASIN
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AD = AREA DRAIN

OVERLAND FLOW DIRECTION

0.1860 ha | SC#4 | 0.37 — AREA OF CATCHMENT; SUB-CATCHMENT | RUNOFF COEFFICIENT

CATCHMENT AREA BOUNDARY

DesignWorks Engineering
P: 647 660 7117 F: 647 660 7117
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DO NOT SCALE THIS DRAWING.

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ELEVATIONS SHOWN ARE GEODETIC AND ARE REFERRED TO CITY OF OTTAWA VERTICAL BENCHMARK NO. 396 (01919680138), HAVING AN ELEVATION OF 95.06 METRES (CGVD28 GEODETIC DATUM).

BE ADVISED THAT SHOULD ANY PARTY, INCLUDING THE APPLICANT OR ANY SUBSEQUENT OWNER, APPLY FOR MORE THAN ONE CONDOMINIUM CORPORATION ENCOMPASSING ANY OR ALL OF THIS DEVELOPMENT OR MAKE AN APPLICATION THAT RESULTS IN A LAND DIVISION, STAFF MAY REQUIRE LEGAL ASSURANCES, INCLUDING BUT NOT LIMITED TO EASEMENTS, WITH RESPECT TO THE APPROVED SERVICES. SUCH ASSURANCES WILL BE DETERMINED AT THE TIME OF APPLICATION FOR CONDOMINIUM APPROVAL.

REVISIONS

No.	Comment	Date
1	ISSUED FOR CLC SUBMISSION	2022-10-25
2	ISSUED FOR CLC SUBMISSION	2023-01-11

SEAL

CLIENT

WestUrban Developments Ltd.

PROJECT

1050 TAWADINA ROAD

1050 TAWADINA ROAD
OTTAWA, ON K1K 4E4

PROJECT DETAILS

ENGINEER:	DOROTHY POON, P.ENG.
CHECKED BY:	D.P.
DRAWN BY:	B.B
DESIGN BY:	B.B.
PROJECT No.:	2021630
DATE:	OCTOBER 2022
SCALE:	

DRAWING TITLE

POST-DEVELOPMENT DRAINAGE PLAN

DRAWING NO.
FIGURE 2

SHEET 2 / 2

Tel. : +1 877 559 6718
Fax : 780 814 5533
Email : info@designworkseng.com

Appendix B

Sanitary System Calculation Sheets

DesignWorks Engineering	Sanitary Demand (Post-Development)		
	Prepared: B.B.	Page No.	B-01
	Checked: D.P.		
Project: 1050 Tawadina Road, Waterigde Village, Ottawa	Proj. # 20216340		
	Date: Oct 24, 22		

Total Site Area: 0.7188 ha

Population Estimates:

Housing Type	PPU	# of units	Population
Single Family	3.4	0	0
Semi-detached	2.7	0	0
Townhouse	2.7	0	0
Duplex	2.3	0	0
Triplex	3.7	0	0
Bachelor	1.4	0	0
1 Bedroom	1.4	146	204.4
2 Bedroom	2.1	108	226.8
3 Bedroom	3.1	0	0
Average Apt	1.8	0	0
Total		**254**	**432**

Harmon Peaking Factor: PF= $1+14/(4+(P/1000)^{0.5})*K$

3.40

Average Wastewater Flow: 280 L/cap/day

Total Domestic Wastewater Flow: 4.77 L/s

Dry Weather Infiltration Allowance (0.05 L/s/ha): 0.04

Wet Weather Infiltration Allowance (0.28 L/s/ha): 0.20

Total Infiltration Allowance (0.33 L/s/ha): 0.24 L/s

Design Flow: **5.00** L/s

<u>Sanitary Service Connection</u>

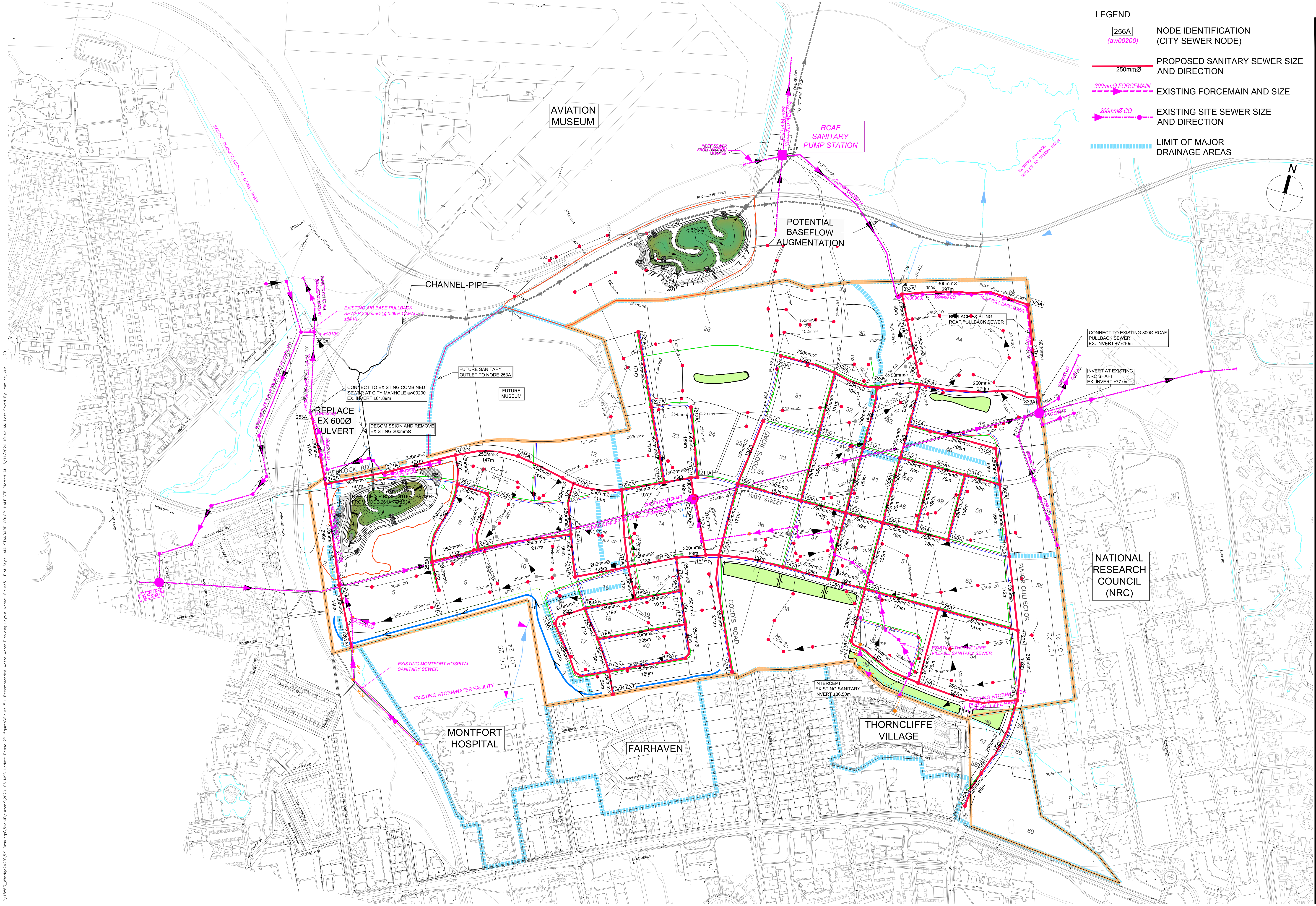
Mannings n: 0.013

Pipe Size: 200 mm

Pipe Slope: 1.00 %

Full Flow Capacity: 32.80 L/s

Percentage Full: 15.26 %



Scale

Project Title

FORMER CFB ROCKCLIFFE MASTER SERVICING STUDY

Drawing Title

RECOMMENDED WASTEWATER PLAN

Sheet No.

FIGURE 5.1

IBI Group
400-333 Preston Street
Ottawa, Ontario
K1S 5N4

SANITARY SEWER DESIGN SHEET

PROJECT: FORMER CFB ROCKCLIFFE
LOCATION: CITY OF OTTAWA
CLIENT: CANADA LANDS COMPANY

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE				TOTAL	PROPOSED SEWER DESIGN						
				UNIT TYPES					AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)			FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW												
STREET	AREA ID	FROM MH	TO MH	SF	SD	TH/F	TH/S	APT	(Ha)	IND	CUM	FACTOR	FLOW (L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	PARKS	IND	CUM	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
PHASE 1 - CODD'S ROAD SHAFT																																
Major Collector	100A	MH100A	MH (52)					500	3.81	900.0	900.0	3.83	13.96									3.81	3.81	1.07	15.03	84.38	48.00	250	1.85	1.665	69.36	82.19
Major Collector		MH (52)	MH105A								900.0	3.83	13.96										3.81	1.07	15.03	84.38	37.62	250	1.85	1.665	69.36	82.19
Major Collector	105A	MH105A	MH (54)				41		0.77	94.3	994.3	3.80	15.31								0.65	1.42	5.23	1.46	16.78	62.04	62.95	250	1.00	1.224	45.26	72.96
Major Collector		MH (54)	MH (55)							0.0	994.3	3.80	15.31										5.23	1.46	16.78	62.04	50.36	250	1.00	1.224	45.26	72.96
Major Collector		MH (55)	MH108A							0.0	994.3	3.80	15.31										5.23	1.46	16.78	43.87	76.71	250	0.50	0.866	27.09	61.76
Major Collector	COM2	MH126A	MH (379)													2.03	2.03			1.76		2.03	2.03	0.57	2.33	60.47	85.08	250	0.95	1.193	58.14	96.15
Major Collector		MH (379)	MH120A														2.03			1.76			2.03	0.57	2.33	60.47	87.33	250	0.95	1.193	58.14	96.15
Major Collector	COM1	MH120A	MH (402)													2.44	4.47			3.88		2.44	4.47	1.25	5.13	43.87	91.89	250	0.50	0.866	38.74	88.30
Major Collector		MH (402)	MH108A														4.47			3.88			4.47	1.25	5.13	43.87	70.26	250	0.50	0.866	38.74	88.30
---	108A	MH108A	MH (375)						1.32	0.0	994.30	3.80	15.31				4.47			3.88		1.32	11.02	3.09	22.28	54.08	80.08	250	0.76	1.067	31.81	58.81
---		MH (375)	MH (376)							0.0	994.3	3.80	15.31				4.47			3.88			11.02	3.09	22.28	54.08	37.59	250	0.76	1.067	31.81	58.81
---		MH (376)	MH114A							0.0	994.3	3.80	15.31				4.47			3.88			11.02	3.09	22.28	54.08	118.80	250	0.76	1.067	31.81	58.81
---	EXT1	Ex	MH114A						5.53	1574.0	1574.0	3.66	23.36									5.53	5.53	1.55	24.91							
---		MH125A	MH (405)			33				89.1	89.1	4.00	1.44				0.00			0.00			0.00	0.00	1.44	44.30	72.00	250	0.51	0.874	42.86	96.74
---		MH (405)	MH114A							0.0	89.1	4.00	1.44				0.00			0.00			0.00	0.00	1.44	44.30	105.98	250	0.51	0.874	42.86	96.74
---	114A	MH114A	MH (65)				95		1.72	218.5	2786.8	3.47	39.17				4.47			3.88		1.72	18.27	5.12	48.16	71.33	69.47	300	0.50	0.978	23.17	32.48
---		MH (65)	MH (66)							0.0	2786.8	3.47	39.17				4.47			3.88			18.27	5.12	48.16	71.33	81.98	300	0.50	0.978	23.17	32.48
---		MH (66)	MH (67)							0.0	2786.8	3.47	39.17				4.47			3.88			18.27	5.12	48.16	71.33	24.65	300	0.50	0.978	23.17	32.48
---		MH (67)	MH113A							0.0	2786.8	3.47	39.17				4.47			3.88			18.27	5.12	48.16	71.33	10.46	300	0.50	0.978	23.17	32.48
---		MH113A	MH119A							0.0	2786.8	3.47	39.17				4.47			3.88			18.27	5.12	48.16	71.33	52.12	300	0.50	0.978	23.17	32.48
---		MH119A	MH130A							0.0	2786.8	3.47	39.17				4.47			3.88			18.27	5.12	48.16	71.33	72.19	300	0.50	0.978	23.17	32.48
---	INST1, INST2	MH120A	MH125A							0.0	0.0	4.00	0.00	5.55	5.55					4.82		5.55	5.55	1.55	6.37	58.86	191.19	250	0.90	1.162	52.48	89.17
---	125A	MH125A	MH130A				253		3.09	581.9	581.9	3.94	9.29		5.55					4.82		3.09	8.64	2.42	16.52	58.86	176.08	250	0.90	1.162	42.33	71.93
---	163A	MH163A	MH (381)				42		0.75	96.6	96.6	4.00	1.57									0.75	0.75	0.21	1.78	35.64	87.43	250	0.33	0.703	33.86	95.02
		MH (381)	MH130A							0.0	96.6	4.00	1.57										0.75	0.21	1.78	35.64	71.87	250	0.33	0.703	33.86	95.02
---	---	MH130A	MH135A							0.0	3465.3	3.39	47.57		5.55		4.47			8.70			27.66	7.74	64.01	100.18	88.80	375	0.30	0.879	36.18	36.11
---	164A	MH164A	MH (383)				41		0.96	94.3	94.3	4.00	1.53									0.96	0.96	0.27	1.80	35.64	87.27	250	0.33	0.703	33.84	94.96
---		MH (383)	MH135A							0.0	94.3	4.00	1.53										0.96	0.27	1.80	35.64	71.78	250	0.33	0.703	33.84	94.96
---	135A	MH135A	MH140A					191	1.76	343.8	3903.4	3.34	52.86		5.55		4.47			8.70		1.76	30.38	8.51	70.06	100.18	107.95	375	0.30	0.879	30.12	30.07
---	---	MH140A	MH (61)							0.0	3903.4	3.34	52.86		5.55		4.47			8.70			30.38	8.51	70.06	100.18	75.16	375	0.30	0.879	30.12	30.07
---		MH (61)	MH150A							0.0	3903.4	3.34	52.86		5.55		4.47			8.70			30.38	8.51	70.06	100.18	76.66	375	0.30	0.879	30.12	30.07
Codd's Road	142A	MH142A	MH (45)																		6.81	6.81	6.81	1.91	1.91	75.98	87.81	250	1.50	1.500	74.07	97.49
Codd's Road		MH (45)	MH (46)																				6.81	1.91	1.91	75.98	70.10	250	1.50	1.500	74.07	97.49
Codd's Road		MH (46)	MH (47)																				6.81	1.91	1.91	33.98	61.03	250	0.30	0.671	32.07	94.39
Codd's Road		MH (47)	MH150A																				6.81	1.91	1.91	33.98	55.07	250	0.30	0.671	32.07	94.39
---	301A	MH301A	MH160A				110		1.87	253.0	253.0	4.00	4.10									1.87	1.87	0.52	4.62	35.64	155.83	250	0.33	0.703	31.02	87.03
---	---	MH160A	MH161A							0.0	253.0	4.00	4.10										1.87	0.52	4.62	70.74	78.00	250	1.30	1.396	66.11	93.46
---	302A	MH302A	MH161A				70		1.25	161.0	161.0	4.00	2.61									1.25	1.25	0.35	2.96	50.02	155.84	250	0.65	0.987	47.06	94.08
Main Street	---	MH161A	MH163A							0.0	414.0	4.00	6.71									0.00	3.12	0.87	7.58	78.47	78.12	250	1.60	1.549	70.89	90.34
---	314A	MH314A	MH308A				35		0.53	80.5	80.5	4.00	1.30									0.53	0.53	0.15	1.45	75.98	75.81	250	1.50	1.500	74.53	98.09
---	314A	MH308A	MH163A							0.0	80.5	4.00	1.30								0.71	0.71	1.24	0.35	1.65	75.98	80.05	250	1.50	1.500	74.33	97.83
Main Street	---	MH163A	MH164A							0.0	494.5	3.98	7.97									0.00	4.36	1.22	9.19	78.47	88.92	250	1.60	1.549	69.29	88.29
---	311A	MH311A	MH164A				84		1.41	193.2	193.2	4.00	3.13									1.41	1.41	0.39	3.53	65.07	155.87	250	1.10	1.284	61.54	94.58
Main Street	---	MH164A	MH165A							0.0	687.7	3.90	10.86									0.00	5.77	1.62	12.48	58.86	107.96	250	0.90	1.162	46.38	78.80
---	205A	MH205A	MH (7)					510	4.39	918.0	918.0	3.82	14.22								5.93	10.32	10.32	2.89	17.11	50.02	80.40	250	0.65	0.987	32.91	65.79
---		MH (7)	MH326A							0.0	918.0	3.82	14.22										10.32	2.89	17.11	36.70	51.99	250	0.35	0.724	19.59	53.39

---	326A	MH323A	MH (10)					224	1.77	403.2	403.2	4.00	6.53									1.77	1.77	0.50	7.03	50.02	29.23	250	0.65	0.987	42.99	85.95
---		MH (10)	MH (9)							0.0	403.2	4.00	6.53										1.77	0.50	7.03	50.02	37.86	250	0.65	0.987	42.99	85.95
---		MH (9)	MH326A							0.0	403.2	4.00	6.53										1.77	0.50	7.03	50.02	36.84	250	0.65	0.987	42.99	85.95

---	312A	MH326A	MH312A					171	1.55	307.8	1629.0	3.65	24.11									1.55	13.64	3.82	27.93	43.87	150.87	250	0.50	0.866	15.94	36.34

---	312A	MH312A	MH165A					190	1.69	342.0	1971.0	3.59	28.67									1.69	15.33	4.29	32.96	43.87	155.81	250	0.50	0.866	10.91	24.86
Main Street	165A	MH165A	MH155A							0.0	2658.7	3.49	37.55								0.60	0.60	21.70	6.08	43.63	63.80	151.90	300	0.40	0.874	20.18	31.62
Codd's Road	201A	MH201A	MH155A					214	1.32	385.2	385.2	4.00	6.24			1.23	1.23					2.55	2.55	0.71	6.96	79.69	157.08	250	1.65	1.573	72.73	91.27

DesignWorks Engineering
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Appendix C

Stormwater Calculation Sheets

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Appendix D

Supporting Documents

May 13th, 2018
Ref No. 65578.1

To:	**Jean Lachance, Canada Lands Company (CLC)**
From:	**Chris Denich, M.Sc., Aquafor Beech Ltd., Meaghan Dustin, E.I.T., Aquafor Beech Ltd.**
Re:	**Wateridge Phase 2B Developer's Checklist**

1.0 Phase 2B

Wateridge Village Phase 2B includes 12 development blocks located between Codd's Road and Wanaki Road to the west and east, and Tawadina Road and Hemlock Road to the north and south. The land-use within this block includes semi-detached singles, townhouse blocks, low-rise residential, mid-rise residential, mid-rise mixed-use, and parks.

As part of the Wateridge Village low impact development (LID) Demonstration project, this phase will include stormwater management treatment strategies that maximize pervious surfaces and increase infiltration and groundwater recharge through a combination of lot-level (source), conveyance and end-of-pipe stormwater management controls.

The following sections outline the stormwater criteria the developer is required to meet with the implementation of LID measures. The testing requirements necessary for design and implementation are also described. Finally, LIDs recommended to be incorporated within Phase 2B are summarized.

2.0 SWM Criteria

All LID measures implemented in Phase 2B of the Wateridge Village development shall be designed to achieve the infiltration, erosion, and water quality design targets summarized in **Table 2.1**. These targets represent minimum volumes to achieve water balance (infiltration), water quality, and erosion controls.

All landscaped areas (turf or garden) will require Topsoil Amendments per Option 1 or Option 2; these options are outlined in **Appendix B**.

Table 2.1 LID Design Targets

LID Design Targets		
Infiltration*	**Erosion***	**Water Quality†**
LID Infiltration target = 4mm Maintain groundwater recharge per the existing conditions water budget. Groundwater recharge includes hydrological connection and linkages to wetlands, woodlots, streams and other natural features. LID lot-level and conveyance controls shall infiltrate an equivalent volume a 4mm event applied to the full catchment area.	LID Erosion Control Target = 4mm LID lot-level and conveyance controls shall match the existing conditions water balance through the application of the infiltration targets in order to reduce or eliminate the effects of hydro-modification (magnitude, duration and frequency) form the contributing drainage area. As such the infiltration targets shall be considered the erosion control targets for LID controls.	Min. Target = 15mm The minimum water quality event for LID lot-level and conveyance controls for the Former CFB Rockcliffe shall be the 15mm event. LID controls shall treat the runoff from a 15mm event through filtration, detention, evapotranspiration, detention and release and infiltration. Drainage areas which achieve the minimum 15mm water quality target shall be required to discharge to another LID in the treatment train and or an end-of-pipe pond to achieve the full enhanced level of control per the MOE SWMPD. Enhanced Target = 25mm To achieve the enhanced level of control, per the MSS, the target water quality event for LID lot-level and conveyance controls shall be the 25mm event. LID controls shall treat the runoff from a 25mm event through filtration, detention, evapotranspiration, detention and release and infiltration. Drainage areas which achieve the enhanced water quality target do not require treatment in an end-of-pipe facility.
*Catchment Based Target – target applied over the full catchment area †Contributing Impervious Area Target – applied to the directly contributing impervious area to the LID control and should focus on the "treatment" of the required event through a combination of filtration, storage and release, evaporation and infiltration. Note: the water quality target shall include the required water balance (infiltration) targets i.e. water quality treatment = 15mm water quality event – 4mm infiltration/erosion target.		

3.0 Testing Requirements

The implementation of LIDs requires a geotechnical assessment (including groundwater monitoring) and infiltration tests to determine the in-situ conditions prior to design.

3.1 Geotechnical Assessment

A soils report will be required to accompany the design of all infiltration facilities to ensure adequate soil permeability and depth to the seasonally high water table. This report should include:

- Borehole information, including soil stratigraphy, composition, grain-size and chemical analysis (additional testing may be required for individual LID techniques per the requirement of the Low Impact Development Stormwater Management Planning and Design Guide, Version 1.0 (TRCA/CVC - 2010); number of boreholes can range from 2 to greater than 20 based on size of facility and site specific conditions. Boreholes should be extended a minimum of 1.5m below the proposed invert of the proposed LID facility.
- Geotechnical assessment will generally include:
  - particle size distribution (ASTM D422 and D2217),
  - Stratigraphy, Piezometer(s) and Standpipes –to determine seasonally high (March – April or Late fall before snowfall) groundwater elevation information per O.Reg 389/09 natural moisture content (ASTM D2216),
  - plasticity characteristics (ASTM D4318),
  - soil strength assessment (CBR and Soaked CBR) for permeable pavement designs.

The scope of the geotechnical assessment shall be determined based on the need to confirm that the following conditions are not present. The following conditions are considered unsuitable or may increase facility failure rate for infiltration based controls.

1. Slopes ≥20% and contributing catchment area slopes ≥15%;
2. Seasonally-high water table elevations that are within 1.0-0.60 metre of the bottom of proposed infiltration based facilities;
3. Bedrock within 1 metre of the bottom of the proposed infiltration facility;
4. Wetlands and associated hydric soils;
5. Proposed Land uses that are classified as potential "hot spots";
6. Drinking water wells within 30 metres; and
7. Karst topography.

It is not anticipated that conditions 1, 6 or 7 above will be of concern.

3.2 Infiltration Testing

For design purposes, the preferred approach to measure field saturated hydraulic conductivity (Kfs) at a subject site include:

- Guelph Permeameter
- Double Ring Infiltrometers (constant head)
- Single ring (constant head pressure)

At least one (1) test will be required at 2 soil depths for each 450m^2 footprint surface area at each location. **Note: Infiltration rates derived from borehole analysis, T-test, slug or other generalized test shall not be accepted for design purposes.** All infiltration testing should be completed per Appendix C of the TRCA/CVC LID Planning and Design Guide (2010). Based on in-situ soil testing of previous phases, it is anticipated that the soils tested in Phase 2B will have a field saturated hydraulic conductivity below 15mm/hr and therefore will require the installation of a underdrain per the TRCA/CVC LID Stormwater Planning and Design Guide (2010).

4.0 Recommended LID Types

The Draft Wateridge Village Phases 2B - Master Concept Plan (Appendix A) displays the proposed land-use in Phase 2B; including: low & medium rise residential and mixed-use, parks, and municipal ROW. Error! Reference source not found. summarizes suitable LID measures by each land use.

Table 4.1 Low Impact Development (LID) Suitability Matrix by Land-Use

		Phase 2B Proposed Land-Uses			
		Low & Medium Rise Residential	Low and Medium Rise Mixed-Use	Schools & Parks	Municipal ROW
	Assumed Lot Coverage	**50-60%**	**80-100%**	**10-30%**	**n/a**
LID Type					
Lot-Level Controls	Green Roofs	□	□	n/a	n/a
	Bioretention	□□	□□	□□□	□□□
	Rainwater Harvesting	□	□	n/a	n/a
	Soakaways, Trenches & Chambers	□□□	□□□	□□□	n/a
	Downspout Disconnection	□□□	□□□	n/a	n/a
	Soil Amendments	□□□	□□□	□□□	n/a
	Permeable Pavements	□□	□□	□□	See Conveyance Controls
	Infiltration Basins	n/a	n/a	□□□	n/a
Conveyance Controls	Vegetated/Grass Swales	n/a	n/a	□	□□
	Bioswales/Biofilters	n/a	n/a	□□	□□□
	Perforated Pipes	n/a	n/a	□	□□
	Permeable Pavements	n/a	n/a	□□	□□□

*Assumed lot coverage indicates percentage of development with hard surface land cover

□□□ **= Highly Suitable,** □□ **= Suitable,** □ **= Poor Suitability,** n/a **= Not Applicable**

In areas where infiltration is not possible, i.e. over underground parking structures, runoff can be collected using ditch inlets, catch basins, or eavestroughs for roof surfaces and conveyed via pipe to an infiltration system or end-of-pipe facility.

Based on the land-use proposed in the Master Concept Plan for Phase 2B, the following LIDs can be implemented in Phase 2B:

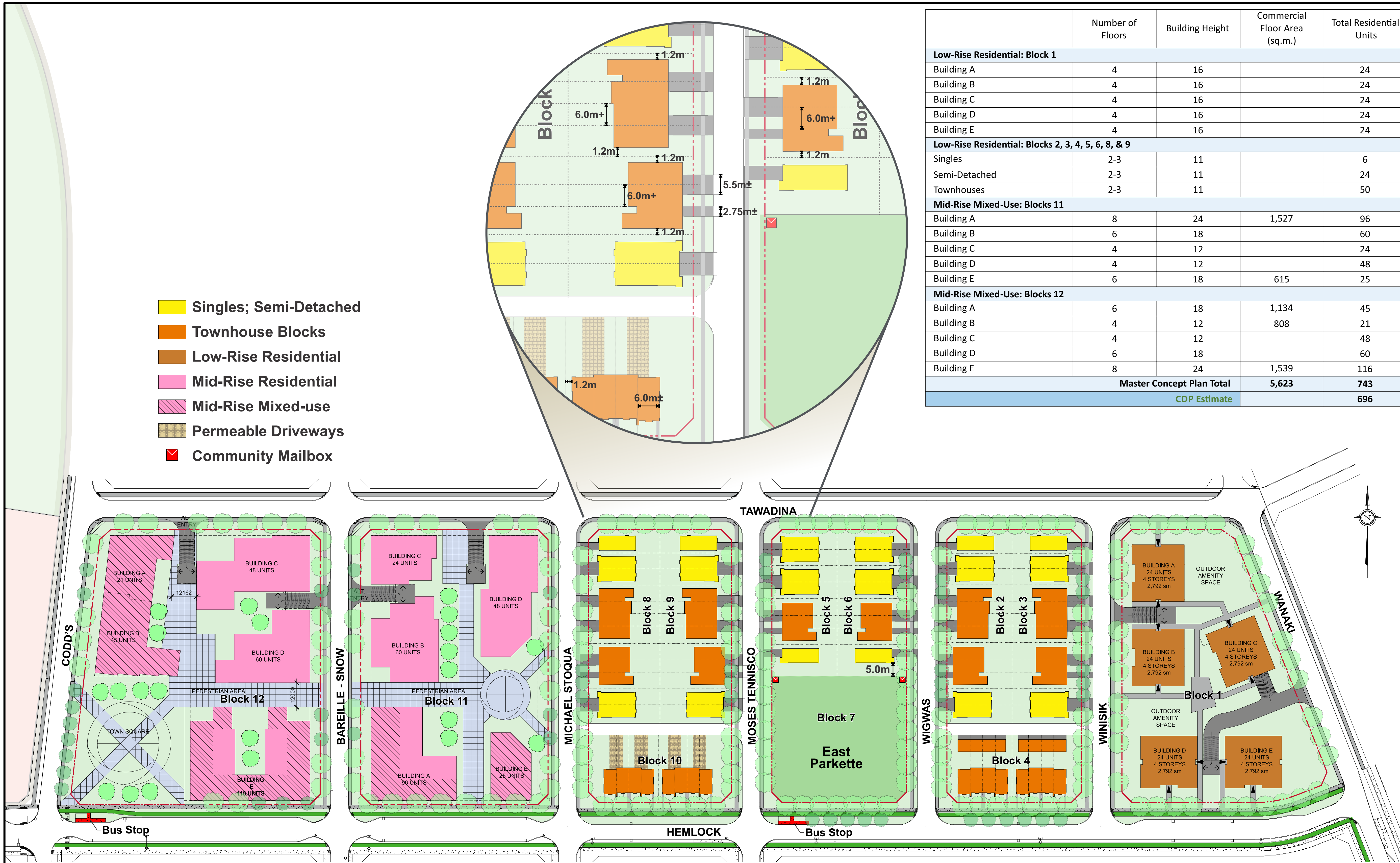
- Soakaways, Trenches & Chambers
- Downspout Disconnection
- Soil Amendments
- Bioretention

- Infiltration Basins
- Bioswales/Biofilters
- Permeable Pavements
- Vegetated/Grass Swales
- Perforated Pipe

Relevant resources detailing the constraints, implementation, construction, and monitoring of all suitable LID measures are included in **Appendix C**. These resources also include the Stormwater Management Planning and Design Manual, background groundwater information, permitting requirements, and monitoring and costing information.

Appendix A: Draft Wateridge Village Phases 2B - Master Concept Plan

	Number of Floors	Building Height	Commercial Floor Area (sq.m.)	Total Residential Units
Low-Rise Residential: Block 1				
Building A	4	16		24
Building B	4	16		24
Building C	4	16		24
Building D	4	16		24
Building E	4	16		24
Low-Rise Residential: Blocks 2, 3, 4, 5, 6, 8, & 9				
Singles	2-3	11		6
Semi-Detached	2-3	11		24
Townhouses	2-3	11		50
Mid-Rise Mixed-Use: Blocks 11				
Building A	8	24	1,527	96
Building B	6	18		60
Building C	4	12		24
Building D	4	12		48
Building E	6	18	615	25
Mid-Rise Mixed-Use: Blocks 12				
Building A	6	18	1,134	45
Building B	4	12	808	21
Building C	4	12		48
Building D	6	18		60
Building E	8	24	1,539	116
		Master Concept Plan Total	5,623	743
		CDP Estimate		696



PHASE 2B

Appendix B: Topsoil Amendment Options

OPTION 1
On-Site Soil Amendment - Default Ratio 3:1
All Building Types

Materials

- Amend existing site topsoil using 3:1 ratio by volume (3 parts existing topsoil, 1 part amendment material)
- Amendment Material: organic matter primarily leaf, yard and bark waste compost of 20-30% by dry weight as determined by Loss-on-Ignition (LOI) and a pH of 6.0 to 8.0
- No uncomposted manure or other organic materials, sphagnum peat or organic amendments that contain sphagnum peat

Placement and Amendments

1. Remove existing topsoil and preserve on-site.
2. Rip native subsoil (decompaction) using the teeth of an excavator or bobcat bucket or equivalent to a depth of 100-200mm. Rip using a perpendicular pattern (See Detail No.1) ensuring full site coverage. No ripping within tree protection areas (See Detail No.2) or within 3m of building foundations (See Detail No.3).
3. Amend existing site topsoil to meet post construction soil amendment requirements using 3:1 ratio by volume (topsoil : amendment material).
4. Two (2) methods for amending the existing soils in place are acceptable:

   Method No.1 - Layer and Incorporate (Detail No.4)

   i. Apply 100mm of existing site topsoil followed by 50mm of amendment material and incorporate/mix amended material.
   ii. Lightly roll or smooth using the back of the machinery bucket.
   iii. Repeat i. and ii.
   iv. Adjust layer quantities to ensure a settled amended topsoil depth of 300m and compliance with site grading. Placement should account for 10% settlement.

   Method No.2 - Mechanical or Bucket Mix

   i. Successively add, mix and pile one (1) unit of amendment material with three (3) units of existing site topsoil.
   ii. Thoroughly mix.
   iii. Repeat i. and ii to ensure thorough mixing until required volume is achieved.
   iv. Place 150mm of amended topsoil, lightly roll or smooth using the back of the machinery bucket.
   v. Repeat iv.
   vi. Adjust layer quantities to ensure a settled amended topsoil depth of 300m and compliance with site grading.

Amended topsoil should be wetted after application, allowed to settle for a minimum of one (1) week and grades adjusted as required prior to installation of turf.

-IMPORTANT-

Documentation Requirements

As part of verification, the owners shall produce delivery tickets, receipts and specifications detailing the delivery address, quantities and product description and sources for verification by City inspectors. Delivery address is to be listed and must correspond to the property/site being inspected. Site without proper documentation may be subject to additional verification procedures including laboratory testing at the expense of the owner. The owner's engineer shall provide a duly notarized letter with all supporting documentation certifying the proper installation and placement of amended soil.

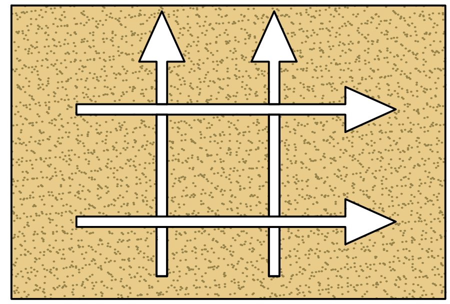
Consultant Verification/Inspection

Verification may occur after the minimum one (1) week settlement period. Verification is suggested prior to turf placement. Non-compliant sites shall be rectified at the expense of the owner.

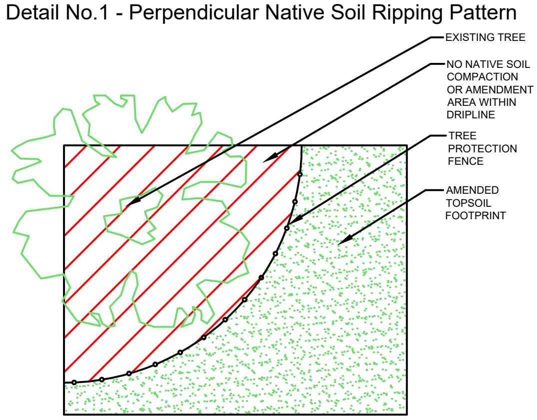
At random, the Developer's consultant shall dig at least one (1) test hole to verify amended topsoil depth and uncompacted soil depths.

Requirements:

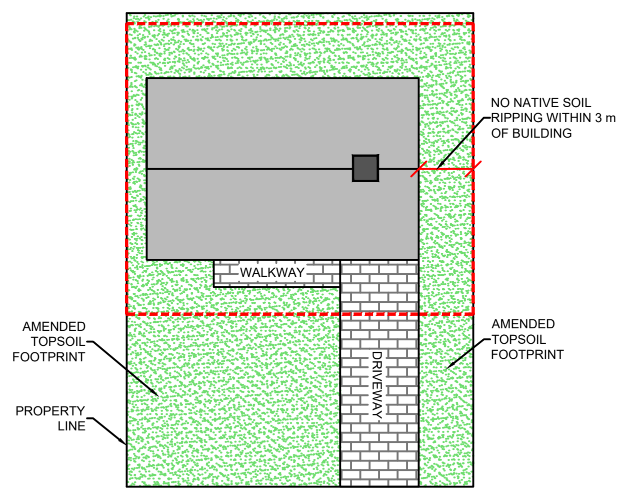
1. Amended topsoil layer shall be easily dug using only the inspector's weight or cored without other mechanical assistance.
2. The amended topsoil layer shall be darker in color than the unamended- ripped subsoil and particles of organic matter should be easily visible.
3. Measured amended topsoil depths shall be deemed to be in conformance based on the following:
   - Using a common garden spade, the measured depth of amended topsoil shall be equal to the required 300mm depth (±25mm)
   - Using a small diameter coring unit, the measured core depth of amended topsoil shall be equal to the required 300mm depth (±50mm)



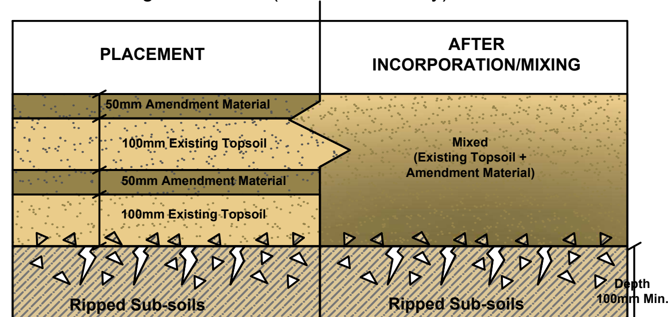
Detail No.1 - Perpendicular Native Soil Ripping Pattern



Detail No.2 - No Native Soil Ripping within Tree Protection Areas or Amendment



Detail No.3 - No native soil ripping within 3.0m of Building Foundation (Amendment Only)

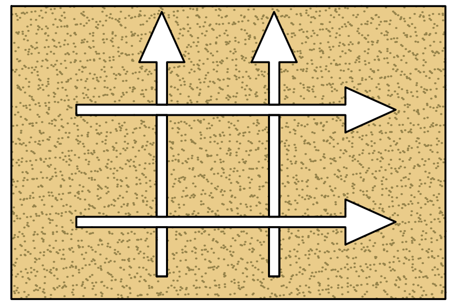


Detail No.4 Amendment Method No. 1

OPTION 2
On-Site Soil Amendment
Import and Replace Topsoil with Amendment Material
All Building Types and Parks

Materials

- Amendment material shall be obtained from a Compost Quality Assurance (CQA) licensed and OMOE/ CCME approved facility and shall comply with the Category "A" compost designation. The amendment material must contain:
  - Organic matter primarily leaf, yard and bark waste compost of 8-15% by dry weight as determined by Loss-on-Ignition (LOI) and a pH of 6.0 to 8.0.
  - No uncomposted manure or other organic materials, sphagnum peat or organic amendments that contain sphagnum peat.

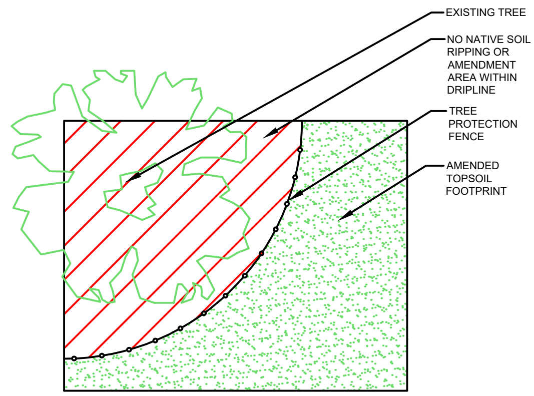


Detail No.1 - Perpendicular Native Soil Ripping Pattern

Placement and Amendments

1. Remove existing topsoil and dispose off-site in accordance with OPSS 206 and OPSS 180, O. Reg. 153/06, the Environmental Protection Act or municipal by-laws and policies, whichever supersedes.
2. Rip native subsoil (decompaction) using the teeth of an excavator or bobcat bucket or equivalent to a native subsoil at depth of 100-200mm. Rip using a perpendicular pattern (See Detail No.1) ensuring full site coverage. No ripping within tree protection areas (See Detail No.2) or within 3m of building foundations (See Detail No.3).
3. Import pre-mixed amended topsoil (300mm depth of coverage required).
4. Place imported pre-mixed amended topsoil in 150mm lifts, lightly roll or smooth using machinery bucket and repeat. Adjust layer quantities to ensure a settled amended topsoil depth of 300mm and compliance with site grading. (See Detail No.4).

Amended topsoil should be wetted after application, allowed to settle for a minimum of one (1) week and grades adjusted as required prior to installation of turf.

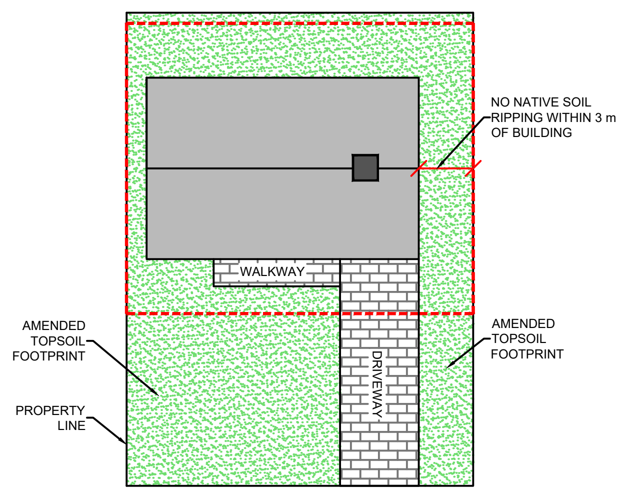


Detail No.2 - No Native Soil Ripping within Tree Protection Areas or Amendment

-IMPORTANT-

Documentation Requirements

As part of verification, the owners shall produce delivery tickets, receipts and specifications detailing the delivery address, quantities and product description and sources for verification by City inspectors. Delivery address is to be listed and must correspond to the property/site being inspected. Sites without proper documentation may be subject to additional verification procedures including laboratory testing at the expense of the owner. The owner's engineer shall provide a duly notarized letter with all supporting documentation certifying the proper installation and placement of amended soil.



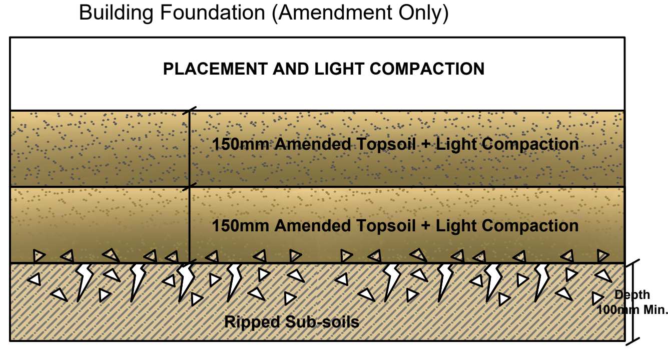
Detail No.3 - No Native Soil Ripping within 3.0m of Building Foundation (Amendment Only)

Consultant Verification/Inspection

Verification may occur after the minimum one (1) week settlement period. Verification is suggested prior to turf placement. Non-compliant sites shall be rectified at the expense of the owner

At random, the Developer's consultant shall dig at least one (1) test hole to verify amended topsoil depth and uncompacted soil depths.
Requirements:

1. Amended topsoil layer shall be easily dug using only the inspector's weight or cored without other mechanical assistance.
2. The amended topsoil layer shall be darker in color than the unamended- ripped subsoil and particles of organic matter should be easily visible.
3. Measured amended topsoil depths shall be deemed to be in conformance based on the following:
   - Using a common garden spade, the measured depth of amended topsoil shall be equal to the required 300mm depth (±25mm)
   - Using a small diameter coring unit, the measured core depth of amended topsoil shall be equal to the required 300mm depth (±50mm)

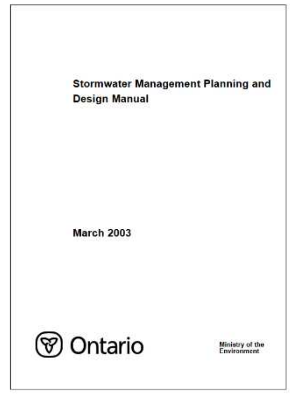
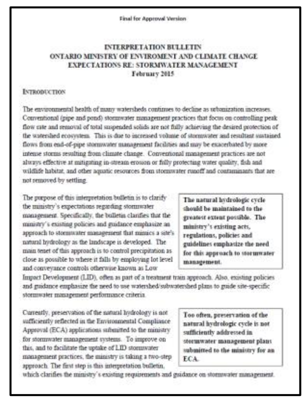
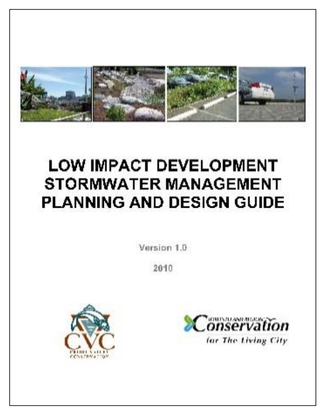


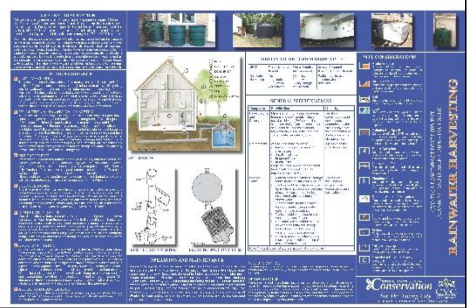
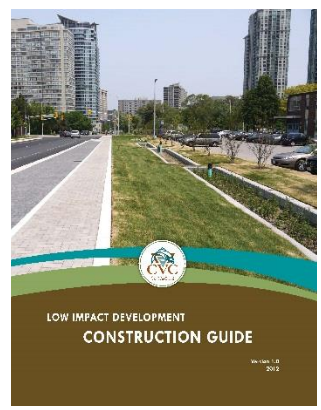
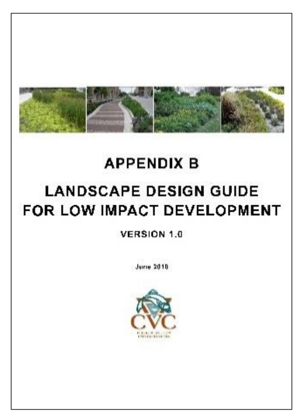
Detail No.4 Placement and Compaction Lifts for Amended Topsoil

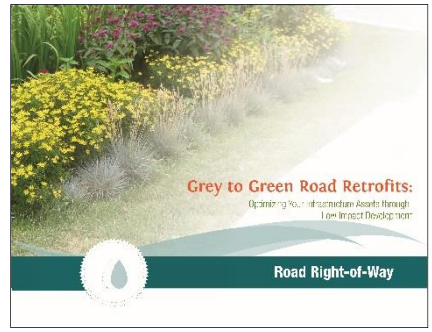
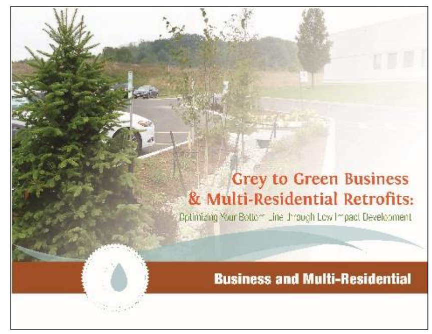
Appendix C: Resource Directory

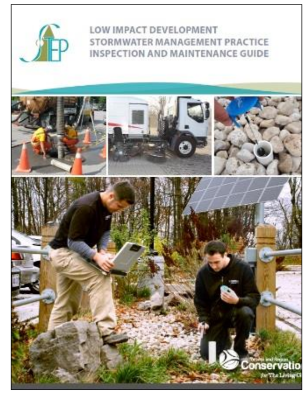
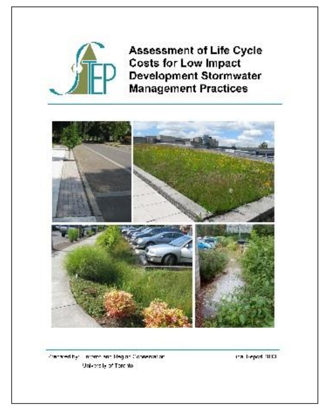
May 13th, 2018
Ref No. 65578.1

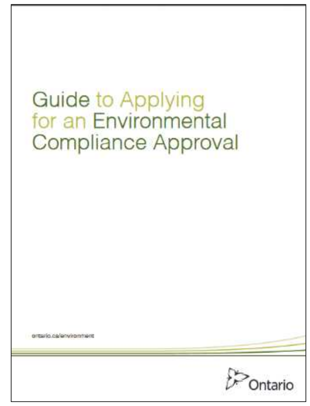
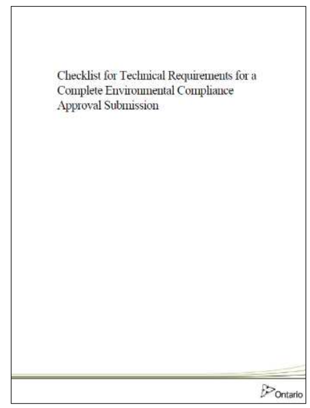
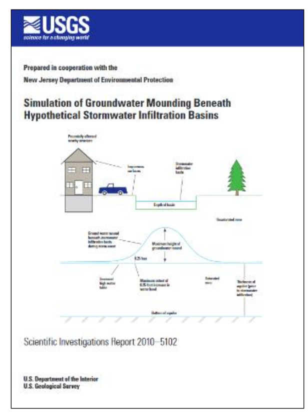
Resource Directory

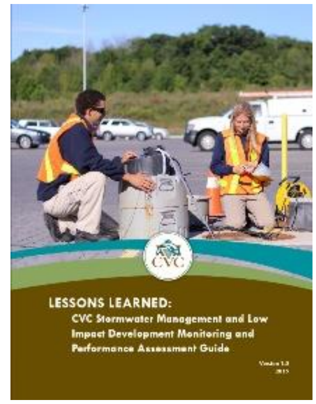
Provincial Manual	**Stormwater Management Planning and Design Manual (MOE, 2003)** https://www.ontario.ca/document/stormwater-management-planning-and-design-manual-0	 Stormwater Management Planning and Design Manual March 2003 Ontario Ministry of the Environment
Interpretation Bulletin	**Interpretation Bulletin Ontario Ministry of Environment and Climate Change Expectation Re: Stormwater Management (MOE, 2015)** http://www.raincommunitysolutions.ca/wp-content/uploads/2015/07/MOECC-interpretation-bulletin-re-stormwater-management.pdf	 Final for Approval Version INTERPRETATION BULLETIN ONTARIO MINISTRY OF ENVIROMENT AND CLIMATE CHANGE EXPECTATIONS RE: STORMWATER MANAGEMENT February 2015 INTRODUCTION The environmental health of many watersheds continues to decline as urbanization increases. Conventional (pipe and pond) stormwater management practices that focus on controlling peak flow rate and removal of total suspended solids are not fully achieving the desired protection of the watershed ecosystem. This is due to increased volume of stormwater and resultant sustained flows from end-of-pipe stormwater management facilities and may be exacerbated by more intense storms resulting from climate change. Conventional management practices are not always effective at mitigating in-stream erosion or fully protecting water quality, fish and wildlife habitat, and other aquatic resources from stormwater runoff and contaminants that are not removed by settling. The purpose of this interpretation bulletin is to clarify the ministry's expectations regarding stormwater management. Specifically, the bulletin clarifies that the ministry's existing policies and guidance emphasize an approach to stormwater management that mimics a site's natural hydrology as the landscape is developed. The main tenet of this approach is to control precipitation as close as possible to where it falls by employing lot level and conveyance controls otherwise known as Low Impact Development (LID), often as part of a treatment train approach. Also, existing policies and guidance emphasize the need to use watershed/subwatershed plans to guide site-specific stormwater management performance criteria. **The natural hydrologic cycle should be maintained to the greatest extent possible. The ministry's existing acts, regulations, policies and guidelines emphasize the need for this approach to stormwater management.** Currently, preservation of the natural hydrology is not sufficiently reflected in the Environmental Compliance Approval (ECA) applications submitted to the ministry for stormwater management systems. To improve on this, and to facilitate the uptake of LID stormwater management practices, the ministry is taking a two-step approach. The first step is this interpretation bulletin, which clarifies the ministry's existing requirements and guidance on stormwater management. **Too often, preservation of the natural hydrologic cycle is not sufficiently addressed in stormwater management plans submitted to the ministry for an ECA.**
Planning and Design Guide	**Low Impact Development Stormwater Management Planning and Design Guide (TRCA/CVC, 2101, Version 1.0)** http://sustainabletechnologies.ca/wp/wp-content/uploads/2013/01/LID-SWM-Guide-v1.0_2010_1_no-appendices.pdf	 LOW IMPACT DEVELOPMENT STORMWATER MANAGEMENT PLANNING AND DESIGN GUIDE Version 1.0 2010 CVC Conservation for The Living City
Planning Guide	**Grey to Green Enhanced Stormwater Management Master Planning: Guide to Optimizing Municipal Infrastructure Assets and Reducing Risk (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2016/01/ORGuide.pdf	

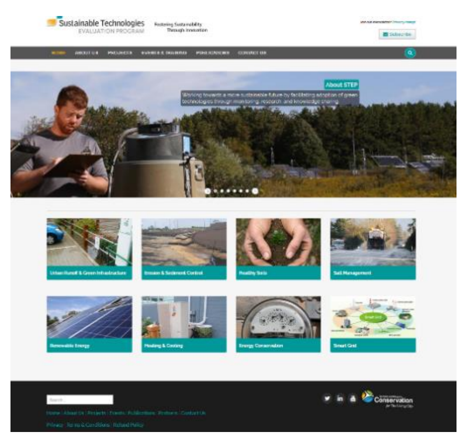
		
Planning & Design Fact Sheets	**Low Impact Development Stormwater Management Planning and Design Guide, including Fact Sheets:** http://www.creditvalleyca.ca/low-impact-development/low-impact-development-support/stormwater-management-lid-guidance-documents/low-impact-development-stormwater-management-planning-and-design-guide/	
Construction Guide	**Construction Guide for Low Impact Development (CVC, 2012, Version 1.0)** http://www.creditvalleyca.ca/wp-content/uploads/2013/03/CVC-LID-Construction-Guide-Book.pdf	
Landscape Design Guide	**Landscape Design Guide for Low Impact Development (CVC – Version 1.0)** http://www.creditvalleyca.ca/low-impact-development/low-impact-development-support/stormwater-management-lid-guidance-documents/andscape-design-guide-for-low-impact-development-version-1-0-june-2010/	

Roads Retrofit Design Guide	**Low Impact Development Road Retrofits: Optimizing Your Infrastructure through Low Impact Development (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2014/08/Grey-to-Green-Road-ROW-Retrofits-Complete_1.pdf	
Business & Multi- Res. Retrofit Design Guide	**Grey to Green Business & Multi- Residential Retrofits: Optimizing Your Infrastructure through Low Impact Development (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2015/01/Grey-to-Green-Business-and-Multiresidential-Guide1.pdf	
Residential Retrofit Design Guide	**Low Impact Development Residential Retrofits: Engaging Residents to Adopt Low Impact Development in their Properties (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2015/01/Grey-to-Green-Residential-Guide1.pdf	
Public Lands Retrofit Design Guide	**Grey to Green Public Lands Retrofits: Optimizing Your Infrastructure through Low Impact Development (CVC)** http://www.creditvalleyca.ca/wp-content/uploads/2015/01/Grey-to-Green-Pulic-Lands-Guide.pdf	

Maintenance Guide	**Low Impact Development Stormwater Management Practice Inspection and Maintenance Guide (TRCA/ STEP, 2016, Version 1.0)** http://www.sustainabletechnologies.ca/wp/home/urban-runoff-green-infrastructure/low-impact-development/low-impact-development-stormwater-practice-inspection-and-maintenance-guide/	
Life Cycle Costs Report	**Assessment of Life Cycle Costs for Low Impact Development Stormwater Management Practices (TRCA, UofT, 2013)** http://www.sustainabletechnologies.ca/wp/wp-content/uploads/2013/06/LID-LCC-final-2013.pdf	
Costing Tool	**Low Impact Development Life Cycle Costing Tool (STEP)** http://www.sustainabletechnologies.ca/wp/home/urban-runoff-green-infrastructure/low-impact-development/low-impact-development-life-cycle-costs/	

Approval Guide	**Guide to Applying for an Environmental Compliance Approval** https://www.ontario.ca/document/guide-applying-environmental-compliance-approval	 Guide to Applying for an Environmental Compliance Approval ontario.ca/environment Ontario
ECA Submission Checklist	**Checklist for Technical Requirements for Complete Environmental Compliance Approval Submission** https://www.ontario.ca/document/checklist-technical-requirements-complete-environmental-compliance-approval-submission	 Checklist for Technical Requirements for a Complete Environmental Compliance Approval Submission Ontario
Groundwater Mounding Analysis	**Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins** **USGS** https://pubs.usgs.gov/sir/2010/5102/ Spreadsheet Hantush_USGS_SIR_2010-5102-1110.xlsm	 USGS Prepared in cooperation with the New Jersey Department of Environmental Protection Simulation of Groundwater Mounding Beneath Hypothetical Stormwater Infiltration Basins Scientific Investigations Report 2010–5102 U.S. Department of the Interior U.S. Geological Survey

Monitoring Guide	**CVC Stormwater Management and Low Impact Development Monitoring and Performance Assessment Guide (2015, V1.0)** http://www.creditvalleyca.ca/wp-content/uploads/2016/06/Monitoring_Guide_Final.pdf	
Planning Level Modelling Tool (Class A)	**LID Treatment Train Tool (LID TTT)** http://www.sustainabletechnologies.ca/wp/low-impact-development-treatment-train-tool/	
LID Performance Resources	**Sustainable Technologies Evaluation Program available** https://wiki.sustainabletechnologies.ca/wiki/Main_Page **LID BMP monitoring plans, technical reports and case studies** http://www.creditvalleyca.ca/low-impact-development/lid-maintenance-monitoring/ **International Stormwater BMP Database** http://www.bmpdatabase.org/index.htm.	

Other Resources and Reports		
	Sustainable Technologies Evaluation Program (STEP): www.sustainabletechnologies.ca/ **Resources, Studies and Reports** 1. Green Infrastructure Map 2. Stormwater Infiltration in Cold Climates Review (2009) 3. Stormwater Management and Watercourse Impacts: The Need for a Water Balance Approach 4. Preserving and Restoring Healthy Soil: Best Practices for Urban Construction 5. LID Discussion Paper 6. Urban Water Balance 7. LID "Barrier Buster" fact sheet series **Features Studies and Resources:** 8. Bioretention and Rain Gardens 9. Green Roofs	

	10. Soakaways, Infiltration Trenches and Chambers 11. Permeable Pavement 12. Swales and Roadside Ditches 13. Perforated Pipe Systems 14. Rainwater Harvesting 15. Residential Stormwater Landscaping 16. Water Balance for the Protection of Natural Features	

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Technical Memorandum

To/Attention	Mary Jarvis - Canada Lands Company	**Date**	November 23, 2022
From	Jim Moffatt – IBI Group	**Project No**	118863-2.0
cc	Krisendat Sewgoolam - Canada Lands Company Meghan Black - IBI Group Anton Chetrar - IBI Group		
Subject	Block 11 - Parcel 1 Site Plan Submission Wateridge Village Phase 2B		

Introduction

This technical memorandum has been prepared for Canada Lands Company and includes a review of the proposed site plan for Parcel 1 at Block 11 in Phase 2B of the Wateridge Village community. The review is based on the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing prepared by IBI Group dated April 26, 2022, also included in **Appendix A**.

Figure 1, in the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing, shows the location site plan for Parcel 1 at Block 11 for which DesignWorks Engineering is seeking approvals. Parcel 1 in Block 11 is surrounded by Tawadina Street to the north, Bareille-Snow Street to the west, Parcel 2 to the south and Michael Stoqua Street to the east. The plan consists of two 9-storey residential buildings with one level of underground parking.

The DesignWorks Engineering site plan shows different storm and sanitary servicing outlets than the ones provided by the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing dated April 26, 2022. This memorandum will outline the impacts on wastewater disposal and a review of the water supply and low impact development for the proposed development. In terms of management of stormwater, the proposed design was compared to the aforementioned April 2022 IBI memo.

Sanitary Servicing

As stated previously, our review will be based on the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing prepared by IBI Group dated April 26, 2022.

In the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing, Parcel 1 in Block 11 is proposed to outlet into the sanitary sewer system on Barreille-Snow Street, north of MH308A. On the site plan submitted by DesignWorks Engineering for parcel, the sanitary sewer is proposed to outlet on Tawadina Street, west of MH304A.

An analysis of the ability of the existing sanitary sewer system in Tawadina Street to accommodate the flows from Parcel 1 in Block 11 was also completed. This analysis is included on the updated sanitary sewer spreadsheet included in **Appendix B**. The updated spreadsheet was based not only on the current City of Ottawa wastewater criteria, which came into effect in 2018 but also on the proposed site plan as submitted by DesignWorks Engineering. The following **Table 1** provides a review of the impacts of this change and the ability of the sanitary sewers to accept and convey any changes in flows.

Table 1: Sanitary Flow vs Sewer Capacity Analysis

Street Location	Original Plan			Final DesignWorks Plan			Sewer Design		
	Units	Total Popn	Flows(l/s)	Units	TotalPopn	Flows(l/s)	Size(mm)	Spare Capacity(l/s)	
								Flow	%
Tawadina									
MH303A – MH304A	**0**	**83.7**	**3.07**	**240**	**515.7**	**7.96**	**250**	**23.06**	**74.33**
Bareille-Snow									
MH304A – MH308A	**140**	**1964.7**	**24.33**	**0**	**2238.3**	**26.80**	**250**	**12.93**	**32.54**

The updated analysis includes the existing sewer system highlighted on the Phase 2B design sheet. It is noted that the proposed site plan has new population of 432.0 people. This shows an increase of 273.6 people from the results of the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing. The new calculated wastewater flows in the Tawadina Road sewer from MH303A to MH304A from Parcel 1 is 7.96 l/s. This shows a wastewater flow increase of 4.89 l/s as a result of re-directing wastewater flow of Parcels 1 from Barreille-Snow Street to Tawadina Road. The spare capacity of that sewer is 23.06 l/s. The capacity of the sanitary sewer in Barreille-Snow Street was analyzed as well. The wastewater flow between MH304A and MH308A is 26.80 l/s. This shows an increase of 2.47 l/s in wastewater flow with an available capacity of 12.93 l/s.
For reference, a highlighted copy of the Phase 2B sanitary sewer design sheet is included in **Appendix B**.

The impact of re-directing wastewater flows from Parcel 1 in Block 11 to the Tawadina Road sanitary sewer has been completed. Based on the analysis noted above, the existing wastewater system in Wateridge Village Phase 2B has sufficient available capacity to carry the re-directed flows from Parcel 1 in Block 11. It is therefore concluded that the existing sanitary sewers in Tawadina Road, Bareille-Snow Street adjacent to the subject property can accommodate the re-direction of flows from Parcel 1 in Block 11.

Stormwater Servicing

The stormwater servicing is not consistent with the servicing presented in the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing prepared by IBI Group dated April 26, 2022. For example, the minor storm connection proposed by DesignWorks Engineering is to Tawadina Road to the north, while it was concluded in the IBI memo that the connection is to be to Bareille-Snow Street to the west. IBI cannot at this time comment on the implication of such a change. It should be noted that in addition to minor system connectivity, the April 2022 memo also outlined major system connectivity as well as minor and major system requirements.

Water Servicing

The objective of this evaluation is to review the water distribution of the submitted site plan by DesignWorks Engineering. A watermain model for the site plan area was included in the phase 2B Design Brief. For reference, the modeling results for Phase 2B are included in **Appendix C**.

The site plan shows a new 200mm diameter watermain connection at the existing 400mm watermain on Tawadina Road. This connection is expected to service both buildings on the site plan. The water design criteria used in calculating the water demands and system pressures for the site plan in Block 11 submitted by DesignWorks Engineering is based on the latest City of Ottawa Water Distribution Guidelines. It is also confirmed that the fire flow demand was calculated on the latest Fire Underwriters Survey (FUS) 2020.

The Wateridge Phase 2B figure shows four nodes around the subject site (I14, I16, I18 and I20). The basic day pressures range from 551.6 kPa to 555.0 kPa on Tawadina Road. The City of Ottawa criteria for pressure reduction during basic day demand is 552 kPa. Therefore, based on our analysis the building along Tawadina Road will not require pressure reducing valves on internal plumbing. The peak hour pressures range between 498.8 kPa and 508.1 kPa. The City criteria is that peak hour pressures must exceed 276 kPa so there is no issue with this criterial. The fire flows available during maximum day demand range between 462.6 l/s and 850.5 l/s which greatly exceeds the required fire flow rate of 320.17 l/s for the proposed buildings on the site plan.

The results of the average day demand for the site shows a demand of 1.4 L/s or 120,960 L/day. The City of Ottawa requires that a minimum 2 feeds be provided to a service area with a demand above 50,000 L/day, to avoid service disruptions. Therefore, an additional watermain connection to service the site is required.

Low Impact Development

A review of the proposed site plan, located at Wateridge Village Phase 2B – Block 11, low impact development (LID) requirements was completed and included in **Appendix D**.

Conclusion

In summary, a review of the proposed site plan for which DesignWorks Engineering is seeking approvals was completed. In terms of wastewater disposal impacts, although the proposed sanitary servicing outlet is not consistent the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing, we can conclude that the existing sanitary sewer in Tawadina Road can accommodate the re-direction of flows from Parcel 1 in Block 11. Based on the analysis above of the water distribution, an additional watermain connection is required at the proposed site plan to meet City of Ottawa Design Guidelines.

In terms of management of stormwater, the stormwater servicing is not consistent with the servicing presented in the Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing prepared by IBI Group dated April 26, 2022. Therefore, IBI cannot at this time comment on the implication of such a change.

We trust our conclusions are satisfactory for your purposes. We are, of course, available to review and discuss the information contained within this document.

Regards,

IBI GROUP

Jim Moffatt, P. Eng.
Associate

APPENDIX A

- Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing

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Memorandum

To/Attention	John Bernier, City of Ottawa Shawn Wessel, City of Ottawa	**Date**	April 26, 2022
From	Meghan Black Jim Moffatt	**Project No**	118863-5.3.1.5
cc	Mary Jarvis, Canada Lands Company		
Subject	Assessment of Revised Block 11 and 12 Storm and Sanitary Servicing		

1. Background

Blocks 11 and 12 are located within Phase 2B of the Wateridge development and are indicated in **Figure 1**. The municipal servicing of the two blocks was addressed in, "Design Brief, Wateridge Village at Rockcliffe Phase 2B," prepared by IBI Group in April 2019. Subsequent to the approval of the Phase 2B detailed design, Canada Lands Company has sub-divided the subject blocks into five parcels for development. The parcels, identified as Parcels 1-5, are being considered for purchase by various parties. IBI has been engaged to assess the impact of this change on adjacent existing storm and sanitary sewers. Enclosed **Figure 1** depicts Blocks 11 and 12 and the respective five parcels.

2. Stormwater Management

2.1 Objective

The objective of the evaluation is to assess the impact on the dual drainage system of discretizing Blocks 11 and 12 into Parcels 1-5 and the associated impacts to the storm servicing. The detailed design of Parcels 1-5 will be carried out by others.

2.2 Dual Drainage Design

Per the Phase 2B design brief, minor storm runoff from Block 11 (identified as drainage area B309) drains to Bareille-Snow Street, with major flow tipping to Bareille-Snow Street at Hemlock Road. Minor flow from Block 12 (identified as drainage area B340) drains to Codd's Road with major flow draining to Hemlock Road. The minor system restriction for the two development blocks corresponds to between the 5 and 100 year storm event, and no on-site storage was proposed. The storm drainage area plan (Drawing 750) from the Phase 2B submission is enclosed in **Appendix A** for reference. With the proposed adjustments to the storm servicing for the sub-divided or discretized parcels, minor system capture and on-site storage has been re-assessed.

2.3 Hydrological Analysis

Hydrological analysis of the dual drainage system of the subject site has been conducted using DDSWMM, consistent with the simulations completed for the Phase 2B design brief.

2.3.1 Storm and Design Parameters

The following storms and design parameters have been used in the evaluation. The main hydrological parameters are summarized in **Table 2.1**, with a comparison of what was included in the Phase 2B evaluation.

- **Design Storms:** The subject site has been evaluated with the following storms, consistent with the Phase 2B evaluation:
    - 5 and 100 year 3 hour Chicago storm events, and associated stress test; applied for the evaluation of the trunk storm sewers;
    - 100 year 24 hour SCS Type II storm event, applied for the evaluation of the trunk storm sewers;
    - July 1979, August 1988, August 1996 historical storms per the OSDG.
- **Area and Imperviousness:** Block 11 (identified as drainage area B309) and Block 12 (identified as drainage area B340) have been discretized into Parcels 1 through 5. An imperviousness value of 86% has been applied to the parcels, consistent with the values applied for B309 and B340 in the Phase 2B design brief.
- **Infiltration:** Infiltration losses were selected to be consistent with the OSDG. The Horton values are as follows: f_o = 76.2 mm/h, f_c = 13.2 mm/h, k = 0.00115 s^{-1}.
- **Subcatchment Width:** The catchment width for the parcels was based on 225 m/ha.
- **Slope:** The ground slope was based upon the average slope for both impervious and pervious area. Generally, the slope is approximately 2% (0.02 m/m). This assumes a slope of approximately 1% for impervious or road surfaces and 3% for pervious surfaces (lot grading).
- **Initial Abstraction (Detention Storage):** Detention storage depths of 1.5 mm and 4.67 mm were used for impervious and pervious areas, respectively. These values are consistent with the OSDG.
- **Manning's roughness:** Manning's roughness coefficients of 0.013 and 0.25 were used for impervious and pervious areas, respectively.
- **Baseflow:** No baseflow components were assumed for any of the areas contributing runoff to the minor system within the DDSWMM model.
- **Minor System Capture:** The minor system capture for the parcels ranges from the 5 year to the 100 year, with three parcels capturing between the 5 and 100 year simulated flow.
- **Major System Storage and Routing:** In order to continue to satisfy City design guidelines, on-site storage has been introduced on four of the parcels, as noted below.

A summary of parameters and minor system and on-site storage is presented in the following tables. A summary from the Phase 2B detailed design is included to facilitate review. Refer to

Figure 2 for the overall storm sewer network and to **Figure 3** for a depiction of the minor and major system connectivity for the five parcels.

Table 2.1 Hydrological Parameters

Block	Phase 2B Design Brief							Current Evaluation							
	Drainage Area ID	Area (ha)	Major System: D/S Segment ID	Minor System: MH ID	IMP Ratio	Segment Length (m)	Sub-catchment Width (m)	Parcel	Drainage Area ID	Area (ha)	Major System: D/S Segment ID	Minor System: MH ID	IMP Ratio	Segment Length (m)	Sub-catchment Width (m)
11	B309	1.24	S308A on Bareille-Snow	MH309 on Bareille-Snow	0.86	135.1	270.2	1	B309_1	0.72	S308 on Bareille-Snow	MH309 on Bareille-Snow	0.86	81	162
								2	B309_2	0.52	S308A on Bareille-Snow	MH310 on Michael Stoqua	0.86	58.5	117
12	B340	1.24	S207 on Hemlock	MH305 on Codd's Road	0.86	173.1	346.3	3	B340_3	0.34	S308A on Bareille-Snow	MH308 on Bareille-Snow	0.86	38.25	76.5
								4	B340_4	0.53	S308 on Bareille-Snow	MH309 on Bareille-Snow	0.86	59.63	119.25
								5	B340_5	0.37	S340 on Codd's	MH305 on Codd's Road	0.86	41.63	83.25

Table 2.2 Minor System Restriction and On-site Storage

Block	Phase 2B Design Brief				Current Evaluation					
	Drainage Area ID	Minor System Capture		Required On-Site Storage (cu-m)	Parcel	Drainage Area ID	Minor System Capture		Major System	
		Simulated Flow (l/s)	Corresponding Design Storm				Simulated Flow (l/s)	Corresponding Design Storm	Required On-Site Storage (cu-m)	Comment
11	B309	370	Between 5 and 100	None	1	B309_1	195	Between 5 and 100 year	43	Control up to the 100 year event
					2	B309_2	105	5 year	64	Control up to the 100 year event
12	B340	366	Between 5 and 100	None	3	B340_3	95	Between 5 and 100 year	18	Control up to the 100 year event
					4	B340_4	150	Between 5 and 100 year	21	Control up to the 100 year event
					5	B340_5	139	100 year	None	N/A

2.4 Results of Hydrological Modeling

2.4.1 Minor System

The minor system hydrographs generated by the hydrological model were exported to the hydraulic model for analysis, discussed in **Section 2.5**.

2.4.2 Major System

Due to the adjustment in major system connectivity, the major system has been reassessed. Refer to drainage areas on Drawing 750 from the Phase 2B submission in **Appendix A**.

2.4.2.1 Street Segment Storage

The available and utilized street sag storage is summarized in the below table for street segments in affected by the revised storm servicing of Parcels 1-5.

Table 2.3 Summary of On-site Street Storage (Available and Utilized) During Target Minor System Design Storm in Vicinity of Parcels 1-5

Street	Drainage Area ID	Minor System Design Storm	Available Static Storage (cu-m)	Total Storage Utilized During Minor System Design Storm (cu-m)	Overflow During Minor System Design Storm (l/s)
Michael Stocqua	S310A	5	61.39	0	0
Bareille-Snow	S308A	5	40.38	0	0
Hemlock	S176C	5	1.14	0	0

The results indicate that there is no ponding on the street segments during the minor system design storm.

2.4.2.2 Velocity x Depth

According to the City of Ottawa Sewer Design Guidelines (October 2012), the maximum depth of flow should not exceed 350 mm and the product of velocity and depth on all the street segments should not exceed 0.6 m^2/s during the 100 year storm event.

The cascading overflow is the flow exiting a drainage area when maximum minor system inflow and maximum available ponding has been utilized. To determine velocity of the cascading overflow, a SWMHYMO file was created (118863VD.dat).

To determine velocity of the cascading overflow at critical locations, SWMHYMO was used. The ROW sections were entered into the model with the appropriate longitudinal slopes to obtain the maximum velocity of flow using the Route Channel routine. The overflow is obtained from the respective DDSWMM output file and is noted in the footnotes of the below tables.

To determine depth of the cascading overflow, the *Calculation Sheet: Overflow From Typical Road Ponding Area* provided at the February 2014 Technical Bulletin ISDTB-2014-01 was used. The exception to this is where the road is on grade in which case the depths were obtained from the SWMHYMO model.

The results are presented in **Table 2.4** and **Table 2.5** and the supporting calculations are included in **Appendix A**.

Table 2.4 Summary of Cascading Flow during the 100 year 3 hour Chicago storm

Street	Drainage Area ID	Dummy Segment ID	Overflow (l/s)[1]	Velocity (m/s)[2]	Max. Static Ponding Depth (m)	Depth of Dynamic Flow (m)[3]	Max. Depth (Static + Dynamic) (m)	Velocity x Depth (m^2/s)
Michael Stoqua	S311A	N/A	49	0.73	N/A	0.04	0.04	0.03
Michael Stoqua	S310A	D14	0	0	0.29	0	0.29	0
Bareille-Snow	S309	N/A	43	0.50	N/A	0.05	0.05	0.03
Bareille-Snow	S308	N/A	65	0.84	N/A	0.05	0.05	0.04
Bareille-Snow	S308A	D18	26	0.47	0.26	0.05	0.31	0.03
Codd's	S340	N/A	50	0.88	N/A	0.04	0.04	0.04
Codd's	S231	N/A	100	0.62	N/A	0.07	0.07	0.04
Hemlock	S205C	N/A	37	0.48	N/A	0.05	0.05	0.02
Hemlock	S207	N/A	61	0.55	N/A	0.06	0.06	0.03

(1) Overflow from DDSWMM output 118863-3CHI100.out
(2) Velocity from SWMHYMO output 118863VD.out
(3) Depth of the cascading overflow was determined from the Calculation Sheet: Overflow From Typical Road Ponding Area provided in the February 2014 Technical Bulletin ISDTB-2014-01. For those areas which have a continuous road grade (or no dummy segment), the depth was taken from SWMHYMO VxD simulation.

Table 2.5 Summary of Cascading Flow during the 100 year 3 hour Chicago storm + 20%

Street	Drainage Area ID	Dummy Segment ID	Overflow (l/s)[1]	Velocity (m/s)[2]	Max. Static Ponding Depth (m)	Depth of Dynamic Flow (m)[3]	Max. Depth (Static + Dynamic) (m)	Velocity x Depth (m^2/s)
Michael Stoqua	S311A	N/A	66	0.79	N/A	0.05	0.05	0.04
Michael Stoqua	S310A	D14	33	0.61	0.29	0.06	0.35	0.04
Bareille-Snow	S309	N/A	71	0.57	N/A	0.06	0.06	0.03
Bareille-Snow	S308	N/A	216	1.15	N/A	0.08	0.08	0.09
Bareille-Snow	S308A	D18	268	1.29	0.26	0.13	**0.39**	0.17
Codd's	S340	N/A	98	1.04	N/A	0.05	0.05	0.06
Codd's	S231	N/A	165	0.71	N/A	0.08	0.08	0.06
Hemlock	S205C	N/A	46	0.51	N/A	0.05	0.05	0.03

Street	Drainage Area ID	Dummy Segment ID	Overflow (l/s)[1]	Velocity (m/s)[2]	Max. Static Ponding Depth (m)	Depth of Dynamic Flow (m)[3]	Max. Depth (Static + Dynamic) (m)	Velocity x Depth (m^2/s)
Hemlock	S207	N/A	89	0.60	N/A	0.07	0.07	0.04

(1) Overflow from DDSWMM output 118863-3CHI120.out
(2) Velocity from SWMHYMO output 118863VD.out
(3) Depth of the cascading overflow was determined from the Calculation Sheet: Overflow From Typical Road Ponding Area provided in the February 2014 Technical Bulletin ISDTB-2014-01. For those areas which have a continuous road grade (or no dummy segment), the depth was taken from SWMHYMO VxD simulation.

During the 100 year 3 hour Chicago storm, the summation of depth of ponding and depth of cascading flow for all street segments is less than the City guideline of 0.35 m. The product of depth and velocity is also less than the City guideline of 0.6 m^2/s.

During the sensitivity analysis applying the 100 year 3 hour Chicago storm increased by 20%, the summation of depth of ponding and depth of cascading flow for all street segments is less than the City guideline of 0.35 m, with the exception of S308A, noted in the above table in bold red type. At all locations, the product of depth and velocity is less than the City guideline of 0.6 m^2/s.

These results are consistent with those of the Phase 2B detailed design. It should be noted that major flow from the above-noted affected areas is at or below that accounted for in the Phase 2B model.

The area at which total depth of ponding and cascading flow exceeds 0.35 m during the stress test is noted in the below table with the critical adjacent property elevation.

Table 2.6 Critical Ponding Locations during the Stress Test and Adjacent Property Elevations

Drainage Area ID	Low Point Elevation (m)	Max. Depth (Static + Dynamic) (m)	(1) Corresponding Elevation (m)	(2) Adjacent Property Line (m)	Difference (2) – (1)
S308A	88.74	0.39	89.13	89.01	-0.12

The corresponding stress test ponding elevation is greater than the adjacent block grading at the boulevard. At the detailed design stage of the blocks, house openings must be greater than the ponding elevation.

2.5 Storm Hydraulic Grade Line Analysis

The hydraulic grade line (HGL) was evaluated using the XPSWMM hydraulic model. The existing overall model for the Wateridge site, most recently revised as part of the Phase 4 submission (December 2021), was revised to include the revised servicing of Parcels 1-5.

XPSWMM simulations were conducted for the 100 year 3 hour Chicago storm to ensure that the HGL is at least 0.3 m below the underside of footing elevations. A sensitivity analysis was also performed using the 100 year Chicago storm with a 20% increase in intensity to ensure that there is no severe flooding to properties. Hydraulic grade line elevations along the existing downstream Phase 1A trunk storm sewer and relevant Phase 2B storm sewers are presented in the below table for these storms, along with a comparison of underside of footing (USF) elevations. Results for the overall development area are presented in the enclosed **Appendix A**, including for the three historical storms per OSDG. Refer to **Figure 1** for the location of storm maintenance holes.

Table 2.7 Storm Hydraulic Grade Line – Phase 1A Trunk and Relevant Phase 2B Storm Sewers

MH ID	Street	Proposed Ground Elev. (m)	USF (m)	100 year 3 hour Chicago		100 year 3 hour Chicago + 20%	
				HGL (m)	USF – HGL (m)	HGL (m)	USF – HGL (m)
MH194	*Top of the escarpment*	82.05	N/A	80.47	N/A	80.55	N/A
MH193	OSHEDINAA	84.68	82.68	81.12	1.56	81.28	1.40
MH192	OSHEDINAA	84.99	82.99	81.46	1.53	81.64	1.35
MH191	OSHEDINAA	85.76	83.76	81.72	2.04	81.93	1.83
MH190	OSHEDINAA	86.36	84.36	81.96	2.40	82.19	2.17
MH180	OSHEDINAA	86.96	84.96	82.27	2.69	82.77	2.19
MH178	HEMLOCK	89.00	86.60	83.41	3.19	83.47	3.13
MH176	HEMLOCK	88.03	85.63	83.77	1.86	83.85	1.78
MH231	CODD’S	89.81	87.41	85.61	1.79	85.64	1.77
MH305	CODD’S	91.00	88.60	86.54	2.06	86.56	2.04
MH207	HEMLOCK	88.53	86.13	84.65	1.48	84.65	1.48
MH206	HEMLOCK	89.10	86.70	85.65	1.05	85.65	1.05
MH308	BAREILLE-SNOW	89.68	87.28	86.88	0.40	86.69	0.59
MH309	BAREILLE-SNOW	90.15	87.75	87.44	0.31	87.08	0.67
MH205	HEMLOCK	89.35	86.95	85.86	1.09	85.88	1.07
MH310	MICHAEL STOCQUA	90.04	87.64	87.28	0.36	87.42	0.22
MH311	MICHAEL STOCQUA	90.69	88.29	87.44	0.85	87.56	0.73

Along the Phase 1A trunk and Phase 2B storm sewers presented above, a minimum 0.3 m clearance between the USF and HGL is maintained during the 100 year 3 hour Chicago storm and the HGL elevations remain below USF elevations during the sensitivity analysis. This is also true for the results for the remainder of the development area for additional storm simulations (enclosed in **Appendix A**).

2.6 Conclusion

The storm servicing of Blocks 11 and 12 was addressed during the detailed design of Phase 2B. The purpose of this evaluation is to assess the impact on the dual drainage system of discretizing Blocks 11 and 12 into Parcels 1-5 and the associated revisions to the storm servicing. The proposed minor and major connectivity of the five parcels is presented on **Figure 3** and minor system capture and required on-site storage is summarized in **Table 2.2**.

In terms of major flow, the depth and velocity of flow on streets adjacent to the five parcels was evaluated. City guidelines with respect to ponding during the minor system design storm, as well as maximum depth and velocity of flow are maintained. Major flow from the adjacent street segments is at or below that accounted for in the Phase 2B model.

With respect to minor flow, the hydraulic grade line evaluation was updated with the revised inflow hydrographs from the five parcels. Results indicate that a minimum 0.3 m clearance between the USF and HGL is maintained during the 100 year 3 hour Chicago storm and the HGL elevations remain below USF elevations during the sensitivity analysis.

It is therefore concluded that the proposed storm servicing to support Parcels 1-5 can be accommodated by the existing storm infrastructure.

3. Wastewater Outlet

3.1 Objective

The objective of this evaluation is to assess the impact on the existing wastewater system by the sub-division of Blocks 11 and 12 into five parcels. **Figure 4** shows the location of the subject site and the existing sanitary sewers which will be impacted by this change.

3.2 Existing Conditions

Development of Phase 2B included the construction of sanitary sewers in Codd's Road from MH231A to the MH340A and Bareille-Snow Street from BLK308A to MH304A. The sanitary sewer on Codd's Road was designed to capture wastewater flows from Block 12 and the sanitary sewer on Bareille-Snow Street was designed to capture wastewater flows from Block 11. The Bareille-Snow sewer outlets to a sanitary sewer in Hemlock Road. The latter sewer was designed in 2017, using the City's wastewater flow criteria in effect at that time and predicted a flow of 28.49 l/s tributary from the Bareille-Snow sewer. The Bareille-Snow sanitary sewer was designed in 2019 based on flow calculation criteria in effect at that time and predicted a slightly less flow of 25.17 l/s. A highlighted copy of the Phase 2B sanitary sewer design sheet is included in **Appendix B**. The spreadsheet has been highlighted to indicate the immediate downstream sewers on Codd's Road and Bareille-Snow Street. The flow calculations in the Phase 2B spreadsheet were based on the City of Ottawa's wastewater criteria in effect of that time (2019) and the block population densities noted in the Master Servicing Study.

3.3 Proposed Condition

Because of the sub-division of Blocks 11 and 12 into five parcels, less wastewater flow is now proposed to outlet to the Codd's Road sanitary sewer. The Phase 2B sewer designed assumed all Block 12 would outlet to that sewer but now only parcel 5 is proposed to outlet in that direction. No further analysis is therefore needed for the Codd's Road sewer.

Parcels 3 and 4, which represent the balance of Block 12, are now proposed to outlet to the existing sanitary sewer in Bareille-Snow Street and not the Codd's Road sewer. There is no proposed change to the wastewater outlet for parcels 1 and 2. The Phase 2B design assumed all Block 11 would outlet to the Bareille-Snow sewer. Consequently, the expected wastewater flows to the latter pipe will likely increase.

An analysis of the ability of the existing sanitary sewer system in Bareille-Snow Street to accommodate the flows from both Block 11 and 12 was completed. This analysis is included on the updated sanitary sewer spreadsheet included in **Appendix B**. The updated spreadsheet was based not only on the current City of Ottawa wastewater criteria, which came into effect in 2018 but also on the most current concept plans for the various parcels which are also included in **Appendix B**. The updated analysis includes the existing sewer system highlighted on the Phase 2B design sheet.

Based on the updated analysis, the calculated wastewater flows tributary to the Hemlock Road sewer from Bareille-Snow Street is 30.31 l/s. This shows a wastewater flow increase of 1.82 l/s as a result of re-directing wastewater flows from parcels 3 and 4 in Block 12. The capacity of that sewer is 88.83 l/s. The Phase 1B design of the sanitary sewer in Hemlock Road between Bareille-Snow Street and Codd's Road indicated a spare capacity in that sewer of about 58 l/s. For reference, a highlighted copy of the Phase 1B sanitary sewer design sheet is included in **Appendix B**.

3.4 Conclusion

The impact of re-directing wastewater flows from Block 12 to the Bareille-Snow Street sanitary sewer has been completed. Based on the analysis noted above, the existing wastewater system in Wateridge Village Phase 1B and 2B has sufficient available capacity to carry the re-directed flows from Block 12. It is therefore concluded that the existing sanitary sewers in Bareille-Snow Street, Codd's Road and Hemlock Road adjacent to the subject property can accommodate the re-direction of flows from Block 12.

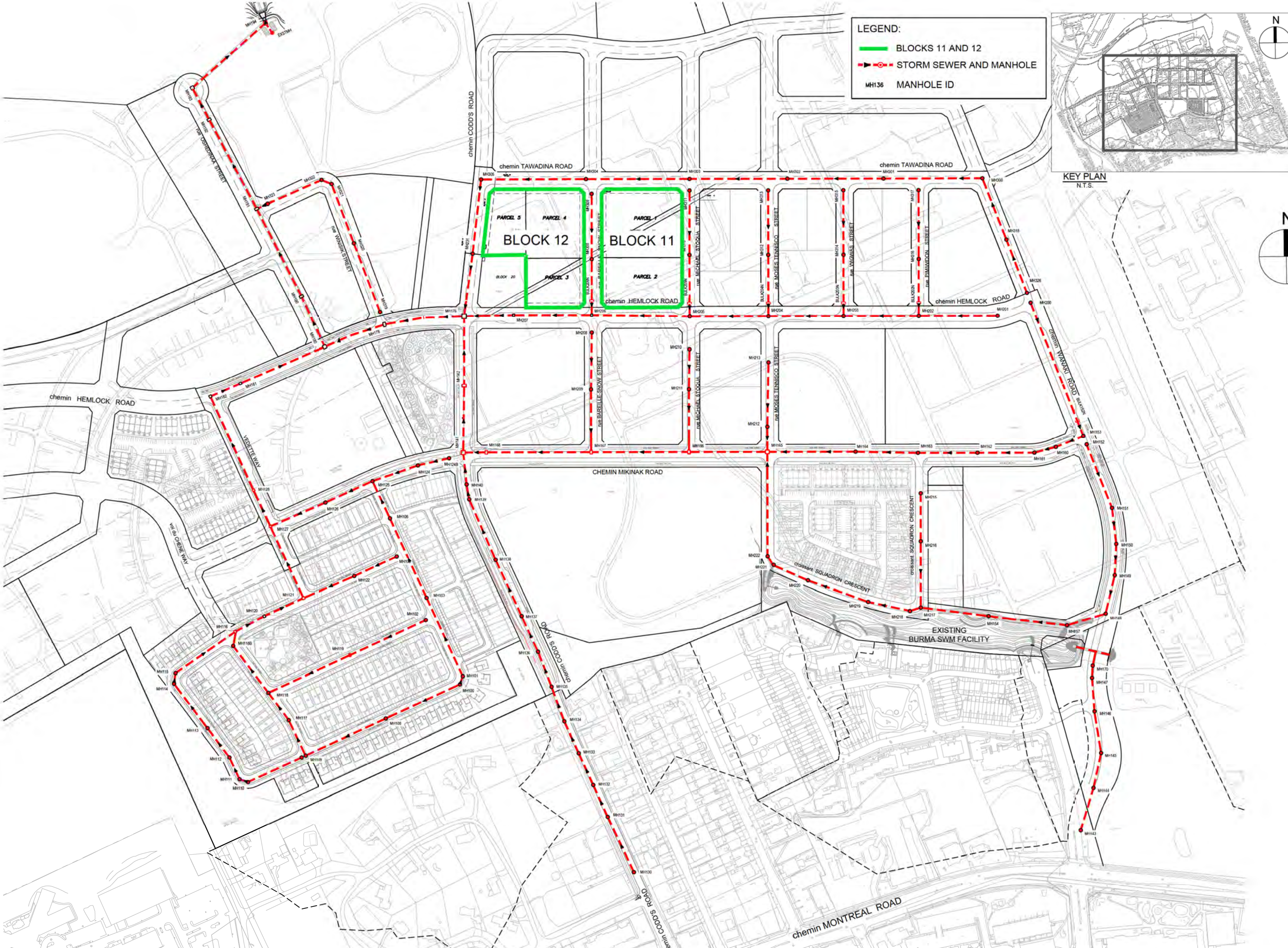
J:\38298-CFBRockcliffe\5.9 Drawings\59civ\SWM\FIGURES\BLOCK 11,12\FIGURE 1.dwg Layout Name: FIG1 Plot Style: AIA STANDARD COLOR-HALF.CTB Plotted At: 4/25/2022 5:40 PM Last Saved By: swakic, Apr. 25, 22

Scale
N.T.S.

Project Title
STORM AND SANITARY SERVICING
ASSESSMENT OF BLOCK 11 AND 12
WATERIDGE VILLAGE PHASE 2B

Drawing Title
LOCATION PLAN

Sheet No.
FIGURE 1



Scale

N.T.S.

Project Title

STORM AND SANITARY SERVICING ASSESSMENT OF BLOCK 11 AND 12 WATERIDGE VILLAGE PHASE 2B

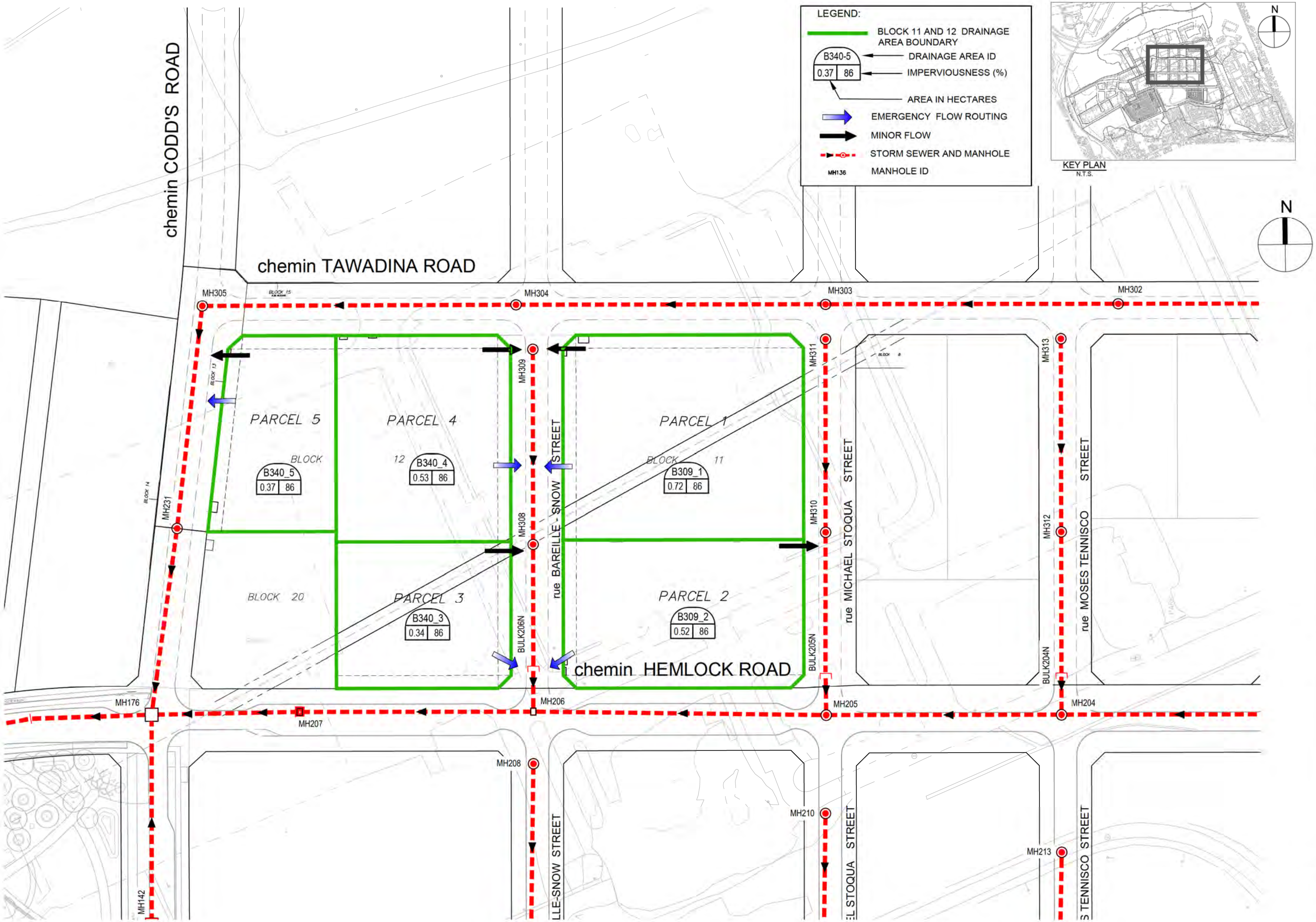
Drawing Title

LOCATION PLAN AND STORM SEWER NETWORK

Sheet No.

FIGURE 2

J:\38298-CFBRockcliffe\5.9 Drawings\59civil\SWM\FIGURES\BLOCK 11,12\FIGURE 2.dwg Layout Name: FIG2 Plot Style: AIA STANDARD COLOR-HALF.CTB Plotted At: 4/25/2022 5:45 PM Last Saved By: skukic, Apr. 25, 22



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N.T.S.

Project Title

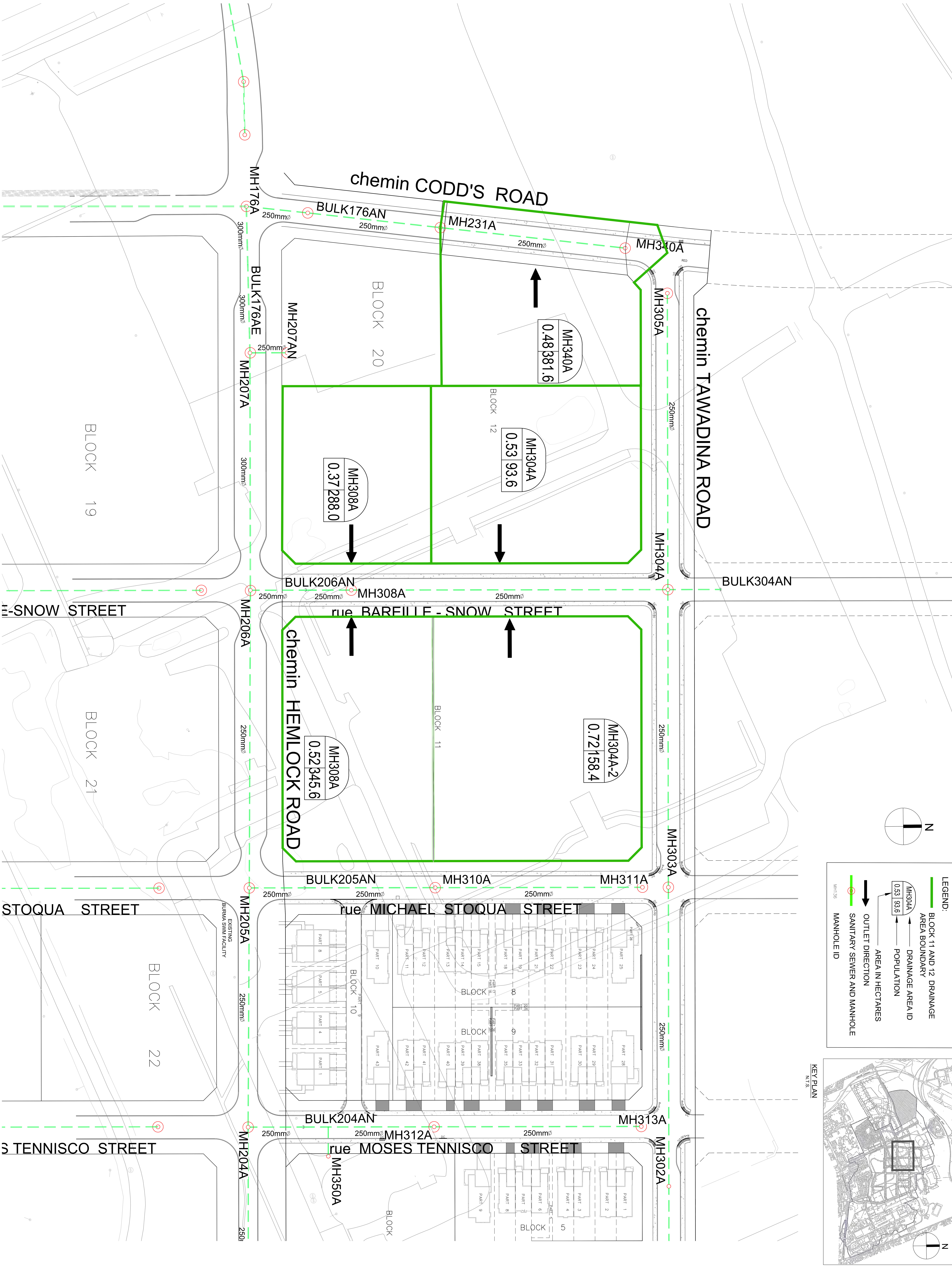
STORM AND SANITARY SERVICING ASSESSMENT OF BLOCK 11 AND 12 WATERIDGE VILLAGE PHASE 2B

Drawing Title

MINOR AND MAJOR SYSTEM CONNECTIVITY

Sheet No.

FIGURE 3



Sheet No.

FIGURE 4

Drawing Title

LOCATION PLAN
AND SANITARY SEWER
NETWORK

Project Title

STORM AND SANITARY SERVICING
ASSESSMENT OF BLOCK 11 AND 12
WATERIDGE VILLAGE PHASE 2B

Scale

N.T.S.

IBI

Appendix A

Supporting Storm Information

Summary of Model Files

DDSWMM:

5 year 3 hour Chicago: 118863-3CHI5.DAT
100 year 3 hour Chicago: 118863-3CHI100.DAT
100 year 3 hour Chicago + 20%: 118863-3CHI120.DAT

100 year 24 hour SCS Type II: 118863-24SCS100.DAT
100 year 24 hour SCS Type II + 20%: 118863-24SCS120.DAT

July 1979: 118863-JUL79.DAT
August 1988: 118863-AUG88.DAT
August 1996: 118863-Aug96.DAT

SWMHYMO VxD:

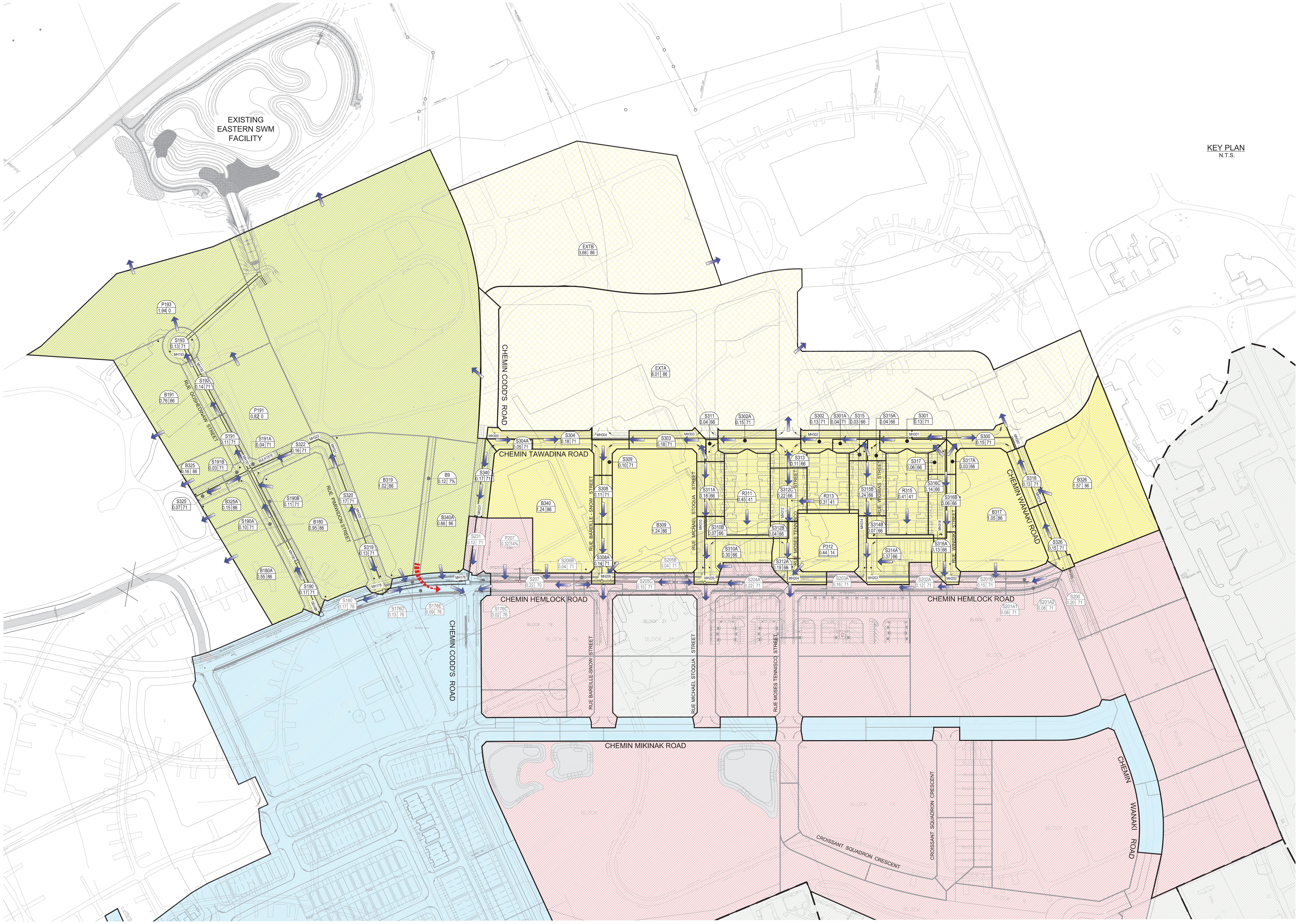
118863VD.dat

XPSWMM:

5 year 3 hour Chicago: 118863-3CHI5_BLK1112_V08_2022-03-15.XP
100 year 3 hour Chicago: 118863-3CHI100_BLK1112_V08_2022-02-28.XP
100 year 3 hour Chicago + 20%: 118863-3CHI120_BLK1112_V08_2022-02-28.XP

100 year 24 hour SCS Type II: 118863-24SCS100_BLK1112_V08_2022-03-15.XP
100 year 24 hour SCS Type II + 20%: 118863-24SCS120_BLK1112_V08_2022-03-15.XP

July 1979: 118863-JUL1979_BLK1112_V08_2022-03-15.XP
August 1988: 118863-AUG1988_BLK1112_V08_2022-03-15.XP
August 1996: 118863-AUG1996_BLK1112_V08_2022-03-15.XP



LEGEND:

- PHASE 2B DRAINAGE AREA
- PHASE 2A DRAINAGE AREA (FUTURE)
- PHASE 2C 2D DRAINAGE AREA (FUTURE)
- PHASE 1B DRAINAGE AREA (EXISTING)
- PHASE 1A DRAINAGE AREA (EXISTING)
- EXTERNAL DRAINAGE AREA

S318 — AREA ID
71 — Imp.(%)
0.13 — AREA (ha)

- MAJOR FLOW
- TOTAL FLOW
- MH136 MANHOLE ID

No.	REVISIONS	By	Date
14			
13			
12			
11			
10			
9			
8			
7			
6			
5			
4			
3			
2			
1	SUBMISSION No.1 FOR CITY REVIEW	P.S.	2018:12:20

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Project Title

WATERIDGE VILLAGE AT ROCKCLIFFE
PHASE 2B

M.S.BLACK 100101736 2019/04/17

Drawing Title

DDSWMM MODEL SCHEMATIC

Scale 1:2000

Design	Date
M.B	DEC. 2018
Drawn	**Checked**
S.V.	P.S.
Project No.	**Drawing No.**
118863	750

D07-16-15-0003

#17063

Velocity x Depth Calculation

Iteration equation:

Velocity:

$$v_x = v_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}}(v_{max} - v_{min})$$

Depth:

$$d_x = d_{min} + \frac{Q_x - Q_{min}}{Q_{max} - Q_{min}}(d_{max} - d_{min})$$

100 Year 3 Hour Chicago Storm																				
					SWMHYMO (118863VD.OUT)					Calculation Sheet: Overflow for Typical Road Ponding Area					SWMHYMO (118863VD.OUT)			Velocity x Depth	Maximum Static Ponding Depth	Total Depth (Static + Dynamic)
Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Depth (m)			Depth (m)					
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)	(m)	(m)
S311A	20	1.52	**49**	0.049	0.039	0.084	0.699	0.847	**0.73**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.044**	**0.03**	0.00	0.04
S310A	20	1.22	**0**	0.000	0.000	0.002	0.000	0.301	**0.00**	0.000	0.001	0.000	0.001	**0.000**	N/A	N/A	**N/A**	**0.00**	0.29	0.29
S309	20	0.60	**43**	0.043	0.024	0.053	0.439	0.532	**0.50**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.050**	**0.03**	0.00	0.05
S308	20	1.84	**65**	0.065	0.043	0.092	0.769	0.932	**0.84**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.047**	**0.04**	0.00	0.05
S308A	20	0.71	**26**	0.026	0.009	0.027	0.365	0.478	**0.47**	0.021	0.027	0.050	0.055	**0.054**	N/A	N/A	**N/A**	**0.03**	0.26	0.31
S340	20	2.40	**50**	0.050	0.049	0.105	0.878	1.064	**0.88**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.041**	**0.04**	0.00	0.04
S205C	24	0.71	**37**	0.037	0.024	0.053	0.439	0.532	**0.48**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.047**	**0.02**	0.00	0.05
S231	20	0.53	**100**	0.100	0.096	0.155	0.617	0.697	**0.62**	N/A	N/A	N/A	N/A	**N/A**	0.068	0.082	**0.069**	**0.04**	0.00	0.07
S207	24	0.51	**61**	0.061	0.053	0.096	0.532	0.617	**0.55**	N/A	N/A	N/A	N/A	**N/A**	0.055	0.068	**0.057**	**0.03**	0.00	0.06

Velocity x Depth Calculation

Iteration equation:

Velocity:

$$v_x = v_{\min} + \frac{Q_x - Q_{\min}}{Q_{\max} - Q_{\min}} \left(v_{\max} - v_{\min} \right)$$

Depth:

$$d_x = d_{\min} + \frac{Q_x - Q_{\min}}{Q_{\max} - Q_{\min}} \left(d_{\max} - d_{\min} \right)$$

100 Year 3 Hour Chicago Storm + 20%																				
					SWMHYMO (118863VD.OUT)					Calculation Sheet: Overflow for Typical Road Ponding Area					SWMHYMO (118863VD.OUT)			Velocity x Depth	Maximum Static Ponding Depth	Total Depth (Static + Dynamic)
Area ID (Dummy Segment, if applicable)	Road ROW Section	Longitudinal Slope (%)	Overflow Flowrate		Flowrate (cms)		Velocity (m/s)			Flowrate (cms)		Depth (m)			Depth (m)					
			Qx (l/s)	Qx (cms)	Qmin	Qmax	vmin	vmax	vx	Qmin	Qmax	dmin	dmax	dx	dmin	dmax	dx	(m^2/s)	(m)	(m)
S311A	20	1.52	**66**	0.066	0.039	0.084	0.699	0.847	**0.79**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.049**	**0.04**	0.00	0.05
S310A	20	1.22	**33**	0.033	0.012	0.035	0.478	0.626	**0.61**	0.028	0.035	0.055	0.060	**0.059**	N/A	N/A	**N/A**	**0.04**	0.29	0.35
S309	20	0.60	**71**	0.071	0.053	0.096	0.532	0.617	**0.57**	N/A	N/A	N/A	N/A	**N/A**	0.055	0.068	**0.060**	**0.03**	0.00	0.06
S308	20	1.84	**216**	0.216	0.167	0.272	1.081	1.221	**1.15**	N/A	N/A	N/A	N/A	**N/A**	0.068	0.082	**0.075**	**0.09**	0.00	0.07
S308A	20	0.71	**268**	0.268	0.255	0.364	0.841	0.919	**1.29**	0.240	0.269	0.125	0.130	**0.130**	N/A	N/A	**N/A**	**0.17**	0.26	0.39
S340	20	2.40	**98**	0.098	0.049	0.105	0.878	1.064	**1.04**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.053**	**0.06**	0.00	0.05
S205C	24	0.71	**46**	0.046	0.024	0.053	0.439	0.532	**0.51**	N/A	N/A	N/A	N/A	**N/A**	0.041	0.055	**0.052**	**0.03**	0.00	0.05
S231	20	0.53	**165**	0.165	0.155	0.234	0.697	0.773	**0.71**	N/A	N/A	N/A	N/A	**N/A**	0.082	0.095	**0.084**	**0.06**	0.00	0.08
S207	24	0.51	**89**	0.089	0.053	0.096	0.532	0.617	**0.60**	N/A	N/A	N/A	N/A	**N/A**	0.055	0.068	**0.066**	**0.04**	0.00	0.07

Storm Hydraulic Grade Line Elevations

XPSWMM NODE ID	MH NO.	PROPOSED GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%		100 YEAR 24 HOUR SCS TYPE II		100 YEAR 24 HOUR SCS TYPE II + 20%		JULY 1 1979		AUGUST 1988		AUGUST 1996	
				HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)
Phase 1B																	
S143	143	102.40	100.00	98.16	1.84	98.16	1.84	98.16	1.84	98.16	1.84	98.16	1.84	98.16	1.84	98.16	1.84
S144	144	99.41	97.01	95.79	1.22	95.79	1.22	95.78	1.23	95.79	1.22	95.78	1.23	95.79	1.22	95.78	1.23
S145	145	97.64	95.24	93.01	2.23	93.01	2.23	93.01	2.23	93.01	2.23	93.00	2.24	93.01	2.23	93.00	2.24
S146	146	95.28	92.88	90.96	1.92	91.82	1.06	90.77	2.11	91.26	1.62	90.91	1.97	91.01	1.87	90.63	2.25
S147	147	93.27	N/A	90.93	N/A	91.78	N/A	90.72	N/A	91.23	N/A	90.88	N/A	90.98	N/A	90.60	N/A
USBRM	N/A	N/A	N/A	90.88	N/A	91.72	N/A	90.67	N/A	91.17	N/A	90.83	N/A	90.93	N/A	90.56	N/A
BURMA	N/A	N/A	N/A	89.41	N/A	89.87	N/A	89.24	N/A	89.53	N/A	89.43	N/A	89.31	N/A	89.04	N/A
OUTLET	N/A	N/A	N/A	89.26	N/A	89.75	N/A	89.07	N/A	89.39	N/A	89.29	N/A	89.15	N/A	88.65	N/A
S152	152	92.73	90.33	89.71	0.62	89.71	0.62	89.71	0.62	89.71	0.62	89.71	0.62	89.71	0.62	89.71	0.62
S151	151	92.50	90.10	89.58	0.52	89.57	0.53	89.58	0.52	89.58	0.52	89.58	0.52	89.58	0.52	89.57	0.53
S150	150	92.32	89.92	89.49	0.43	89.48	0.44	89.49	0.43	89.49	0.43	89.49	0.43	89.49	0.43	89.49	0.43
S149	149	92.34	89.94	89.42	0.52	89.42	0.52	89.42	0.52	89.42	0.52	89.42	0.52	89.42	0.52	89.42	0.52
S148	148	92.14	89.74	89.30	0.44	89.29	0.45	89.30	0.44	89.30	0.44	89.30	0.44	89.30	0.44	89.30	0.44
S157	157	91.24	N/A	89.21	N/A	89.20	N/A	89.21	N/A	89.21	N/A	89.21	N/A	89.21	N/A	89.21	N/A
S154	154	91.02	N/A	87.68	N/A	87.68	N/A	87.68	N/A	87.68	N/A	87.68	N/A	87.68	N/A	87.68	N/A
S215	215	90.77	88.37	87.58	0.79	87.58	0.79	87.58	0.79	87.58	0.79	87.58	0.79	87.58	0.79	87.58	0.79
S216	216	90.85	88.45	87.30	1.15	87.30	1.15	87.30	1.15	87.30	1.15	87.30	1.15	87.31	1.14	87.30	1.15
S217	217	90.66	88.26	87.13	1.13	87.18	1.08	87.12	1.14	87.15	1.11	87.14	1.12	87.13	1.13	87.12	1.14
S218	218	90.40	88.00	87.04	0.96	87.10	0.90	87.02	0.98	87.06	0.94	87.05	0.95	87.04	0.96	87.02	0.98
S219	219	90.08	87.68	86.85	0.83	86.94	0.74	86.82	0.86	86.88	0.80	86.86	0.82	86.84	0.84	86.81	0.87
S220	220	89.86	87.46	86.74	0.72	86.84	0.62	86.70	0.76	86.78	0.68	86.75	0.71	86.72	0.74	86.68	0.78
S221	221	89.88	87.48	86.57	0.91	86.72	0.76	86.51	0.97	86.63	0.85	86.59	0.89	86.54	0.94	86.36	1.12
S222	222	89.86	87.46	86.38	1.08	86.51	0.95	86.32	1.14	86.43	1.03	86.39	1.07	86.35	1.11	86.19	1.27
S200	200	94.71	92.31	90.73	1.58	90.74	1.57	90.73	1.58	90.72	1.59	90.73	1.58	90.72	1.59	90.73	1.58
S214	214	93.52	91.12	90.26	0.86	90.28	0.84	90.26	0.86	90.27	0.85	90.26	0.86	90.26	0.86	90.26	0.86
MH201	201	94.29	91.89	90.72	1.17	90.73	1.16	90.72	1.17	90.72	1.17	90.72	1.17	90.72	1.17	90.71	1.18
MH202	202	93.91	91.51	90.42	1.09	90.43	1.08	90.41	1.10	90.42	1.09	90.41	1.10	90.41	1.10	90.40	1.11
MH203	203	92.38	89.98	88.66	1.32	88.68	1.30	88.63	1.35	88.66	1.32	88.63	1.35	88.64	1.34	88.61	1.37
MH204	204	90.40	88.00	87.08	0.92	87.10	0.90	87.06	0.94	87.08	0.92	87.06	0.94	87.07	0.93	87.02	0.98
MH205	205	89.35	86.95	85.86	1.09	85.88	1.07	85.83	1.12	85.86	1.09	85.84	1.11	85.84	1.11	85.77	1.18
MH206	206	89.10	86.70	85.65	1.05	85.65	1.05	85.62	1.08	85.65	1.05	85.63	1.07	85.63	1.07	85.57	1.13
MH207	207	88.53	86.13	84.65	1.48	84.65	1.48	84.62	1.51	84.65	1.48	84.63	1.50	84.64	1.49	84.58	1.55
S212	212	90.25	87.85	86.86	0.99	86.87	0.98	86.83	1.02	86.85	1.00	86.83	1.02	86.84	1.01	86.82	1.03
S213	213	89.74	87.34	86.45	0.89	86.45	0.89	86.43	0.91	86.45	0.89	86.44	0.90	86.44	0.90	86.42	0.92
S210	210	89.14	86.74	86.43	0.31	86.43	0.31	86.42	0.32	86.43	0.31	86.42	0.32	86.43	0.31	86.41	0.33
S211	211	89.15	86.75	85.94	0.81	85.93	0.82	85.93	0.82	85.94	0.81	85.93	0.82	85.93	0.82	85.92	0.83
S208	208	88.77	86.37	85.92	0.45	85.91	0.46	85.78	0.59	85.91	0.46	85.81	0.56	85.88	0.49	85.70	0.67
S209	209	88.75	86.35	85.46	0.89	85.45	0.90	85.41	0.94	85.46	0.89	85.42	0.93	85.45	0.90	85.38	0.97
MH231	231	89.81	87.41	85.61	1.79	85.64	1.77	85.73	1.67	85.78	1.63	85.84	1.57	85.77	1.63	85.71	1.69

XPSWMM NODE ID	MH NO.	PROPOSED GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%		100 YEAR 24 HOUR SCS TYPE II		100 YEAR 24 HOUR SCS TYPE II + 20%		JULY 1 1979		AUGUST 1988		AUGUST 1996	
				HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)
Wateridge Village Phase 1A																	
S153	153	92.78	90.38	89.45	0.93	89.46	0.92	89.44	0.94	89.45	0.93	89.44	0.94	89.45	0.93	89.44	0.94
S160	160	92.27	89.87	89.01	0.86	89.02	0.85	89.01	0.86	89.01	0.86	89.01	0.86	89.01	0.86	89.00	0.87
S161	161	91.94	89.54	88.57	0.97	88.58	0.96	88.57	0.97	88.57	0.97	88.57	0.97	88.57	0.97	88.57	0.97
S162	162	91.34	88.94	88.26	0.68	88.26	0.68	88.25	0.69	88.26	0.68	88.25	0.69	88.26	0.68	88.25	0.69
S163	163	90.94	88.54	87.68	0.86	87.68	0.86	87.68	0.86	87.68	0.86	87.68	0.86	87.68	0.86	87.68	0.86
S164	164	90.22	87.82	87.00	0.82	87.01	0.81	86.99	0.83	87.00	0.82	87.00	0.82	87.00	0.82	86.99	0.83
S165B	165	89.61	87.21	86.45	0.76	86.45	0.76	86.44	0.77	86.44	0.77	86.44	0.77	86.44	0.77	86.44	0.77
S165	165	89.30	86.90	85.98	0.92	86.05	0.85	85.93	0.97	86.01	0.89	85.99	0.91	85.96	0.94	85.83	1.07
S166	166	88.90	86.50	84.88	1.62	85.03	1.47	84.78	1.72	84.93	1.57	84.88	1.62	84.85	1.65	84.59	1.91
S167	167	88.40	86.00	84.71	1.29	84.86	1.14	84.60	1.40	84.76	1.24	84.71	1.29	84.67	1.33	84.39	1.61
S168	168	87.70	85.30	84.54	0.76	84.66	0.64	84.43	0.87	84.58	0.72	84.54	0.76	84.50	0.80	84.22	1.08
S141	141	87.32	84.92	84.28	0.64	84.39	0.53	84.18	0.74	84.32	0.60	84.28	0.64	84.25	0.67	83.97	0.95
S142	142	87.52	85.12	84.02	1.10	84.12	1.00	83.94	1.18	84.06	1.06	84.03	1.09	84.00	1.12	83.74	1.38
MH176	176	88.03	85.63	83.77	1.86	83.85	1.78	83.69	1.94	83.80	1.83	83.77	1.86	83.75	1.88	83.49	2.14
MH178	178	89.00	86.60	83.41	3.19	83.47	3.13	83.34	3.26	83.44	3.16	83.41	3.19	83.39	3.21	83.18	3.42
MH180	180	88.23	85.83	82.20	3.62	82.44	3.38	81.98	3.84	82.27	3.56	82.21	3.62	82.10	3.73	81.49	4.34
MH190	190	88.10	85.70	81.90	3.80	82.12	3.58	81.65	4.05	81.97	3.73	81.91	3.79	81.80	3.90	81.23	4.47
MH191	191	86.36	83.96	81.66	2.30	81.86	2.10	81.44	2.52	81.73	2.23	81.67	2.29	81.56	2.40	81.06	2.91
MH192	192	85.92	83.52	81.41	2.11	81.59	1.93	81.21	2.31	81.47	2.05	81.41	2.11	81.31	2.21	80.89	2.63
MH193	193	84.85	82.45	81.09	1.36	81.24	1.21	80.92	1.53	81.14	1.31	81.09	1.36	81.00	1.45	80.60	1.85
MH194	194	82.44	N/A	80.45	N/A	80.53	N/A	80.35	N/A	80.48	N/A	80.46	N/A	80.40	N/A	80.13	N/A
S130	130		N/A	101.25	N/A	101.25	N/A	101.24	N/A	101.25	N/A	101.24	N/A	101.24	N/A	101.23	N/A
S131	131		N/A	101.05	N/A	101.05	N/A	101.04	N/A	101.05	N/A	101.04	N/A	101.04	N/A	101.03	N/A
S132	132		N/A	99.64	N/A	99.64	N/A	99.64	N/A	99.64	N/A	99.64	N/A	99.64	N/A	99.63	N/A
S133	133		N/A	96.52	N/A	96.52	N/A	96.51	N/A	96.52	N/A	96.51	N/A	96.51	N/A	96.50	N/A
S134	134		N/A	93.01	N/A	93.01	N/A	93.00	N/A	93.01	N/A	93.00	N/A	93.00	N/A	92.99	N/A
S135	135		N/A	90.11	N/A	90.11	N/A	90.10	N/A	90.11	N/A	90.10	N/A	90.10	N/A	90.09	N/A
S136	136		N/A	87.38	N/A	87.38	N/A	87.37	N/A	87.38	N/A	87.37	N/A	87.37	N/A	87.37	N/A
S137	137		86.91	85.77	1.14	85.77	1.14	85.76	1.15	85.77	1.14	85.76	1.15	85.77	1.14	85.76	1.15
S138	138		86.31	84.96	1.35	84.96	1.35	84.95	1.36	84.96	1.35	84.95	1.36	84.95	1.36	84.94	1.37
S139	139		85.66	84.46	1.20	84.48	1.18	84.46	1.20	84.46	1.20	84.46	1.20	84.46	1.20	84.45	1.21
S140	140		N/A	84.35	N/A	84.42	N/A	84.34	N/A	84.37	N/A	84.35	N/A	84.34	N/A	84.34	N/A
S100	100		87.16	85.70	1.46	85.69	1.47	85.70	1.46	85.70	1.46	85.70	1.46	85.70	1.46	85.70	1.46
S108	108		86.66	85.24	1.43	85.23	1.43	85.23	1.43	85.24	1.42	85.23	1.43	85.23	1.43	85.23	1.43
S109	109		85.36	84.05	1.31	84.05	1.31	84.05	1.31	84.05	1.31	84.05	1.31	84.05	1.31	84.05	1.31
S117	117		85.06	83.54	1.52	83.58	1.48	83.53	1.53	83.54	1.52	83.53	1.53	83.54	1.52	83.53	1.53
S118	118		84.71	83.21	1.50	83.48	1.23	83.20	1.51	83.25	1.46	83.22	1.49	83.21	1.50	83.20	1.51
S101	101		87.16	85.55	1.61	85.55	1.61	85.54	1.62	85.55	1.61	85.54	1.62	85.54	1.62	85.54	1.62
S102	102		86.46	84.72	1.74	84.72	1.74	84.71	1.75	84.72	1.74	84.71	1.75	84.71	1.75	84.70	1.76
S119	119		85.46	83.95	1.51	83.95	1.51	83.95	1.51	83.95	1.51	83.94	1.52	83.95	1.51	83.95	1.51
S104	104		N/A	85.90	N/A	85.89	N/A	85.89	N/A	85.90	N/A	85.89	N/A	85.89	N/A	85.88	N/A

Storm Hydraulic Grade Line Elevations

XPSWMM NODE ID	MH NO.	PROPOSED GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%		100 YEAR 24 HOUR SCS TYPE II		100 YEAR 24 HOUR SCS TYPE II + 20%		JULY 1 1979		AUGUST 1988		AUGUST 1996	
				HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)
S103	103		86.46	84.36	2.10	84.36	2.10	84.34	2.12	84.36	2.10	84.35	2.11	84.35	2.11	84.34	2.12
S105	105		85.71	83.90	1.81	83.91	1.80	83.89	1.82	83.90	1.81	83.89	1.82	83.90	1.81	83.89	1.82
S122	122		84.86	83.53	1.33	83.53	1.33	83.53	1.33	83.53	1.33	83.53	1.33	83.53	1.33	83.53	1.33
S121	121		84.26	82.80	1.46	83.03	1.23	82.43	1.83	82.82	1.44	82.77	1.49	82.61	1.65	81.98	2.28
S127	127		84.36	82.67	1.69	82.92	1.44	82.34	2.02	82.71	1.65	82.66	1.70	82.51	1.85	81.85	2.51
S128	128		N/A	82.61	N/A	82.86	N/A	82.30	N/A	82.67	N/A	82.61	N/A	82.47	N/A	81.81	N/A
S107	107		N/A	85.29	N/A	85.29	N/A	85.28	N/A	85.29	N/A	85.28	N/A	85.28	N/A	85.27	N/A
S106	106		85.61	83.76	1.85	83.75	1.86	83.73	1.88	83.76	1.85	83.74	1.87	83.75	1.86	83.73	1.88
S124	124		85.69	83.94	1.75	83.94	1.75	83.93	1.76	83.94	1.75	83.93	1.76	83.93	1.76	83.92	1.77
S125	125		85.34	83.37	1.97	83.38	1.96	83.35	1.99	83.37	1.97	83.36	1.98	83.36	1.98	83.35	1.99
S126	126		84.96	82.87	2.09	83.14	1.82	82.85	2.11	82.89	2.07	82.85	2.11	82.86	2.10	82.84	2.12
S182	182		N/A	82.46	N/A	82.70	N/A	82.18	N/A	82.52	N/A	82.46	N/A	82.32	N/A	81.68	N/A
S181	181		N/A	82.36	N/A	82.61	N/A	82.11	N/A	82.43	N/A	82.37	N/A	82.24	N/A	81.61	N/A
S110	110		85.56	83.59	1.97	83.80	1.76	83.59	1.97	83.59	1.97	83.59	1.97	83.59	1.97	83.59	1.97
S111	111		84.96	83.59	1.37	83.80	1.16	83.58	1.38	83.59	1.37	83.58	1.38	83.59	1.37	83.58	1.38
S112	112		84.91	83.40	1.52	83.77	1.14	83.18	1.73	83.50	1.41	83.42	1.49	83.22	1.69	83.22	1.69
S113	113		84.51	83.41	1.10	83.74	0.77	83.06	1.45	83.48	1.03	83.40	1.11	83.08	1.43	83.05	1.46
S114	114		83.91	83.06	0.85	83.31	0.60	82.66	1.25	83.11	0.80	83.04	0.87	82.85	1.06	82.49	1.42
S115	115		83.56	83.04	0.52	83.33	0.23	82.64	0.92	83.13	0.43	83.01	0.55	82.83	0.73	82.45	1.11
S116	116		83.71	82.88	0.83	83.16	0.55	82.51	1.20	82.92	0.79	82.85	0.86	82.70	1.01	82.10	1.61
S120	120		83.96	82.86	1.10	83.08	0.88	82.48	1.48	82.88	1.08	82.83	1.13	82.67	1.29	82.06	1.90

Storm Hydraulic Grade Line Elevations

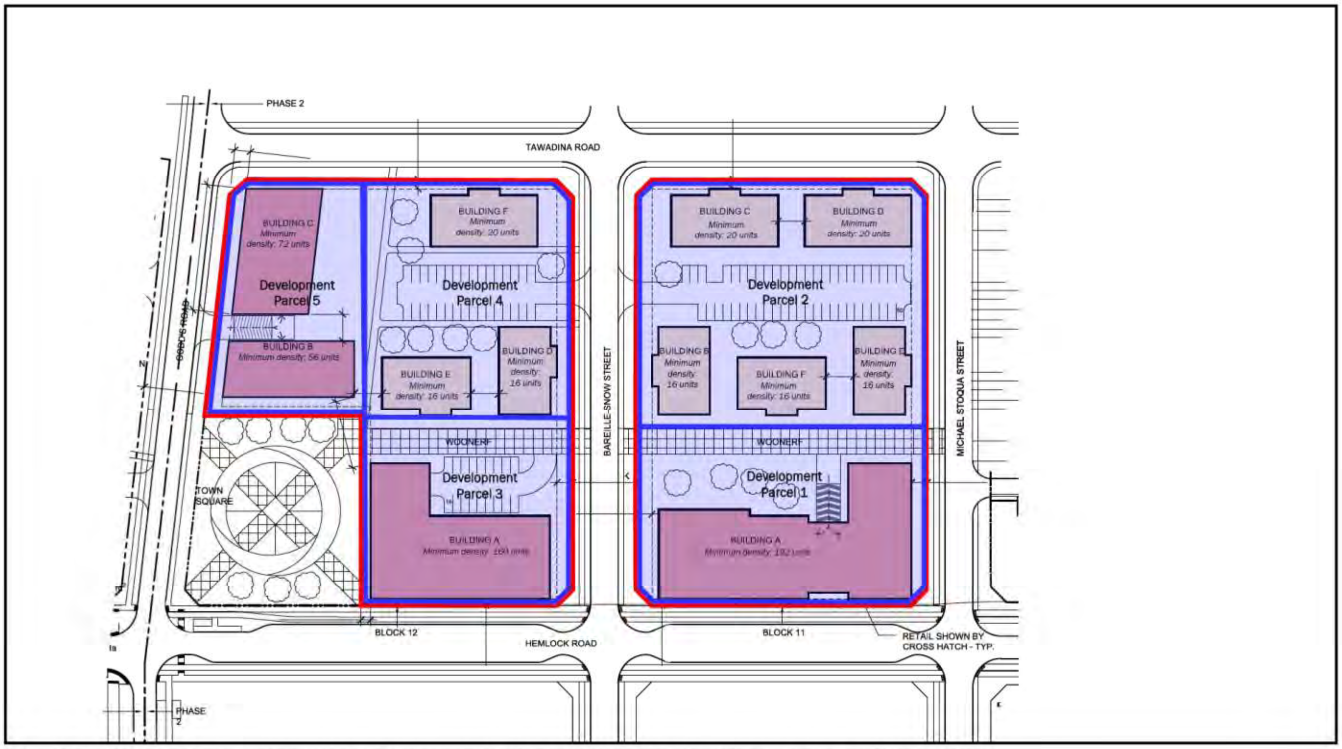
XPSWMM NODE ID	MH NO.	PROPOSED GROUND ELEVATION (M)	USF (M)	100 YEAR 3 HOUR CHICAGO		100 YEAR 3 HOUR CHICAGO INCREASED BY 20%		100 YEAR 24 HOUR SCS TYPE II		100 YEAR 24 HOUR SCS TYPE II + 20%		JULY 1 1979		AUGUST 1988		AUGUST 1996	
				HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)	HGL (M)	USF - HGL (M)
Phase 2B, 4																	
MH317	317	94.08	91.68	91.17	0.51	91.18	0.50	91.14	0.54	91.15	0.53	91.15	0.53	91.14	0.54	91.11	0.57
MH316	316	94.09	91.69	90.96	0.73	90.96	0.73	90.95	0.74	90.95	0.74	90.95	0.74	90.95	0.74	90.92	0.77
MH315	315	93.39	91.36	90.28	1.08	90.29	1.07	90.25	1.11	90.26	1.10	90.27	1.09	90.27	1.09	90.26	1.10
MH314	314	93.00	91.16	89.91	1.25	89.91	1.25	89.91	1.25	89.91	1.25	89.91	1.25	89.91	1.25	89.89	1.27
MH313	313	92.62	90.71	89.35	1.36	89.34	1.37	89.35	1.36	89.35	1.36	89.35	1.36	89.35	1.36	89.34	1.37
MH312	312	91.36	89.68	88.42	1.26	88.42	1.26	88.41	1.27	88.42	1.26	88.42	1.26	88.42	1.26	88.38	1.30
MH311	311	90.69	88.29	87.44	0.85	87.56	0.73	87.40	0.89	87.48	0.81	87.45	0.84	87.47	0.82	87.38	0.91
MH310	310	90.04	87.64	87.28	0.36	87.42	0.22	87.25	0.39	87.35	0.29	87.30	0.34	87.33	0.31	87.06	0.58
MH309	309	90.15	87.75	87.44	0.31	87.08	0.67	87.33	0.42	87.44	0.31	87.41	0.34	87.43	0.32	87.22	0.53
MH308	308	89.68	87.28	86.88	0.40	86.69	0.59	86.81	0.47	86.88	0.40	86.87	0.41	86.88	0.40	86.76	0.52
MH326	326	94.76	92.36	91.33	1.03	91.33	1.03	91.32	1.04	91.32	1.04	91.32	1.04	91.32	1.04	91.33	1.03
MH318	318	94.40	92.00	91.03	0.97	91.03	0.97	91.00	1.00	91.03	0.97	91.00	1.00	91.00	1.00	91.00	1.00
MH300	300	94.00	91.60	90.71	0.89	90.70	0.90	90.67	0.93	90.70	0.90	90.68	0.92	90.68	0.92	90.68	0.92
MH301	301	93.73	91.33	90.21	1.12	90.21	1.12	90.20	1.13	90.20	1.13	90.21	1.12	90.20	1.13	90.20	1.13
MH302	302	92.80	90.40	88.64	1.76	88.64	1.76	88.63	1.77	88.63	1.77	88.64	1.76	88.63	1.77	88.63	1.77
MH303	303	90.67	88.27	87.80	0.47	87.81	0.46	87.63	0.64	87.65	0.62	87.79	0.48	87.72	0.55	87.64	0.63
MH304	304	90.30	87.90	87.39	0.51	87.38	0.52	87.30	0.60	87.31	0.59	87.38	0.52	87.34	0.56	87.30	0.60
MH305	305	91.00	88.60	86.54	2.06	86.56	2.04	86.61	1.99	86.64	1.96	86.69	1.91	86.65	1.95	86.60	2.00
MH319	319	88.81	86.61	86.13	0.48	86.12	0.49	86.12	0.49	86.13	0.48	86.12	0.49	86.12	0.49	86.12	0.49
MH320	320	89.12	86.92	85.49	1.43	85.49	1.43	85.49	1.43	85.49	1.43	85.49	1.43	85.49	1.43	85.49	1.43
MH321	321	87.67	85.47	84.18	1.29	84.39	1.08	84.10	1.37	84.15	1.32	84.11	1.36	84.13	1.34	84.09	1.38
MH322	322	87.50	85.30	84.18	1.12	84.39	0.91	84.10	1.20	84.15	1.15	84.10	1.20	84.12	1.18	84.09	1.21
MH323	323	86.57	84.37	83.40	0.97	83.48	0.89	83.31	1.06	83.37	1.00	83.32	1.05	83.34	1.03	83.30	1.07

Appendix B

Supporting Sanitary Information

SCHEDULE "A"

PARCEL IDENTIFICATION, DESCRIPTION, AND MINIMUM DENSITY[1]



**Boundaries of the development parcels are estimated. Purchasers to provide dimensioned sketch or electronic survey to confirm these boundaries

[1] This image if provided for demonstration purposes only

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Block 11&12 Proposed Conditions
Old Criteria being used

AS-BUILT SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS							INFILTRATION ALLOWANCE			FIXED	TOTAL	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		PEAK	PEAK	AREA (Ha)						PEAK	AREA (Ha)		FLOW	FLOW	FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
		FROM	TO	Phase 1B					EXTERNAL			FACTOR	FLOW	INSTITUTIONAL		COMMERCIAL		INDUSTRIAL		FLOW										(full)		
STREET	AREA ID	MH	MH	(Ha)	SF	SD	TH	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Phase 1B																																
rue Michael Stoqua Street	EX205A	BULK205AN	MH205A						0.66	33.1	33.1	4.00	0.54		0.00		0.00		0.00	0.00	0.66	0.66	0.18	0.00	0.72	66.24	21.00	250	1.14	1.307	65.52	98.91%
Hemlock Road	205A	MH205A	MH206A	0.25						0.0	186.6	4.00	3.02		0.00		0.00		0.00	0.00	0.25	2.51	0.70	0.00	3.73	31.02	111.90	250	0.25	0.612	27.29	87.99%
rue Bareille-Snow Street	EX206A-B	BULK206AN	MH206A						9.79	2598.3	2598.3	3.49	36.78		0.00		0.00		0.00	0.00	9.79	9.79	2.74	0.00	39.52	88.83	21.00	250	2.05	1.753	49.30	55.50%
Hemlock Road	206A	MH206A	MH207A	0.20						0.0	2784.9	3.47	39.14		0.00		0.00		0.00	0.00	0.20	12.50	3.50	0.00	42.64	100.88	89.30	300	1.00	1.383	58.24	57.73%
Block 20	PARK1	MH207AN	MH207A	0.32						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.32	0.32	0.09	0.00	0.09	50.02	13.80	250	0.65	0.987	49.93	99.82%
Hemlock Road	PARK1, 207A	MH207A	*BULK176AE*	0.12						0.0	2784.9	3.47	39.14		0.00		0.00		0.00	0.00	0.12	12.94	3.62	0.00	42.77	134.59	33.10	300	1.78	1.845	91.83	68.23%
Phase 1A																																
Hemlock Road		*BULK176AE*	*MH176A*							0.0	2784.9	3.47	39.14		0.00		0.00		0.00	0.00	0.00	12.94	3.62	0.00	42.77	65.38	*21.97*	*300*	*0.42*	0.896	22.61	34.59%
Phase 1B																																
chemin Wanaki Road	200A, COM1	MH200A	MH214A	0.25						0.0	0.0	4.00	0.00		0.00	0.90	0.90		0.00	0.78	1.15	1.15	0.32	0.00	1.10	71.01	98.50	250	1.31	1.401	69.90	98.45%
chemin Wanaki Road	214A, COM2	MH214A	*BULK153AN*	0.16						0.0	0.0	4.00	0.00		0.00	0.65	1.55		0.00	1.35	0.81	1.96	0.55	0.00	1.89	57.20	44.60	250	0.85	1.129	55.30	96.69%
Phase 1A																																
chemin Wanaki Road	COM2	*BULK153AN*	*MH153A*							0.0	0.0	4.00	0.00		0.00		1.55		0.00	1.35	0.00	1.96	0.55	0.00	1.89	51.91	*20.13*	*250*	*0.70*	1.024	50.01	96.35%
chemin Wanaki Road	153A, COM3	*MH153A*	*MH151A*	0.21						0.0	0.0	4.00	0.00		0.00	0.88	2.43		0.00	2.11	1.09	3.05	0.85	0.00	2.96	36.70	*85.04*	*250*	*0.35*	0.724	33.74	91.93%
chemin Wanaki Road	151A, COM4	*MH151A*	*MH150A*	0.11						0.0	0.0	4.00	0.00		0.00	0.45	2.88		0.00	2.50	0.56	3.61	1.01	0.00	3.51	36.70	*40.97*	*250*	*0.35*	0.724	33.19	90.43%
chemin Wanaki Road	150A, COM5	*MH150A*	*MH149A*	0.11						0.0	0.0	4.00	0.00		0.00	0.95	3.83		0.00	3.32	1.06	4.67	1.31	0.00	4.63	36.70	*41.34*	*250*	*0.35*	0.724	32.07	87.38%
chemin Wanaki Road	149A	*MH149A*	*MH148A*	0.10						0.0	0.0	4.00	0.00		0.00		3.83		0.00	3.32	0.10	4.77	1.34	0.00	4.66	36.70	*40.04*	*250*	*0.35*	0.724	32.04	87.30%
chemin Wanaki Road	148A	*MH148A*	*MH157A*	0.04						0.0	0.0	4.00	0.00		0.00		3.83		0.00	3.32	0.04	4.81	1.35	0.00	4.67	36.70	*20.58*	*250*	*0.35*	0.724	32.03	87.27%
Phase 1B																																
chemin Wanaki Road	143B	BULK143AE	MH143A	0.31						104.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.31	0.31	0.09	0.00	1.77	43.87	21.50	250	0.50	0.866	42.10	95.96%
chemin Wanaki Road	143A	MH143A	MH144A	0.27						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.27	0.58	0.16	0.00	1.85	83.69	34.70	250	1.82	1.652	81.85	97.79%
chemin Wanaki Road	144A, 144B	MH144A	MH145A	0.72						0.0	104.0	4.00	1.69		0.00		0.00		0.00	0.00	0.72	1.30	0.36	0.00	2.05	88.61	41.10	250	2.04	1.749	86.56	97.69%
chemin Wanaki Road	145A, 145B, 145C	MH145A	MH146A	2.77						835.6	939.6	3.82	14.53		0.00		0.00		0.00	0.00	2.77	4.07	1.14	0.00	15.67	105.83	53.30	250	2.91	2.089	90.16	85.19%
chemin Wanaki Road	146A	MH146A	MH147A	0.14						0.0	939.6	3.82	14.53		0.00		0.00		0.00	0.00	0.14	4.21	1.18	0.00	15.71	43.54	37.30	250	0.97	1.206	27.83	63.92%
chemin Wanaki Road	PARK2	BLK147AE	MH147A	0.55						0.0	0.0	4.00	0.00		0.00		0.00		0.00	0.00	0.55	0.55	0.15	0.00	0.15	39.24	17.70	250	0.40	0.774	39.08	99.61%
chemin Wanaki Road	147C	BLK147AW	MH147A	0.10						33.6	33.6	4.00	0.54		0.00		0.00		0.00	0.00	0.10	0.10	0.03	0.00	0.57	41.62	17.70	250	0.45	0.821	41.04	98.62%
chemin Wanaki Road	147A	MH147A	MH170A	0.03						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.03	4.89	1.37	0.00	16.38	38.74	10.30	250	0.39	0.765	22.36	57.72%
chemin Wanaki Road	147B	MH170A	MH147C	0.16						0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.16	5.05	1.41	0.00	16.42	31.63	38.20	250	0.26	0.624	15.21	48.08%
chemin Wanaki Road		MH147C	*BLK148AW*							0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.00	5.05	1.41	0.00	16.42	46.01	11.80	250	0.55	0.908	29.58	64.30%
Phase 1A																																
chemin Wanaki Road		*BULK148AW*	*MH157A*							0.0	973.2	3.81	15.01		0.00		0.00		0.00	0.00	0.00	5.05	1.41	0.00	16.42	62.04	*8.00*	*250*	*1.00*	1.224	45.61	73.52%
chemin Wanaki Road	157A	*MH157A*	*MH158A*	0.05						0.0	973.2	3.81	15.01		0.00		3.83		0.00	3.32	0.05	9.91	2.77	0.00	21.11	31.02	*25.68*	*250*	*0.25*	0.612	9.91	31.94%
Street No. 2	INST1	*BULK158AN*	*MH158A*							0.0	0.0	4.00	0.00	2.62	2.62		0.00		0.00	2.27	2.62	2.62	0.73	0.00	3.01	39.24	*15.10*	*250*	*0.40*	0.774	36.23	92.33%
chemin Wanaki Road	158A	*MH158A*	*MH154A*	0.22						0.0	973.2	3.81	15.01		2.62		3.83		0.00	5.60	0.22	12.75	3.57	0.00	24.18	31.02	*68.91*	*250*	*0.25*	0.612	6.84	22.05%

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Block 11&12 Proposed Conditions
Old Criteria being used

AS-BUILT SANITARY SEWER DESIGN SHEET

Former CFB Rockcliffe
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL									
STREET	AREA ID	FROM MH	TO MH	AREA Phase 1B (Ha)	UNIT TYPES SF	SD	TH	APT	AREA EXTERNAL (Ha)	POPULATION IND	CUM	PEAK FACTOR	PEAK FLOW (L/s)
Phase 1B													
Block 9	154A	*Ex. BULK*	MH217Aa	0.19						0.0	973.2	3.81	15.01
Block 9		MH217Aa	MH217A							0.0	973.2	3.81	15.01
croissant Squadron Crescent	215Aa-b	MH215A	MH216A	0.79	3	4				117.8	117.8	4.00	1.91
croissant Squadron Crescent	216Aa-b	MH216A	MH217A	0.67	2	6				94.5	212.3	4.00	3.44
croissant Squadron Crescent	217A	MH217A	MH218A	0.02						0.0	1185.5	3.75	18.01
croissant Squadron Crescent	218A	MH218A	MH218B	0.02						0.0	1185.5	3.75	18.01
Thorncliffe Village	THORN1	MH600A	MH601A						5.55	1574.0	1574.0	3.66	23.36
Thorncliffe Village		MH601A	MH218B							0.0	1574.0	3.66	23.36
croissant Squadron Crescent	218B	MH218B	MH219A	0.07						0.0	2759.5	3.47	38.82
croissant Squadron Crescent	219A	MH219A	MH220A	0.15						0.0	2759.5	3.47	38.82
croissant Squadron Crescent	220A, 220B	MH220A	MH221A	1.46						319.0	3078.5	3.43	42.81
croissant Squadron Crescent	221A	MH221A	MH222A	0.02						0.0	3078.5	3.43	42.81
croissant Squadron Crescent		MH222A	MH223A							0.0	3078.5	3.43	42.81
croissant Squadron Crescent	BLOCK 15	BLK223AE	MH223A	Design by Others									
croissant Squadron Crescent	222A	MH223A	*MH165A*	0.22						0.0	3078.5	3.43	42.81

LOCATION				ICI AREAS							INFILTRATION ALLOWANCE			FIXED FLOW (L/s)	TOTAL FLOW (L/s)	PROPOSED SEWER DESIGN						
STREET	AREA ID	FROM MH	TO MH	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	PEAK FLOW (L/s)	AREA (Ha) IND	AREA (Ha) CUM	FLOW (L/s)			CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	(%)
Block 9	154A	*Ex. BULK*	MH217Aa		2.62		3.83		0.00	5.60	0.19	12.94	3.62	0.00	24.23	104.37	24.40	250	2.83	2.060	80.13	76.78%
Block 9		MH217Aa	MH217A		2.62		3.83		0.00	5.60	0.00	12.94	3.62	0.00	24.23	62.66	78.50	250	1.02	1.237	38.42	61.32%
croissant Squadron Crescent	215Aa-b	MH215A	MH216A		0.00		0.00		0.00	0.00	0.79	0.79	0.22	0.00	2.13	55.49	56.10	250	0.80	1.095	53.36	96.16%
croissant Squadron Crescent	216Aa-b	MH216A	MH217A		0.00		0.00		0.00	0.00	0.67	1.46	0.41	0.00	3.85	46.01	70.80	250	0.55	0.908	42.16	91.63%
croissant Squadron Crescent	217A	MH217A	MH218A		2.62		3.83		0.00	5.60	0.02	14.42	4.04	0.00	27.65	39.72	9.70	250	0.41	0.784	12.07	30.39%
croissant Squadron Crescent	218A	MH218A	MH218B		2.62		3.83		0.00	5.60	0.02	14.44	4.04	0.00	27.66	39.24	9.90	250	0.40	0.774	11.58	29.51%
Thorncliffe Village	THORN1	MH600A	MH601A		0.00		0.00		0.00	0.00	5.55	19.99	5.60	0.00	28.96	69.16	21.40	300	0.47	0.948	40.20	58.12%
Thorncliffe Village		MH601A	MH218B		0.00		0.00		0.00	0.00	0.00	19.99	5.60	0.00	28.96	108.18	46.90	300	1.15	1.483	79.22	73.23%
croissant Squadron Crescent	218B	MH218B	MH219A		2.62		3.83		0.00	5.60	0.07	34.50	9.66	0.00	54.08	96.76	40.20	300	0.92	1.326	42.68	44.11%
croissant Squadron Crescent	219A	MH219A	MH220A		2.62		3.83		0.00	5.60	0.15	34.65	9.70	0.00	54.12	66.92	72.40	300	0.44	0.917	12.79	19.12%
croissant Squadron Crescent	220A, 220B	MH220A	MH221A		2.62		3.83		0.00	5.60	1.46	36.11	10.11	0.00	58.52	74.82	43.30	300	0.55	1.025	16.30	21.78%
croissant Squadron Crescent	221A	MH221A	MH222A		2.62		3.83		0.00	5.60	0.02	36.13	10.12	0.00	58.53	64.60	7.40	300	0.41	0.885	6.07	9.40%
croissant Squadron Crescent		MH222A	MH223A		2.62		3.83		0.00	5.60	0.00	36.13	10.12	0.00	58.53	58.82	81.60	300	0.34	0.806	0.30	0.51%
croissant Squadron Crescent	BLOCK 15	BLK223AE	MH223A	Design by Others												109.23	10.00	250	3.10	2.156	109.23	100.00%
croissant Squadron Crescent	222A	MH223A	*MH165A*		2.62		3.83		0.00	5.60	0.22	36.35	10.18	0.00	58.59	96.24	36.10	300	0.91	1.319	37.65	39.12%

Design Parameters:

Residential			ICI Areas			Peak Factor
SF	3.4	p/p/u	INST	50,000	L/Ha/day	1.5
TH/SD	2.7	p/p/u	COM	50,000	L/Ha/day	1.5
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 350 L/day 300 L/day
3. Infiltration allowance: 0.28 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+P^0.5))
   where P = population in thousands

Designed: WY

Checked: JIM

Dwg. Reference: 38298-501

No.	Revision	Date
1.	City submission No. 1	2016-07-08
2.	City submission No. 2	2016-11-04
3.	City submission No. 3	2017-01-25
4.	Revised as per Mattamy's Design	2017-12-08
5.	As-Built Submission	2018-01-29
6.	Block 11 & 12 Study	2022-03-15

File Reference:	Date:	Sheet No:
38298.5.7.1	2016-07-08	1 of 2

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MH231A	Existing infrastructure (shown for information only)
(yellow)	Block 11, 12 Existing Conditions

SANITARY SEWER DESIGN SHEET

Wateridge at Rockcliffe - Phase 2B
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
STREET	AREA ID	FROM MH	TO MH	AREA w/ Units (Ha)	UNIT TYPES SF	SD / TH/F	TH/S	APT	AREA w/o Units (Ha)	POPULATION IND	POPULATION CUM	RES PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha) INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	ICI PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha) IND	AREA (Ha) CUM	FLOW (L/s)	IND	CUM	(L/s)	CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	AVAILABLE CAPACITY (%)
Pimiwidon Street	MH317-1, MH317-2	MH317A	MH316A	1.50	1	104				284.2	284.2	3.47	3.20	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.50	1.50	0.50	0.00	0.00	3.69	40.68	83.00	250	0.43	0.803	36.99	90.93%
Pimiwidon Street	MH316A	MH316A	BULK202AN	0.16		1				2.7	286.9	3.47	3.23	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.16	1.66	0.55	0.00	0.00	3.77	37.74	43.10	250	0.37	0.745	33.96	90.00%
Pimiwidon Street	-	*BULK202AN*	*MH202A*							*0.0*	*286.9*	*3.47*	*3.23*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*1.66*	*0.55*	*0.00*	*0.00*	*3.77*	*40.68*	*21.00*	*250*	*0.43*	*0.803*	*36.91*	*90.72%*
Wigwas Street	MH315A	MH315A	MH314A	0.79	2	18				55.4	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.79	0.79	0.26	0.00	0.00	0.92	49.63	111.64	250	0.64	0.979	48.72	98.16%
Wigwas Street	MH314A	MH314A	BULK203AN	0.06						0.0	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.06	0.85	0.28	0.00	0.00	0.93	83.46	14.37	250	1.81	1.647	82.53	98.88%
Wigwas Street	-	*BULK203AN*	*MH203A*							*0.0*	*55.4*	*3.64*	*0.65*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.85*	*0.28*	*0.00*	*0.00*	*0.93*	*80.17*	*21.00*	*250*	*1.67*	*1.582*	*79.24*	*98.83%*
Moses Tennisco Street	MH313A	MH313A	MH312A	0.66	2	16				50.0	50.0	3.65	0.59	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.66	0.66	0.22	0.00	0.00	0.81	75.73	77.20	250	1.49	1.495	74.92	98.93%
Moses Tennisco Street	MH312A, PARK	MH312A	BULK204AN	0.21		2				5.4	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.21	0.87	0.29	0.00	0.00	0.94	94.29	49.70	250	2.31	1.861	93.35	99.00%
Park	PARK	MH350A	pipe	0.42						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.42	0.42	0.14	0.00	0.00	0.14	48.39	11.00	200	2.00	1.492	48.25	99.71%
Moses Tennisco Street	-	*BULK204AN*	*MH204A*							*0.0*	*55.4*	*3.64*	*0.65*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.87*	*0.29*	*0.00*	*0.00*	*0.94*	*89.90*	*21.00*	*250*	*2.10*	*1.774*	*88.96*	*98.95%*
Michael Stoqua Street	MH311A	MH311A	MH310A	0.44	1	9				27.7	27.7	3.69	0.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.44	0.44	0.15	0.00	0.00	0.48	72.35	77.82	250	1.36	1.428	71.87	99.34%
Michael Stoqua Street	MH310A	MH310A	BULK205AN	0.21		2				5.4	33.1	3.68	0.39	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.21	0.65	0.21	0.00	0.00	0.61	65.66	49.19	250	1.12	1.296	65.05	99.07%
Michael Stoqua Street	-	*BULK205AN*	*MH205A*							*0.0*	*33.1*	*3.68*	*0.39*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.65*	*0.21*	*0.00*	*0.00*	*0.61*	*66.24*	*21.00*	*250*	*1.14*	*1.307*	*65.63*	*99.08%*
Wanaki Road	MH200A	MH200A	MH318A							0.0	0.0	3.80	0.00	0.00	0.00	1.01	1.01	0.00	0.00	1.50	0.49	1.01	1.01	0.33	0.00	0.00	0.82	42.53	63.35	250	0.47	0.839	41.71	98.06%
Wanaki Road	MH318A	MH318A	MH300A							0.0	0.0	3.80	0.00	0.00	0.00	0.95	1.96	0.00	0.00	1.50	0.95	0.95	1.96	0.65	0.00	0.00	1.60	42.53	77.11	250	0.47	0.839	40.93	96.24%
Tawadina Road	MH300A	MH300A	MH301A	0.47		15				40.5	40.5	3.67	0.48	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.47	2.43	0.80	0.00	0.00	2.24	31.02	109.85	250	0.25	0.612	28.78	92.79%
Tawadina Road	MH301A	MH301A	MH302A	0.54		14				37.8	78.3	3.62	0.92	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.54	2.97	0.98	0.00	0.00	2.85	59.18	110.39	250	0.91	1.168	56.33	95.18%
Tawadina Road	MH302A	MH302A	MH303A	0.26		2				5.4	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.26	3.23	1.07	0.00	0.00	3.00	72.61	111.69	250	1.37	1.433	69.62	95.87%
Tawadina Road	MH303A	MH303A	MH304A	0.21						0.0	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.21	3.44	1.14	0.00	0.00	3.07	31.02	112.10	250	0.25	0.612	27.95	90.11%
Tawadina Road	MH305A	MH305A	MH304A	0.24						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.24	0.24	0.08	0.00	0.00	0.08	49.63	111.61	250	0.64	0.979	49.55	99.84%
																					0.00													
Bareille-Snow Street	EXT-1	BULK304AN	MH304A	7.35				905		1629.0	1629.0	3.12	16.49	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	7.35	7.35	2.43	0.00	0.00	18.91	31.02	20.00	250	0.25	0.612	12.11	39.04%
Bareille-Snow Street	MH304A-1, MH304A-2	MH304A	MH308A	1.47				190		342.0	2054.7	3.06	20.38	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	1.47	12.50	4.13	0.00	0.00	25.14	39.72	119.21	250	0.41	0.784	14.58	36.70%
Bareille-Snow Street	MH308A	MH308A	BULK206AN	0.07						0.0	2054.7	3.06	20.38	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.07	12.57	4.15	0.00	0.00	25.17	84.15	16.82	250	1.84	1.661	58.99	70.09%
Bareille-Snow Street		BULK206AN	MH206A							0.0	2054.7	3.06	20.38	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.00	12.57	4.15	0.00	0.00	25.17	88.83	21.00	250	2.05	1.753	63.66	71.67%
Codd's Road	MH340A	MH340A	BLK231AN	1.78				278		500.4	500.4	3.38	5.48	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.78	1.78	0.59	0.00	0.00	6.07	75.98	70.00	250	1.50	1.500	69.91	92.01%
Codd's Road		*MH231A*	*BULK176AN*							*0.0*	*500.4*	*3.38*	*5.48*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*1.78*	*0.59*	*0.00*	*0.00*	*6.07*	*83.92*	*50.22*	*250*	*1.83*	*1.656*	*77.86*	*92.77%*

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				
TH/F/SD	2.7	p/p/u	INST	28,000	L/Ha/day	
TH/S	2.3	p/p/u	COM	28,000	L/Ha/day	
APT	1.8	p/p/u	IND	35,000	L/Ha/day	MOE Chart
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,
   1.5 if greater than 20%, otherwise 1.0

Designed: KH

Checked: JIM

Dwg. Reference: 118863-400

No.	Revision	Date
1	Submission No. 1 for City Review	2018-12-20
2	Submission No. 2 for City Review	2019-03-15
3	MECP Submission	2019-04-17
4	Record information Added (No.1)	2020-10-08
5	Record information Added (No.2)	2021-03-23
6	Block 11 & 12 Study	2022-03-15

File Reference:	Date:	Sheet No:
118863.5.7.1	2021-03-31	1 of 1

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LEGEND

MH231A	Existing infrastructure (shown for information only)
	Block 11&12 Proposed Conditions

SANITARY SEWER DESIGN SHEET

Wateridge at Rockcliffe - Phase 2B
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN						
				AREA w/ Units	UNIT TYPES				AREA w/o Units	POPULATION		RES PEAK FACTOR	PEAK FLOW	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
														INSTITUTIONAL		COMMERCIAL		INDUSTRIAL																
STREET	AREA ID	FROM MH	TO MH	(Ha)	SF	SD / TH/F	TH/S	APT	(Ha)	IND	CUM		(L/s)	IND	CUM	IND	CUM	IND	CUM		(L/s)	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
Pimiwidon Street	MH317-1, MH317-2	MH317A	MH316A	1.50	1	104				284.2	284.2	3.47	3.20	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.50	1.50	0.50	0.00	0.00	3.69	40.68	*83.00*	*250*	*0.43*	0.803	36.99	90.93%
Pimiwidon Street	MH316A	MH316A	BULK202AN	0.16		1				2.7	286.9	3.47	3.23	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.16	1.66	0.55	0.00	0.00	3.77	37.74	*43.10*	*250*	*0.37*	0.745	33.96	90.00%
Pimiwidon Street	-	*BULK202AN*	*MH202A*							*0.0*	*286.9*	*3.47*	*3.23*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*1.66*	*0.55*	*0.00*	*0.00*	*3.77*	*40.68*	*21.00*	*250*	*0.43*	*0.803*	*36.91*	*90.72%*
Wigwas Street	MH315A	MH315A	MH314A	0.79	2	18				55.4	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.79	0.79	0.26	0.00	0.00	0.92	49.63	*111.64*	*250*	*0.64*	0.979	48.72	98.16%
Wigwas Street	MH314A	MH314A	BULK203AN	0.06						0.0	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.06	0.85	0.28	0.00	0.00	0.93	83.46	*14.37*	*250*	*1.81*	1.647	82.53	98.88%
Wigwas Street	-	*BULK203AN*	*MH203A*							*0.0*	*55.4*	*3.64*	*0.65*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.85*	*0.28*	*0.00*	*0.00*	*0.93*	*80.17*	*21.00*	*250*	*1.67*	*1.582*	*79.24*	*98.83%*
Moses Tennisco Street	MH313A	MH313A	MH312A	0.66	2	16				50.0	50.0	3.65	0.59	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.66	0.66	0.22	0.00	0.00	0.81	75.73	*77.20*	*250*	*1.49*	1.495	74.92	98.93%
Moses Tennisco Street	MH312A, PARK	MH312A	BULK204AN	0.21		2				5.4	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.21	0.87	0.29	0.00	0.00	0.94	94.29	*49.70*	*250*	*2.31*	1.861	93.35	99.00%
Park	PARK	MH350A	pipe	0.42						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.42	0.42	0.14	0.00	0.00	0.14	48.39	*11.00*	*200*	*2.00*	1.492	48.25	99.71%
Moses Tennisco Street	-	*BULK204AN*	*MH204A*							*0.0*	*55.4*	*3.64*	*0.65*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.87*	*0.29*	*0.00*	*0.00*	*0.94*	*89.90*	*21.00*	*250*	*2.10*	*1.774*	*88.96*	*98.95%*
Michael Stoqua Street	MH311A	MH311A	MH310A	0.44	1	9				27.7	27.7	3.69	0.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.44	0.44	0.15	0.00	0.00	0.48	72.35	77.82	250	1.36	1.428	71.87	99.34%
Michael Stoqua Street	MH310A	MH310A	BULK205AN	0.21		2				5.4	33.1	3.68	0.39	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.21	0.65	0.21	0.00	0.00	0.61	65.66	49.19	250	1.12	1.296	65.05	99.07%
Michael Stoqua Street	-	*BULK205AN*	*MH205A*							*0.0*	*33.1*	*3.68*	*0.39*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.65*	*0.21*	*0.00*	*0.00*	*0.61*	*66.24*	*21.00*	*250*	*1.14*	*1.307*	*65.63*	*99.08%*
Wanaki Road	MH200A	MH200A	MH318A							0.0	0.0	3.80	0.00	0.00	0.00	1.01	1.01	0.00	0.00	1.50	0.49	1.01	1.01	0.33	0.00	0.00	0.82	42.53	*63.35*	*250*	*0.47*	0.839	41.71	98.06%
Tawadina Road	MH300A	MH300A	MH301A	0.47		15				40.5	40.5	3.67	0.48	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.47	2.43	0.80	0.00	0.00	2.24	*31.02*	*109.85*	*250*	*0.25*	0.612	28.78	92.79%
Tawadina Road	MH301A	MH301A	MH302A	0.54		14				37.8	78.3	3.62	0.92	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.54	2.97	0.98	0.00	0.00	2.85	*59.18*	*110.39*	*250*	*0.91*	1.168	56.33	95.18%
Tawadina Road	MH302A	MH302A	MH303A	0.26		2				5.4	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.26	3.23	1.07	0.00	0.00	3.00	*72.61*	*111.69*	*250*	*1.37*	1.433	69.62	95.87%
Tawadina Road	MH303A	MH303A	MH304A	0.21						0.0	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.21	3.44	1.14	0.00	0.00	3.07	31.02	112.10	250	0.25	0.612	27.95	90.11%
Tawadina Road	MH305A	MH305A	MH304A	0.24						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.24	0.24	0.08	0.00	0.00	0.08	49.63	111.61	250	0.64	0.979	49.55	99.84%
																					0.00													
Bareille-Snow Street	EXT-1	BULK304AN	MH304A	7.35				905		1629.0	1629.0	3.12	16.49	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	7.35	7.35	2.43	0.00	0.00	18.91	31.02	20.00	250	0.25	0.612	12.11	39.04%
Bareille-Snow Street	MH304A-1, MH304A-2	MH304A	MH308A	1.48				140		252.0	1964.7	3.07	19.57	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	1.48	12.51	4.13	0.00	0.00	24.33	39.72	119.21	250	0.41	0.784	15.39	38.75%
Bareille-Snow Street	MH308A	MH308A	BULK206AN	0.96				352		633.6	2598.3	3.00	25.23	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.96	13.47	4.45	0.00	0.00	30.31	84.15	16.82	250	1.84	1.661	53.85	63.99%
Bareille-Snow Street		BULK206AN	MH206A							0.0	2598.3	3.00	25.23	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.00	13.47	4.45	0.00	0.00	30.31	88.83	21.00	250	2.05	1.753	58.52	65.88%
Codd's Road	MH340A	MH340A	BLK231AN	0.88				212		381.6	381.6	3.43	4.24	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.88	0.88	0.29	0.00	0.00	4.53	75.98	70.00	250	1.50	1.500	71.46	94.04%
Codd's Road		*MH231A*	*BULK176AN*							*0.0*	*381.6*	*3.43*	*4.24*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.88*	*0.29*	*0.00*	*0.00*	*4.53*	*83.92*	*50.22*	*250*	*1.83*	*1.656*	*79.40*	*94.61%*

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u	INST	28,000	L/Ha/day	
TH/F/SD	2.7	p/p/u	COM	28,000	L/Ha/day	
TH/S	2.3	p/p/u	IND	35,000	L/Ha/day	MOE Chart
APT	1.8	p/p/u				
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,
   1.5 if greater than 20%, otherwise 1.0

Designed: KH

Checked: JIM

Dwg. Reference: 118863-400

No.	Revision	Date
1	Submission No. 1 for City Review	2018-12-20
2	Submission No. 2 for City Review	2019-03-15
3	MECP Submission	2019-04-17
4	Record information Added (No.1)	2020-10-08
5	Record information Added (No.2)	2021-03-23
6	Block 11 & 12 Study	2022-03-15

File Reference:	Date:	Sheet No:
118863.5.7.1	2021-03-31	1 of 1

APPENDIX B

- Sanitary Sewer Spreadsheet – Original Concept Site Plan
- Sanitary Sewer Spreadsheet – DesignWorks Engineering Site Plan

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LEGEND

MH231A	Existing infrastructure (shown for information only)
(shaded)	Block 11&12 Proposed Conditions

SANITARY SEWER DESIGN SHEET

Wateridge at Rockcliffe - Phase 2B
City of Ottawa
Canada Lands Company

LOCATION: STREET	LOCATION: AREA ID	LOCATION: FROM MH	LOCATION: TO MH	RESIDENTIAL: AREA w/ Units (Ha)	RESIDENTIAL: UNIT TYPES SF	UNIT TYPES SD / TH/F	UNIT TYPES TH/S	UNIT TYPES APT	AREA w/o Units (Ha)	POPULATION IND	POPULATION CUM	RES PEAK FACTOR	PEAK FLOW (L/s)	ICI AREAS: AREA (Ha) INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	ICI PEAK FACTOR	PEAK FLOW (L/s)	INFILTRATION ALLOWANCE: AREA (Ha) IND	AREA (Ha) CUM	FLOW (L/s)	FIXED FLOW (L/s) IND	FIXED FLOW (L/s) CUM	TOTAL FLOW (L/s)	PROPOSED SEWER DESIGN: CAPACITY (L/s)	LENGTH (m)	DIA (mm)	SLOPE (%)	VELOCITY (full) (m/s)	AVAILABLE CAPACITY L/s	AVAILABLE CAPACITY (%)
Pimiwidon Street	MH317-1, MH317-2	MH317A	MH316A	1.50	1	104				284.2	284.2	3.47	3.20	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	1.50	1.50	0.50	0.00	0.00	3.69	40.68	83.00	250	0.43	0.803	36.99	90.93%
Pimiwidon Street	MH316A	MH316A	BULK202AN	0.16		1				2.7	286.9	3.47	3.23	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.16	1.66	0.55	0.00	0.00	3.77	37.74	43.10	250	0.37	0.745	33.96	90.00%
Pimiwidon Street	-	*BULK202AN*	*MH202A*							*0.0*	*286.9*	*3.47*	*3.23*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*1.66*	*0.55*	*0.00*	*0.00*	*3.77*	*40.68*	*21.00*	*250*	*0.43*	*0.803*	*36.91*	*90.72%*
Wigwas Street	MH315A	MH315A	MH314A	0.79	2	18				55.4	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.79	0.79	0.26	0.00	0.00	0.92	49.63	111.64	250	0.64	0.979	48.72	98.16%
Wigwas Street	MH314A	MH314A	BULK203AN	0.06						0.0	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.06	0.85	0.28	0.00	0.00	0.93	83.46	14.37	250	1.81	1.647	82.53	98.88%
Wigwas Street	-	*BULK203AN*	*MH203A*							*0.0*	*55.4*	*3.64*	*0.65*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.85*	*0.28*	*0.00*	*0.00*	*0.93*	*80.17*	*21.00*	*250*	*1.67*	*1.582*	*79.24*	*98.83%*
Moses Tennisco Street	MH313A	MH313A	MH312A	0.66	2	16				50.0	50.0	3.65	0.59	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.66	0.66	0.22	0.00	0.00	0.81	75.73	77.20	250	1.49	1.495	74.92	98.93%
Moses Tennisco Street	MH312A, PARK	MH312A	BULK204AN	0.21		2				5.4	55.4	3.64	0.65	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.21	0.87	0.29	0.00	0.00	0.94	94.29	49.70	250	2.31	1.861	93.35	99.00%
Park	PARK	MH350A	pipe	0.42						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.42	0.42	0.14	0.00	0.00	0.14	48.39	11.00	200	2.00	1.492	48.25	99.71%
Moses Tennisco Street	-	*BULK204AN*	*MH204A*							*0.0*	*55.4*	*3.64*	*0.65*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.87*	*0.29*	*0.00*	*0.00*	*0.94*	*89.90*	*21.00*	*250*	*2.10*	*1.774*	*88.96*	*98.95%*
Michael Stoqua Street	MH311A	MH311A	MH310A	0.44	1	9				27.7	27.7	3.69	0.33	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.44	0.44	0.15	0.00	0.00	0.48	72.35	77.82	250	1.36	1.428	71.87	99.34%
Michael Stoqua Street	MH310A	MH310A	BULK205AN	0.21		2				5.4	33.1	3.68	0.39	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.21	0.65	0.21	0.00	0.00	0.61	65.66	49.19	250	1.12	1.296	65.05	99.07%
Michael Stoqua Street	-	*BULK205AN*	*MH205A*							*0.0*	*33.1*	*3.68*	*0.39*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.65*	*0.21*	*0.00*	*0.00*	*0.61*	*66.24*	*21.00*	*250*	*1.14*	*1.307*	*65.63*	*99.08%*
Wanaki Road	MH200A	MH200A	MH318A							0.0	0.0	3.80	0.00	0.00	0.00	1.01	1.01	0.00	0.00	1.50	0.49	1.01	1.01	0.33	0.00	0.00	0.82	42.53	63.35	250	0.47	0.839	41.71	98.06%
Tawadina Road	MH300A	MH300A	MH301A	0.47		15				40.5	40.5	3.67	0.48	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.47	2.43	0.80	0.00	0.00	2.24	31.02	109.85	250	0.25	0.612	28.78	92.79%
Tawadina Road	MH301A	MH301A	MH302A	0.54		14				37.8	78.3	3.62	0.92	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.54	2.97	0.98	0.00	0.00	2.85	59.18	110.39	250	0.91	1.168	56.33	95.18%
Tawadina Road	MH302A	MH302A	MH303A	0.26		2				5.4	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.26	3.23	1.07	0.00	0.00	3.00	72.61	111.69	250	1.37	1.433	69.62	95.87%
Tawadina Road	MH303A	MH303A	MH304A	0.21						0.0	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.21	3.44	1.14	0.00	0.00	3.07	31.02	112.10	250	0.25	0.612	27.95	90.11%
Tawadina Road	MH305A	MH305A	MH304A	0.24						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.24	0.24	0.08	0.00	0.00	0.08	49.63	111.61	250	0.64	0.979	49.55	99.84%
																					0.00													
Bareille-Snow Street	EXT-1	BULK304AN	MH304A	7.35				905		1629.0	1629.0	3.12	16.49	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	7.35	7.35	2.43	0.00	0.00	18.91	31.02	20.00	250	0.25	0.612	12.11	39.04%
Bareille-Snow Street	MH304A-1, MH304A-2	MH304A	MH308A	1.48				140		252.0	1964.7	3.07	19.57	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	1.48	12.51	4.13	0.00	0.00	24.33	39.72	119.21	250	0.41	0.784	15.39	38.75%
Bareille-Snow Street	MH308A	MH308A	BULK206AN	0.96				352		633.6	2598.3	3.00	25.23	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.96	13.47	4.45	0.00	0.00	30.31	84.15	16.82	250	1.84	1.661	53.85	63.99%
Bareille-Snow Street		BULK206AN	MH206A							0.0	2598.3	3.00	25.23	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.00	13.47	4.45	0.00	0.00	30.31	88.83	21.00	250	2.05	1.753	58.52	65.88%
Codd's Road	MH340A	MH340A	BLK231AN	0.88				212		381.6	381.6	3.43	4.24	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.88	0.88	0.29	0.00	0.00	4.53	75.98	70.00	250	1.50	1.500	71.46	94.04%
Codd's Road		*MH231A*	*BULK176AN*							*0.0*	*381.6*	*3.43*	*4.24*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.88*	*0.29*	*0.00*	*0.00*	*4.53*	*83.92*	*50.22*	*250*	*1.83*	*1.656*	*79.40*	*94.61%*

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u	INST	28,000	L/Ha/day	
TH/F/SD	2.7	p/p/u	COM	28,000	L/Ha/day	
TH/S	2.3	p/p/u	IND	35,000	L/Ha/day	MOE Chart
APT	1.8	p/p/u				
Other	60	p/p/Ha		17000	L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
   Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
   where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,
   1.5 if greater than 20%, otherwise 1.0

Designed: KH
Checked: JIM
Dwg. Reference: 118863-400

No.	Revision	Date
1	Submission No. 1 for City Review	2018-12-20
2	Submission No. 2 for City Review	2019-03-15
3	MECP Submission	2019-04-17
4	Record information Added (No.1)	2020-10-08
5	Record information Added (No.2)	2021-03-23
6	Block 11 & 12 Study	2022-03-15

File Reference:	Date:	Sheet No:
118863.5.7.1	2021-03-31	1 of 1

IBI GROUP
400-333 Preston Street
Ottawa, Ontario K1S 5N4 Canada
tel 613 225 1311 fax 613 225 9868
ibigroup.com

LEGEND
MH231A Existing infrastructure (shown for information only)
Block 11 Proposed Conditions (DesignWorks Engineering)

SANITARY SEWER DESIGN SHEET

Wateridge at Rockcliffe - Phase 2B
City of Ottawa
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL	PROPOSED SEWER DESIGN						
				AREA	UNIT TYPES				AREA	POPULATION		RES	PEAK	AREA (Ha)						ICI	PEAK	AREA (Ha)		FLOW			FLOW	CAPACITY	LENGTH	DIA	SLOPE	VELOCITY	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH	w/ Units (Ha)	SF	SD / TH/F	TH/S	APT	w/o Units (Ha)	IND	CUM	PEAK FACTOR	FLOW (L/s)	INSTITUTIONAL IND	INSTITUTIONAL CUM	COMMERCIAL IND	COMMERCIAL CUM	INDUSTRIAL IND	INDUSTRIAL CUM	PEAK FACTOR	FLOW (L/s)	IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(full) (m/s)	L/s	(%)
Tawadina Road	MH300A	MH300A	MH301A	0.47		15				40.5	40.5	3.67	0.48	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.47	2.43	0.80	0.00	0.00	2.24	*31.02*	*109.85*	*250*	*0.25*	0.612	28.78	92.79%
Tawadina Road	MH301A	MH301A	MH302A	0.54		14				37.8	78.3	3.62	0.92	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.54	2.97	0.98	0.00	0.00	2.85	*59.18*	*110.39*	*250*	*0.91*	1.168	56.33	95.18%
Tawadina Road	MH302A	MH302A	MH303A	0.26		2				5.4	83.7	3.61	0.98	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.26	3.23	1.07	0.00	0.00	3.00	*72.61*	*111.69*	*250*	*1.37*	1.433	69.62	95.87%
Tawadina Road	MH303A	MH303A	MH304A	0.93				240		432.0	515.7	3.37	5.64	0.00	0.00	0.00	1.96	0.00	0.00	1.50	0.95	0.93	4.16	1.37	0.00	0.00	7.96	31.02	112.10	250	0.25	0.612	23.06	74.33%
Tawadina Road	MH305A	MH305A	MH304A	0.24						0.0	0.0	3.80	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.24	0.24	0.08	0.00	0.00	0.08	49.63	111.61	250	0.64	0.979	49.55	99.84%
																					0.00													
Bareille-Snow Street	EXT-1	BULK304AN	MH304A	7.35				905		1629.0	1629.0	3.12	16.49	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	7.35	7.35	2.43	0.00	0.00	18.91	31.02	20.00	250	0.25	0.612	12.11	39.04%
Bareille-Snow Street	MH304A-1, MH304A-2	MH304A	MH308A	0.76				52		93.6	2238.3	3.04	22.04	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.76	12.51	4.13	0.00	0.00	26.80	39.72	119.21	250	0.41	0.784	12.93	32.54%
Bareille-Snow Street	MH308A	MH308A	BULK206AN	0.96				352		633.6	2871.9	2.97	27.61	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.96	13.47	4.45	0.00	0.00	32.69	84.15	16.82	250	1.84	1.661	51.46	61.15%
Bareille-Snow Street		BULK206AN	MH206A							0.0	2871.9	2.97	27.61	0.00	0.00	0.00	1.96	0.00	0.00	1.00	0.64	0.00	13.47	4.45	0.00	0.00	32.69	88.83	21.00	250	2.05	1.753	56.13	63.20%
Codd's Road	MH340A	MH340A	BLK231AN	0.88				212		381.6	381.6	3.43	4.24	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.00	0.88	0.88	0.29	0.00	0.00	4.53	75.98	70.00	250	1.50	1.500	71.46	94.04%
Codd's Road		*MH231A*	*BULK176AN*							*0.0*	*381.6*	*3.43*	*4.24*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*0.00*	*1.00*	*0.00*	*0.00*	*0.88*	*0.29*	*0.00*	*0.00*	*4.53*	*83.92*	*50.22*	*250*	*1.83*	*1.656*	*79.40*	*94.61%*

Design Parameters:

Residential			ICI Areas		
SF	3.4	p/p/u	INST	28,000 L/Ha/day	
TH/F/SD	2.7	p/p/u	COM	28,000 L/Ha/day	
TH/S	2.3	p/p/u	IND	35,000 L/Ha/day	MOE Chart
APT	1.8	p/p/u			
Other	60	p/p/Ha		17000 L/Ha/day	

Notes:
1. Mannings coefficient (n) = 0.013
2. Demand (per capita): 280 L/day 200 L/day
3. Infiltration allowance: 0.33 L/s/Ha
4. Residential Peaking Factor:
Harmon Formula = 1+(14/(4+(P/1000)^0.5))0.8
where K = 0.8 Correction Factor
5. Commercial and Institutional Peak Factors based on total area,
1.5 if greater than 20%, otherwise 1.0

Designed: KH

Checked: JIM

Dwg. Reference: 118863-400

No.	Revision	Date
1	Submission No. 1 for City Review	2018-12-20
2	Submission No. 2 for City Review	2019-03-15
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5	Record information Added (No.2)	2021-03-23

File Reference:	Date:	Sheet No:
118863.5.7.1	2021-03-31	1 of 1

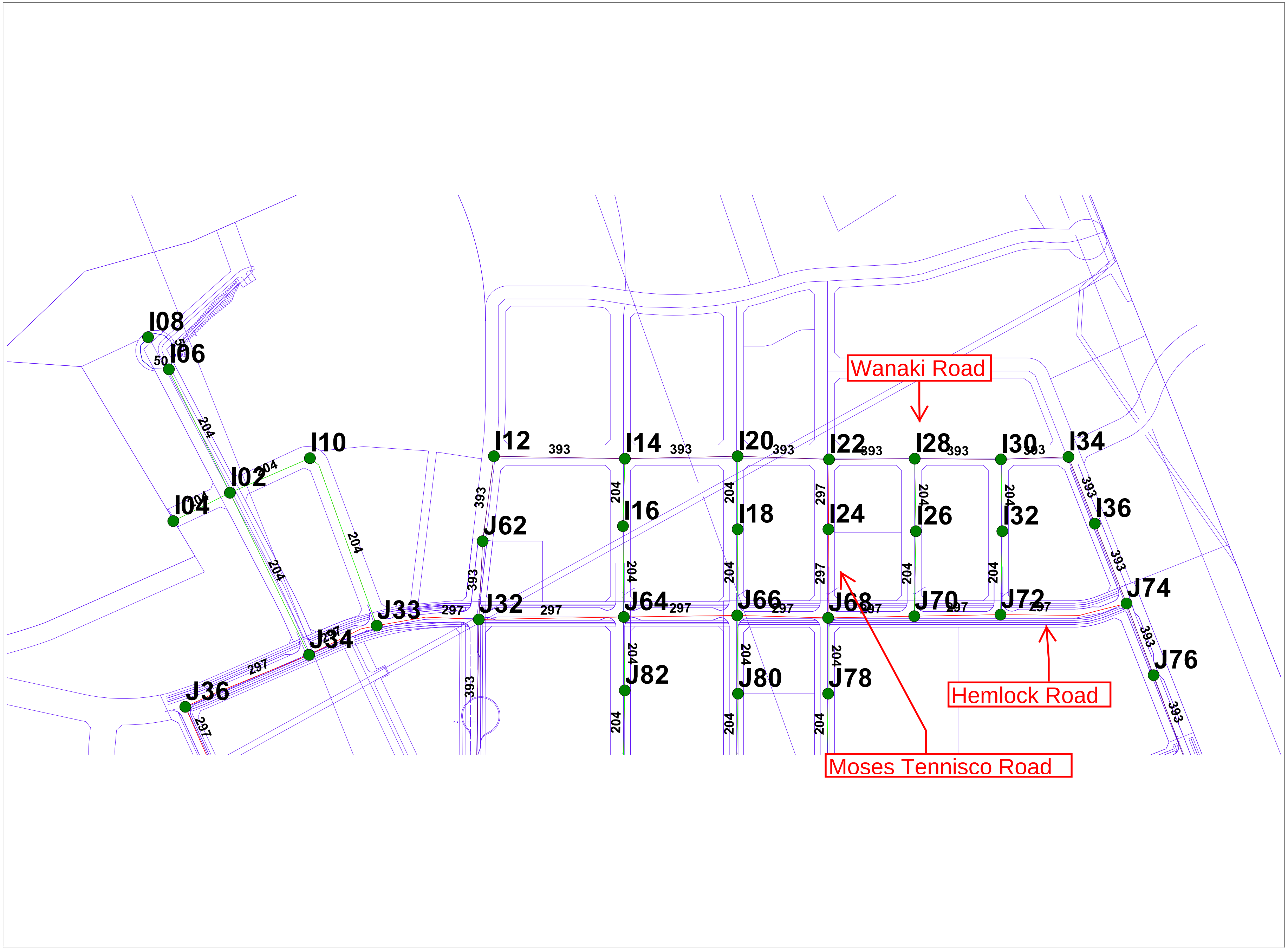
APPENDIX C

- Water Modeling Results – Phase 2B Design Brief

Wateridge Overall Model

Date: Thursday, December 06, 2018

Phase 2 Node ID's and Pipe Sizes



Date: Thursday, December 06, 2018

Phase 2 Basic Day (Max HGL) Pressures

Date: Thursday, December 06, 2018

Phase 2 Peak Hour Pressures

Date: Thursday, December 06, 2018

Phase 2 Max Day + Fire Design Fireflows

Date: Thursday, December 06, 2018

APPENDIX D

- Low Impact Development (LID) Review

To: **Anton Chetrar & Jim Moffatt**
IBI
400-333 Preston Street, Ottawa, ON K1S 5N4

Krisendat Sewgoolam & Mary Jarvis
Canada Lands Corporation (CLC)
30 Metcalfe Street, Suite 601, Ottawa, Ontario, K1P 5L4

From: **Chris Denich, M.Sc. P.Eng., Aquafor Beech Ltd.**
55 Regal Road, Guelph, ON, N1K 1B6

Re: **Submission 1: Site Plan Package Submission to Canada Lands Company; 1050 Tawadina Road, Ottawa**

At the request of CLC, we have completed a review of submission 1 for 1050 Tawadina Road, Ottawa (Block 11) in regards to the Low Impact Development (LID) requirements. The review has been based on the designs as detailed in the relevant reports and site drawings prepared by Westurban Developments and offer the following advisory comments, without prejudice. The following documents, reports and drawings were reviewed:

1. Wateridge Village Municipal Servicing and Stormwater Management Feasibility Study Report (October 21, 2022) – Prepared by Design Works Engineering Ltd.;
2. Civil Drawings (Issued for CLC Submission) – October 25, 2022 – Prepared by Design Works Engineering Ltd:
    a. Site Grading Plan;
    b. Site Servicing Plan;
    c. Site Erosion and Sediment Control Plan;
    d. Utility Plan;
3. Geotechnical Investigation – Proposed Two New Apartments Buildings 1050 Tawadina Road, Ottawa, ON (November 3, 2022) – Prepared by Englobe.
4. Architectural Drawings (undated) – Prepared By Formed Alliance Architects Studio (FAAS)
5. Landscape Drawings (October 24, 3022) – Prepared by CSW

<u>General Comments</u>

1. In regards to submission 1, it is noted that CLC`s goal for this overall development is for the Wateridge Village development (Former CFB Rockcliffe) to be a model community for LID. In general, the proposed design is not in keeping with CLC's design vision nor the LID Demonstration Project goals and objectives, including overall aesthetic enhancement and synergies using LIDs. The current site plan does not demonstrate LID technologies to the full extent.

2. It is acknowledged that per Section 5.3 Wateridge Village Municipal Servicing and Stormwater Management Feasibility Study Report that reference has been appropriately made to Wateridge Phase 2B LID Developer's Checklist, which was include as Appendix D. It is further noted that notwithstanding the comments below, the design calculations demonstrates that proposed LID achieves the required 4mm LID Infiltration target and 4mm LID Erosion Target, but does not achieve the required Minimum Water Quality Target of the 15mm event as specified in Table 2.1.

3. It is acknowledged that a series two (2) Soleno Underground Infiltration Systems (Solo Max Perforated Subdrain) been included with the intent of infiltrating runoff from the respective roof drainage area. The following is noted:
    a. Sufficient design details have not been provided for the proposed Underground Infiltration Systems. No design details and/or cross-sections are provided within the civil drawings and no product specifications/ technical documents. Trench widths, bedding materials, filter fabrics, founding elevations, backfill and compaction requirements etc. should be detailed.
    b. Per the TRCA/CVC LID Planning and Design Guide (2010), Wiki Document (wiki.sustainabletechnologies.ca) or most current, infiltration galleries (soakaways, trenches and chambers), should be set back at least four (4) metres from building foundations (specifically where liveable spaces, mechanical rooms, parking or other are located sub-surface) unless infiltration facility inverts are located below the lowest finished floor elevation. As such the following is recommended:
        i. Show offset from the respective Building A proximal to the infiltration gallery and increase to 4m if feasible.
        ii. Please confirm if the infiltration system inverts are located below the lowest finished floor elevation of Building A proximal to the infiltration system.
        iii. If 4m cannot be accommodated or infiltration systems cannot be located below the lowest finished floor elevation, it is recommended that inclusion of impermeable barriers proximal to the building side of the infiltration system or additional building waterproofing be included.
    c. It is understood that the infiltration systems will accept roof runoff. Pre-treatment devises (leaf screens and/or filters) are recommended to prevent debris from entering the infiltration systems.
    d. The Wateridge Village Municipal Servicing and Stormwater Management Feasibility Study Report should include a discussion of winter operation/ functionality of the infiltration systems
    e. Per the TRCA/CVC LID Planning and Design Guide (2010), Wiki Document (wiki.sustainabletechnologies.ca) or most current, please confirm that the impervious drainage area to the areas of each infiltration systems is between 5:1 and 20:1.
    f. LID specific Erosion and Sediment Controls and Construction Staging for Section 5.21 of the Stormwater Management Existing Conditions Report & LID Pilot Project Scoping (Aquafor Beech (2015) have not been provided. LID controls that rely on infiltration require specific ESC controls to be in place during construction to prevent contamination/ clogging during construction.
    g. LID designs should reference the requirements of the City of Ottawa, Low Impact Development Technical Guidance Report – Implementation in Areas with Potential Hydrogeological Constraints (February 2021) for design, analysis and in-situ testing requirements.

4. No discussion or details are provided with the Wateridge Village Municipal Servicing and Stormwater Management Feasibility Study Report or the Geotechnical Investigation in regards to the site context as it relates to the Underground Infiltration Systems specifically:
    a. In-situ Infiltration rates of the native soils within the proposed footprint of the Underground Infiltration Systems
    b. the seasonally high groundwater elevation,

   c. bedrock elevation, and
   d. the soil stratigraphy that proposed Underground Infiltration Systems would be founded

5. As an advisory comment, opportunities for additional LID integration into the site include but are not limited to:
   a. Raised planter areas: opportunity to design as bioretention planters
   b. Tree plantings: opportunity to design tree pits or cluster plantings
   c. Area drains: opportunity to design as bioretention areas
   d. Unit paver areas: opportunity to design as permeable pavements

The above noted comments should be considered preliminary in nature and limited to the information provided. Additional information shall be required prior to Aquafor Beech completing a thorough and complete review.