200 Codd's Road (Wateridge Blocks 22-23)

Site Servicing and Stormwater Management Report

Stantec

Prepared for:
Mattamy (Rockcliffe II) Inc.

Prepared by:
Stantec Consulting Ltd.

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Prepared by:

Signature

Michael Wu, E.I.T.

Reviewed by:

Signature

Dustin Thiffault, P.Eng.

Approved by:

Signature

Peter Moroz, P.Eng. MBA

Table of Contents

List of Tables

List of Figures

List of Appendices

1 Introduction

Mattamy (Rockcliffe II) Inc. has commissioned Stantec Consulting Ltd. to prepare this Servicing and Stormwater Management Report for their development site identified as Blocks 22 and 23 with a block address of 200 Codd's Road within Phase 7 of the Wateridge Village Subdivision in the City of Ottawa.

The subject site is zoned R5Y [2312] and [2313] – Residential Fifth Density Zone, and is bound by open greenspace to the north, proposed parks to the west and east, and the future extension of Codd's Road to the south and will be constructed as part of Phase 7 of the Wateridge Subdivision development. The site location is outlined in Figure 1 below.

The proposed 3.69 ha residential development will consist of 17 row townhome blocks, 8 back-to-back townhome blocks, for a total of 185 townhouse units, and associated private access roads. The objective of this report is to provide a servicing scenario for the site that is free of conflicts, provides on-site servicing in accordance with City of Ottawa design guidelines, and utilizes the existing local infrastructure in accordance with the various background studies outlined in **Section 2**.

Figure 1.1: Site Location

2 References

The following documents were referenced in the preparation of this report:

- Former CFB Rockcliffe Master Servicing Study, IBI, June 2020
- Design Brief Wateridge Village at Rockcliffe Phases 6 and 7, Arcadis, August 2025
- Former CFB Rockcliffe Redevelopment Stormwater Management Existing Conditions & LID Pilot Project Scoping, Aquafor Beech Limited, August 2015
- *City of Ottawa Design Guidelines – Water Distribution*, Infrastructure Services Department, City of Ottawa, Second Edition, November 2025, and all subsequent Technical Bulletins
- *City of Ottawa Sewer Design Guidelines*, 3rd Ed., City of Ottawa, November 2025, and all subsequent Technical Bulletins
- *Environmental Compliance Approval No. 0824-A8CR5H*, Ministry of the Environment and Climate Change, April 2016
- *Geotechnical Investigation – Proposed Residential Development – Wateridge Village Phases 6, 7 & 8, Ottawa, Ontario,* Revision 5, Paterson Group, December 2024

3 Water Servicing

3.1 Background

The proposed site is within the MONT pressure zone of the City of Ottawa's water distribution network. The site is expected to be serviced through 200mm diameter watermains within Codd's Road and Bareille Snow Street to be installed as part of Wateridge Phase 7. The 200mm mains are supplied by multiple connections to distribution mains within the adjacent phases of the Wateridge subdivision.

3.2 Design Criteria

3.2.1 Water Demand and Allowable Pressure

The domestic water demand and allowable water pressure are assessed using the City of Ottawa Water Distribution Guidelines (2025) as amended, and the ISTB 2021-03 Technical Bulletin.

Residential Apartment Population Density	
Townhouse	2.7 persons / unit
Residential Apartment Demand	
Average Daily (AVDY)	280 L/cap/day
Maximum Daily (MXDY)	2.5 × AVDY
Peak Hour (PKHR)	2.2 × MXDY
Allowable Water Pressure	
MXDY Flow	345 kPa (50 psi) to 552 kPa (80 psi)
PKHR Flow Minimum	276 kPa (40 psi)
MXDY + Fire Flow	140 kPa (20 psi)
Maximum Allowable for Occupied Area	552 kPa (80 psi)

3.2.2 Fire Flow and Hydrant Capacity

Detailed fire flow requirements are assessed using the Fire Underwriters Survey (FUS) methodology (2020). Site specific criteria considered are noted in Section 2.3.2.

Individual fire hydrant capacity is assessed based on Table 18.5.4.3 of the National Fire Protection Agency (NFPA) Fire Code document. A hydrant situated less than 76 m away from a building can supply a maximum capacity of 5,678 L/min, and a hydrant 76 to less than 152 m away can supply a maximum capacity of 3,785 L/min.

3.3 Proposed Watermain Sizing and Layout

The proposed development will be serviced by a looped private watermain network fed by two connections to the 200 mm diameter watermains in Codd's Road.

3.3.1 Water Demands

Based on the site layout, the proposed development is estimated to have a total population of 500 persons. The estimated demand for the proposed development is summarized in **Table 3.1** and detailed in **Appendix A.1**.

Table 3.1: Estimated Domestic Water Demands

Population	AVDY (L/s)	MXDY (L/s)	PKHR (L/s)
500	1.6	4.0	8.9

3.3.2 Fire Flow Demands

The fire flow requirements for the residential properties were determined using the 2020 Fire Underwriters Survey (FUS), in combination with requirements for Part 9 buildings within the Ontario Building Code (OBC), which caps the building area of the residential blocks at 600 m^2. To accomplish the building area reduction for the purposes of the fire flow analysis, firewalls with a minimum two-hour fire-resistance rating that comply with OBC Div. B, Subsection 3.1.10, are constructed to separate the townhouses and meet the 600 m^2 cap in building area.

Additional fire walls have been incorporated within on-site structures to ensure required fire flows do not exceed 15,000 L/min based on results of the hydraulic analysis within the Design Brief for Wateridge Subdivision Phases 6-7. Based on the FUS calculations, Block 17 has the worst-case fire flow demand of 250 L/s (15,000 L/min). All 12-unit and the 14-unit back-to back dwellings, and all 7 row dwellings within the development will be built with 2-hr fire separation walls to separate the blocks to comply with OBC Div. B, Subsection 3.1.10.

3.3.3 Boundary Conditions

Boundary conditions are yet to be received based on supplied demands from the City of Ottawa to confirm availability of increased fire flow rates. These are attached in **Appendix A.3** and summarized below. Results of the subdivision analysis are to be reassessed once revised boundary conditions have been received from City of Ottawa staff.

3.4 Hydraulic Assessment

A hydraulic model was built by Arcadis (2025) for the Wateridge Subdivision to assess the anticipated pressures to meet the minimum servicing requirements. A fire flow analysis was also performed under maximum day conditions.

3.4.1.1 Average Day & Peak Hour

The hydraulic model results show that the maximum pressures (AVDY condition) are anticipated to be approximately 522 to 526 kPa (75.7 to 76.3psi), while minimum pressures during PKHR are anticipated to be approximately 540 to 561 kPa (53.5 to 60.7 psi) adjacent to Codd's Road. These pressures are well above the minimum allowable pressure of 276 kPa (40 psi).

3.4.1.2 Maximum Day & Fire Flow

An analysis was carried out using the hydraulic model to determine if the development, under maximum day demands, can achieve a fire flow of 15,000 L/min (250 L/s) in the site. This was accomplished using a steady-state maximum day demand scenario along with the automated fire flow simulation feature of the software.

Results of the modeling analysis indicate that adequate flows are available under emergency fire demand conditions while still maintaining a residual pressure of 140 kPa (20 psi). Results of the hydraulic modeling performed for the subdivision in 2025 are included in **Appendix A.3.**

3.4.1.3 Fire Hydrant Coverage

There are eight fire hydrants proposed to deliver fire flow in the site. The full site falls under the coverage of all eight proposed hydrants. According to the NFPA 1 Table 18.5.4.3 in Appendix I of the City of Ottawa Technical Bulletin ISTB-2018-02, a hydrant situated less than 76 m away from a building can supply a maximum capacity of 5,678 L/min.

The proposed fire hydrant layout provides for three of the hydrants to be within 76 m away from the worst case Block 17, as such the fire flow demands for Block 17 (250 L/s) can be provided by the three hydrants. See **Appendix A.4** for fire hydrant coverage table calculations, NFPA Table 18.5.4.3, and the fire hydrant coverage figure.

3.5 Summary of Findings

Based on the findings of the hydraulic analysis, the proposed network is capable of servicing the development area and is expected to meet all servicing requirements as per the City of Ottawa standards under typical demand conditions (average day and peak hour conditions) as well as under emergency fire demand conditions (maximum day + fire flow). Results of the subdivision analysis are to be reassessed once revised boundary conditions have been received from City of Ottawa staff.

Adequate fire hydrant coverage has been provided throughout the subdivision. Fire walls will be required for the back-to-back blocks that are over 600 m^2 in area to meet OBC requirements and to ensure required fire flows do not exceed 15,000 L/min per FUS 2020. Fire hydrants have been sited to provide the required fire flow.

4 Wastewater Servicing

4.1 Background

The Phases 6 and 7 Servicing Brief for the Wateridge Subdivision indicates that wastewater flows from Blocks 22 and 23 are to be directed to the Ottawa Interceptor Trunk Sewer via a connection to the municipal sanitary sewer within Codd's Road. Under the Servicing Brief's drainage area plan, Blocks 22 and 23 (Areas MH3A and MH8A) are to contribute a total of 21.1 L/s of sanitary peak flow based on an assumed total population of 1,021 persons over an area of 3.7 ha. The Phases 6 and 7 Servicing Brief Sanitary Drainage Area Plan has been included in **Appendix B.2**.

4.2 Design Criteria

As outlined in the City's Sewer Design Guidelines, the following design parameters were used to calculate estimated wastewater flow rates and to size on-site sanitary sewers for the proposed development:

- Minimum Full Flow Velocity – 0.6 m/s
- Maximum Full Flow Velocity – 3.0 m/s
- Manning's roughness coefficient for all smooth walled pipes – 0.013
- Population Persons per unit – 2.7
- Extraneous Flow Allowance – 0.33 L/s/ha
- Residential Average Flows – 280 L/cap/day
- Manhole Spacing – 120 m
- Minimum Cover – 2.5 m

4.3 Proposed Servicing

As shown on **Drawing SA-1** and detailed in the sanitary sewer design sheet attached in **Appendix B.1**, the development will be serviced by a network of 200 mm diameter sanitary sewers discharging to the existing 250 mm diameter sanitary sewers within Codd's Road and Bareille Snow Street, the latter which will in turn direct wastewater flows south to Mikinak Way and turn west to the Codd's Road Shaft.

Peak design flows from the site are calculated to be 6.7 L/s. Details of the peak flow calculations are included in the sanitary sewer design sheet attached in **Appendix B.1**, while the background report excerpts are attached in **Appendix B.2**.

Full port backwater valves are to be installed on all sanitary services within the site to prevent any surcharge from the downstream sewer main from impacting the proposed property.

5 Stormwater Management

5.1 Objectives

The goal of this servicing and stormwater management (SWM) plan is to determine the measures necessary to control the quantity and quality of stormwater released from the proposed development to meet the design criteria established for the site, and to provide the details required for approval and construction.

5.2 Existing Conditions

Stormwater generated on the site is subject to the requirements outlined in the former CFB Rockcliffe Master Servicing Study (MSS) and the Phases 6 and 7 Design Brief for the Wateridge Subdivision (Arcadis, 2025). The Phases 6 and 7 Servicing Brief outlines that stormwater from the site is to be directed to the Eastern Stormwater Management Facility (Eastern Pond). Minor system contributions are to be restricted to the 1:5 storm event. Runoff in excess of the minor system capture rate is to be directed overland over the downstream street segments to the Eastern Pond. Drainage area plans from the MSS and the 2025 Design Brief are included in **Appendix C**.

As detailed in the Design Brief, minor system flows from the site will be directed to a proposed 1200 mm diameter concrete storm sewer flowing east to west on Codd's Road, ultimately discharging to the Eastern Stormwater Management Facility (Eastern Pond) via an outlet sewer in Kishkabika Park. The major system flows will be directed east to the Eastern Dry Pond in Phase 8.

The stormwater management design for the site shall also meet the Low Impact Development (LID) design criteria outlined in the Aquafor Beech Former CFB Rockcliffe Redevelopment Stormwater Management Existing Conditions & LID Pilot Project Scoping report.

5.3 SWM Criteria and Constraints

The following summarizes the SWM criteria and constraints that will govern the detailed design of the proposed site as per the latest revision of the City of Ottawa Sewer Design Guidelines as well as the conclusions made in the MSS and Design Brief.

- Design using the dual drainage principle. (City of Ottawa SDG)
- Where there is footing drainage connected to the storm collection system, separation of at least 0.3 m between the 100-year storm hydraulic grade line (HGL) and building under side of footing (USF) must be provided. (City)
- Where there is footing drainage connected to the storm collection system, maximum 'climate change' HGL to be lower than proposed basement elevations. (City)
- Total maximum depth of flow under static and dynamic conditions shall be less than 0.35 m. (City)

- Design storm sewers along local roadways to convey the 2-year peak flow respectively under free-flow conditions using 2004 City of Ottawa I-D-F parameters and an inlet time of 10 minutes. (City)
- Assess impact of 2-year storm, and the worst case 100-year storm events, on the major & minor drainage system. (City)
- Building openings to be above the 100-year water level. (City)
- There must be at least 30 cm of vertical clearance between the spill elevation on the private street and the lowest building opening that is in the proximity of the flow route or ponding area. (City)
- Minimum roadway profile grades at 0.5 %. (City)
- Minimum roadway slope of 0.1 % from crest-to-crest for overland flow route. (City)
- Provide adequate emergency overflow conveyance off-site. (City)

Per the 2025 Design Brief, minor system outflow to the Codd's Road sewer is defined by subareas B5 and B8A, which have a 5-year allowable discharge rate of 338L/s and 299L/s respectively, for a total minor system allotment of **637L/s** for all events up to and including the 100-year storm event. Major system allowable flows are identified as 287L/s and 254L/s (total 541L/s) under the 100-year storm event, and 437L/s and 386L/s (total 823L/s) under the climate change 100-year +20% event.

5.4 Design Methodology

The design methodology for the SWM component of the development is as follows:

- Create a PCSWMM model that generates major and minor system hydrographs and assesses the minor system hydraulic grade line and the major system flow depths.
- Size inlet control devices for the proposed catch basins to avoid surface ponding during the 2-year storm while meeting the required 0.3 m 100-year HGL to USF clearance.
- Ensure that total dynamic and static surface ponding depths do not exceed 0.35 m during the 100-year storm scenario.
- Confirm that climate change storm simulation does not result in flooding of properties.

The site is designed using the "dual drainage" principle, whereby the minor (pipe) system is designed to convey the peak rate of runoff from the 2-year design storm and runoff from larger events is conveyed by both minor (pipe) and major (overland) channels, such as roadways and walkways, safely to the appropriate outlet without impacting proposed or existing downstream properties.

Drawing SD-1 outlines the proposed storm sewer alignment, drainage divides, and labels. The storm sewer design sheet is included in **Appendix C.1**.

5.5 Modeling Rationale

A comprehensive hydrologic modeling exercise was completed with PCSWMM, accounting for the estimated major and minor systems to evaluate the storm sewer infrastructure and major system segments. The use of PCSWMM for modeling of the site hydrology and hydraulics allowed for an analysis

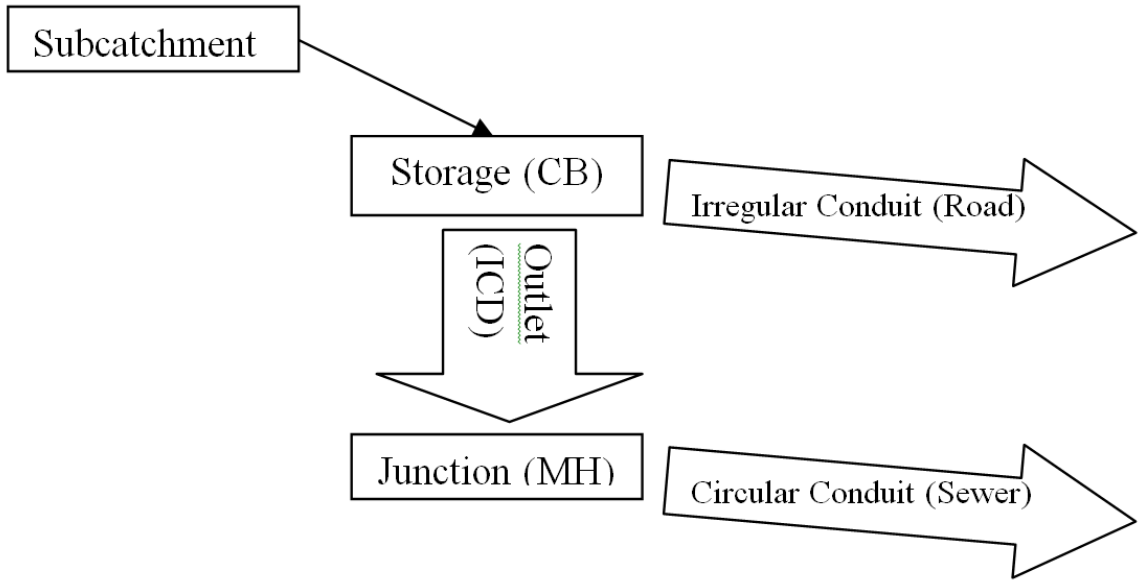
of the systems' response during various storm events. The following assumptions were applied to the detailed model:

- Hydrologic parameters as per Ottawa Sewer Design Guidelines, including Horton infiltration, Manning's 'n', and depression storage values.
- 3-hour Chicago Storm distribution for the 2-year, 5-year and 100-year analysis.
- To 'stress test' the system a 'climate change' scenario was created by adding 20% of the individual intensity values of the 100-year storm at their specified time step.
- Percent imperviousness calculated based on actual soft and hard surfaces for the proposed catchments and converted to equivalent Runoff Coefficient using the relationship C = (Imp. X 0.7) + 0.2.
- Subcatchment areas are defined from high-point to high-point where sags occur.
- Width parameter was taken as twice the length of the street/swale segment for two-sided catchments and as the length of the street/swale segment for one-sided catchments. Irregular shaped catchments were calculated by measuring the flow length on the drawing and the width parameter was calculated respectively or alternatively set at 225 x subcatchment area per recommendations of the OSDG.
- Surface storage in road sags calculated based on grading plans (**Drawing SD-1**).

5.5.1 SWMM Dual Drainage Methodology

The proposed development is modeled in one modeling program as a dual conduit system (see **Figure 5.1**), with: 1) circular conduits representing the sewers & storage nodes representing manholes and the underground LID infiltration facility; 2) irregular conduits using street-shaped cross-sections to represent the approximate overland road network and storage nodes representing catchbasins. The dual drainage systems are connected via orifice link objects from storage node (i.e. CB) to storage node (i.e. MH) and represent catch basin leads. Subcatchments are linked to the storage node on the surface so that generated hydrographs are directed there firstly.

Figure 5.1: Schematic Representing Model Object Roles



Storage nodes are used in the model to represent catch basins as well as major system junctions. For storage nodes representing catch basins (CBs), the invert of the storage node represents the invert of the control orifice for the CB and the rim of the storage node represents the top of grate elevation plus allowable flow depth on the segment. For the purpose of this SWM plan, an additional fixed depth has been added to rim elevations to allow routing from one surface storage to the next.

Storage nodes that represent catch basins at sags, are connected by irregular conduits with cross-sections set to correspond to proposed roadway design for the subject area. Surface storage is determined within PCSWMM based on the typical roadway section and using grading from high-point to low-point.

Inlet control devices, as represented by orifice links, have been used to represent the proposed vertical circular orifices sized to restrict minor system capture rates to the 2-year storm runoff for proposed roadways.

5.5.2 Design Storms

The 3-hour Chicago distribution was selected to estimate the 2-year capture rates for the proposed subcatchments, and to assess the 100-year HGL across the proposed development.

To ‘stress test’ the system a ‘climate change’ scenario was created by adding 20% of the individual intensity values of the 100-year storm at their specified time step.

5.5.3 Boundary Conditions

The detailed PCSWMM hydrology and the proposed storm sewers were used to assess the peak inflows and hydraulic grade line (HGL) in the proposed site. Fixed boundary conditions in the form of backwater elevations were obtained from the Arcadis Phases 6 and 7 Design Brief from the outlet for Block 23 (Node MH3) and attached in **Appendix C**.

5.5.4 Modeling Parameters

Table 5.1 presents the general subcatchment parameters used:

Table 5.1: General Subcatchment Parameters

Subcatchment Parameter	Value
Infiltration Method	Horton
Max. Infil. Rate (mm/hr)	76.2
Min. Infil. Rate (mm/hr)	13.2
Decay Constant (1/hr)	4.14
N Imperv	0.013
N Perv	0.25
Dstore Imperv (mm)	1.57
Dstore Perv (mm)	4.67

Table 5.2 presents the individual parameters that vary for each of the subcatchments tributary to the storm outlet.

Table 5.2: Subcatchment Parameters

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient
C103AA	0.14	13.9	2.0	92.9	0.85
C105AA	0.15	10.8	2.0	85.7	0.80
C106A	0.02	6.6	2.0	78.6	0.75
C107A	0.06	11.3	2.0	85.7	0.80
C108A	0.10	12.5	2.0	50.0	0.55
C110A	0.19	21.9	2.0	78.6	0.75
C110B	0.15	28.5	2.0	78.6	0.75
C110C	0.16	19.2	2.0	38.6	0.47
C114A	0.24	24.0	2.0	78.6	0.75
C115A	0.13	22.6	2.0	80.0	0.76
C115B	0.17	23.0	2.0	78.6	0.75
C117A	0.24	42.7	2.0	78.6	0.75

Area ID	Area (ha)	Width (m)	Slope (%)	% Impervious	Runoff Coefficient
C117B	0.19	24.1	2.0	78.6	0.75
C119A	0.15	16.6	2.0	90.0	0.83
C119CA	0.28	16.6	2.0	50.0	0.55
C121A	0.16	17.4	2.0	80.0	0.76
C122A	0.14	20.5	2.0	80.0	0.76
C123A	0.15	16.2	2.0	90.0	0.83
C123B	0.16	30.6	2.0	78.6	0.75
C124A	0.14	23.7	2.0	78.6	0.75
C124B	0.19	34.7	2.0	78.6	0.75
TANK-1	0.11	12.5	2.0	42.9	0.50
UNC-1	0.14	31.1	2.0	57.1	0.60
UNC-2	0.06	14.1	2.0	57.1	0.60
UNC-3	0.07	15.1	2.0	42.9	0.50

5.5.5 Hydraulic Parameters

As per the City of Ottawa Sewer Design Guidelines, 2012, Manning's roughness values of 0.013 were used for sewer modeling and overland flow corridors representing roadways.

Storm sewers were modeled to confirm flow capacities, assess hydraulic grade lines (HGLs) and to determine minor system peak outflows to the outlet. The detailed storm sewer design sheet is included in **Appendix C.1**. Exit losses at manholes were set for all pipe segments based on the flow angle through the structure. Exit losses were assigned as per City guidelines (Appendix 6b), see **Table 5.4** below.

Table 5.3: Exit Loss Coefficients for Bends at Manholes

Degrees	Coefficient
11	0.060
22	0.140
30	0.210
45	0.390
60	0.640
90	1.320
180	0.020

The table below present the parameters for the outlet and orifice link objects in the model, which represent ICDs. All IPEX tempest orifices were assigned a discharge coefficient of 0.572. It should be noted that the proposed ICDs will consist of slide type vertical circular orifices. A coefficient of 0.572 was

applied when using orifices to conform to head/discharge curves as supplied by the manufacturer for IPEX Tempest HF model ICDs.

Table 5.4: Orifice Parameters for Proposed Catchments

Orifice Name	Catchbasin ID	Tributary Area ID	Minor System Node	ICD Type
OL5	CB 103A-1	C103AA	103A	108 mm Orifice
OL13	CB 105A	C105A	105A	95 mm Orifice
OL15	CB 106A	C106A	106	83 mm Orifice
OL16	CB 107A	C107A	107	83 mm Orifice
OL17	CB 108A	C108A	108	83 mm Orifice
OL19	CB 110A	C110A	110	83 mm Orifice
OR15	CB 110A	C110A	110	83 mm Orifice
OL21	CB 110B	C110B	110	83 mm Orifice
OR14	CB 110B	C110B	110	83 mm Orifice
OL23	CB 110C	C110C	110	108 mm Orifice
OL18	CB 114A	C114A	114	95 mm Orifice
OR13	CB 114A	C114A	114	95 mm Orifice
OL22	CB 115A	C115A	115	83 mm Orifice
OR12	CB 115A	C115A	115	83 mm Orifice
OL20	CB 115B	C115B	115	83 mm Orifice
OR11	CB 115B	C115B	115	83 mm Orifice
OL12	CB 117A	C117A	117	95 mm Orifice
OR10	CB 117A	C117A	117	95 mm Orifice
OL11	CB 117B	C117B	117	83 mm Orifice
OR9	CB 117B	C117B	117	83 mm Orifice
OL2	CB 119A	C119A	119	83 mm Orifice
OR6	CB 119A	C119A	119	83 mm Orifice
OL1	CB 119C	C119C	119C	152 mm Orifice
OL9	CB 121A	C121A	121	83 mm Orifice
OR7	CB 121A	C121A	121	83 mm Orifice
OL10	CB 122A	C122A	122	83 mm Orifice
OR8	CB 122A	C122A	122	83 mm Orifice
OL3	CB 123A	C123A	123	83 mm Orifice
OR4	CB 123A	C123A	123	83 mm Orifice
OL4	CB 123B	C123B	123	83 mm Orifice
OR5	CB 123B	C123B	123	83 mm Orifice
OL7	CB 124A	C124A	124	83 mm Orifice

Orifice Name	Catchbasin ID	Tributary Area ID	Minor System Node	ICD Type
OR3	CB 124A	C124A	124	83 mm Orifice
OL8	CB 124B	C124B	124	83 mm Orifice
OR2	CB 124B	C124B	124	83 mm Orifice

5.6 Modeling Results and Discussion

The following sections summarize the key hydrologic and hydraulic model results. For detailed model results or inputs please refer to the electronic model files.

5.6.1 Proposed Inlet Control Devices

Table 5.6 summarizes the orifice link maximum flow rates and heads across the proposed development.

Table 5.5: Proposed Phase Orifice Link Results

Orifice Name	Catchbasin ID	Tributary Area ID	ICD Type	2yr Head (m)	100yr Head (m)	2yr Flow (L/s)	100yr Flow (L/s)
OL5	CB 103A-1	C103AA	108 mm Orifice	1.24	2.52	25.3	36.5
OL13	CB 105A	C105A	95 mm Orifice	1.75	2.27	23.4	26.8
OL15	CB 106A	C106A	83 mm Orifice	0.09	0.69	3.0	11.0
OL16	CB 107A	C107A	83 mm Orifice	0.6	1.42	10.3	16.1
OL17	CB 108A	C108A	83 mm Orifice	0.66	1.51	10.8	16.6
OL19	CB 110A	C110A	83 mm Orifice	1.32	1.56	15.5	16.9
OR15	CB 110A	C110A	83 mm Orifice	1.32	1.56	15.5	16.9
OL21	CB 110B	C110B	83 mm Orifice	0.86	1.53	12.4	16.7
OR14	CB 110B	C110B	83 mm Orifice	0.86	1.53	12.4	16.7
OL23	CB 110C	C110C	108 mm Orifice	0.83	1.24	13.2	19.9
OL18	CB 114A	C114A	95 mm Orifice	1.25	1.67	19.7	22.9
OR13	CB 114A	C114A	95 mm Orifice	1.25	1.67	19.7	22.9
OL22	CB 115A	C115A	83 mm Orifice	0.73	1.54	11.4	16.8
OR12	CB 115A	C115A	83 mm Orifice	0.73	1.54	11.4	16.8
OL20	CB 115B	C115B	83 mm Orifice	1.12	1.56	14.3	16.9
OR11	CB 115B	C115B	83 mm Orifice	1.12	1.56	14.3	16.9
OL12	CB 117A	C117A	95 mm Orifice	1.33	1.59	20.3	22.3
OR10	CB 117A	C117A	95 mm Orifice	1.33	1.59	20.3	22.3
OL11	CB 117B	C117B	83 mm Orifice	1.34	1.58	15.6	17.0

Orifice Name	Catchbasin ID	Tributary Area ID	ICD Type	2yr Head (m)	100yr Head (m)	2yr Flow (L/s)	100yr Flow (L/s)
OR9	CB 117B	C117B	83 mm Orifice	1.34	1.58	15.6	17.0
OL2	CB 119A	C119A	83 mm Orifice	1.03	1.44	13.6	16.2
OR6	CB 119A	C119A	83 mm Orifice	1.03	1.44	13.6	16.2
OL1	CB 119C	C119C	152 mm Orifice	0.68	1.38	28.5	46.6
OL9	CB 121A	C121A	83 mm Orifice	1.00	1.52	13.5	16.7
OR7	CB 121A	C121A	83 mm Orifice	1.00	1.52	13.5	16.7
OL10	CB 122A	C122A	83 mm Orifice	0.74	1.52	11.4	16.7
OR8	CB 122A	C122A	83 mm Orifice	0.74	1.52	11.4	16.7
OL3	CB 123A	C123A	83 mm Orifice	1.04	1.57	13.7	16.9
OR4	CB 123A	C123A	83 mm Orifice	1.04	1.57	13.7	16.9
OL4	CB 123B	C123B	83 mm Orifice	0.97	1.55	13.2	16.9
OR5	CB 123B	C123B	83 mm Orifice	0.97	1.55	13.2	16.9
OL7	CB 124A	C124A	83 mm Orifice	0.74	1.54	11.5	16.8
OR3	CB 124A	C124A	83 mm Orifice	0.74	1.54	11.5	16.8
OL8	CB 124B	C124B	83 mm Orifice	1.38	1.59	15.9	17.0
OR2	CB 124B	C124B	83 mm Orifice	1.38	1.59	15.9	17.0

5.6.2 Proposed Development Hydraulic Grade Line Analysis

The 100-year hydraulic grade line (HGL) elevation across the proposed development was estimated using the PCSWMM model for the worst-case HGL using the 3-hour Chicago storm for the 100-year runoff.

The climate change scenario was assessed using the 100-year runoff intensities (worst-case HGL) increased by 20%. **Table 5.7** presents the clearance between the proposed storm sewers worst case HGL and the nearest proposed under side of footing (USF). The storm sewer design sheet is included in **Appendix C.1**.

Table 5.6: Worst-Case 100-Year HGL Results

STM MH	USF (m)	100-Year, 3hr Chicago Storm		100-year+20%, 3hr Chicago Storm	
		HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
100	88.02	86.25	1.77	86.26	1.76
100A	88.02	86.15	1.87	86.16	1.86
100B	88.02	86.03	1.99	86.04	1.98

STM MH	USF (m)	100-Year, 3hr Chicago Storm		100-year+20%, 3hr Chicago Storm	
		HGL (m)	Clearance (m)	HGL (m)	Clearance (m)
101	88.02	86.31	1.71	86.31	1.71
102	88.02	86.43	1.59	86.44	1.58
103	88.02	86.48	1.54	86.48	1.54
104	88.14	86.55	1.59	86.56	1.58
105	87.55	86.62	0.93	86.63	0.92
106	87.55	86.72	0.83	86.73	0.82
107	87.61	86.77	0.84	86.78	0.83
108	88.33	86.93	1.40	86.93	1.40
109	87.61	86.86	0.75	86.87	0.74
110	87.64	87.01	0.63	87.01	0.63
111	87.75	87.13	0.62	87.13	0.62
112	87.75	86.86	0.89	86.86	0.89
113	87.55	86.92	0.63	86.93	0.62
114	87.61	87.19	0.42	87.19	0.42
115	87.75	87.30	0.45	87.30	0.45
116	87.55	86.69	0.86	86.69	0.86
117	87.59	87.11	0.48	87.11	0.48
118	88.21	86.44	1.77	86.44	1.77
119	88.06	86.71	1.35	86.72	1.34
119A	88.06	86.84	1.22	86.84	1.22
120	87.82	86.89	0.93	86.90	0.92
121	87.76	87.00	0.76	87.01	0.75
122	87.76	87.18	0.58	87.18	0.58
123	87.78	87.14	0.64	87.14	0.64
124	87.78	87.31	0.47	87.32	0.46

The model results indicate that there is sufficient clearance between the worst-case HGL and the proposed USFs within Blocks 22-23. Detailed grading of the site has been completed to ensure that the maximum hydraulic grade line is kept at least 0.30 m below the underside-of-footing (USF) of the adjacent units connected to the storm sewer during the worst case 100-year storm event and below proposed basement elevations during the ‘climate change’ event.

5.6.3 Overland Flow

Table 5.8 presents the maximum total surface water depths (static ponding depth + dynamic flow) above the top-of-grate of the proposed catch basins for the 100-year, 3-hr Chicago storm and the 'climate change' storm. Based on the model results, the total ponding depth (static + dynamic) does not exceed the required 0.35 m maximum during the 100-year event.

Table 5.7: Proposed Maximum Static and Dynamic Surface Water Depths

Storage node ID	Structure ID	Top of Grate Elevation (m)	2-year, 3-hour Chicago		100-year, 3-hour Chicago		100-year, 3-hour Chicago+20%	
			Max HGL (m)	Total Surface Water Depth (m)	Max HGL (m)	Total Surface Water Depth (m)	Max HGL (m)	Total Surface Water Depth (m)
CB103A1	CB 103A-1	89.39	88.16	-	89.44	0.05	89.46	0.07
CB105A1	CB 105A	89.32	88.94	-	89.46	0.14	89.47	0.15
CB106A	CB 106A	89.48	88.19	-	88.79	0.00	89.28	0.00
CB107A	CB 107A	89.76	88.97	-	89.79	0.03	89.80	0.04
CB108A	CB 108A	89.02	87.66	-	88.51	0.00	88.52	0.00
CB110A	CB 110A	89.63	89.57	-	89.81	0.18	89.84	0.21
CB110B	CB 110B	89.54	89.02	-	89.69	0.15	89.71	0.17
CB110C	CB 110C	89.16	88.10	-	88.51	0.00	88.52	0.00
CB114A	CB 114A	89.47	89.17	-	89.59	0.12	89.64	0.17
CB115A	CB 115A	89.51	88.86	-	89.67	0.16	89.71	0.20
CB115B	CB 115B	89.46	89.20	-	89.64	0.18	89.70	0.24
CB117A	CB 117A	89.26	89.21	-	89.47	0.21	89.55	0.29
CB117B	CB 117B	89.38	89.34	-	89.58	0.20	89.62	0.24
CB119A	CB 119A	89.73	89.38	-	89.79	0.06	89.79	0.06
CB119C	CBMH 119C	88.05	87.16	-	87.86	0.00	87.87	0.00
CB121A	CB 121A	89.56	89.18	-	89.70	0.14	89.71	0.15
CB122A	CB 122A	89.49	88.85	-	89.63	0.14	89.65	0.16
CB123A	CB 123A	89.46	89.12	-	89.65	0.19	89.66	0.20
CB123B	CB 123B	89.46	89.05	-	89.63	0.17	89.67	0.21
CB124A	CB 124A	89.44	88.80	-	89.60	0.16	89.64	0.20
CB124B	CB 124B	89.41	89.41	-	89.62	0.21	89.65	0.24

5.6.4 Results

The following section summarizes the key hydrologic and hydraulic model results for the proposed site. For detailed model results or inputs please refer to the example input file in **Appendix C.2** and the electronic model files.

Table 5.8: Target and Resultant Major and Minor System Release Rates

Storm event	Minor System (L/s)	Major System (L/s)	Total Proposed (L/s)	Total Allowable (L/s)
2-year, 3-hour Chicago	506	-	506	637
5-year, 3-hour Chicago	626	-	626	637
100-year, 3-hour Chicago	685	286	971	1178
100-year, 3-hour Chicago+20%	703	423	1126	1460

5.6.5 Low Impact Development (LID) Practices

The water balance and erosion control targets for the site (retention of 4mm of runoff as defined by background reports) are proposed to be met via retention within a proposed Cultec underground storage system. Table 35 of the former CFB Rockcliffe Stormwater Management Existing Conditions & LID Pilot Project Scoping Report by Aquafor Beech specifies design targets at the LIDs to infiltrate the equivalent volume of a 4 mm event applied to the total development area.

Upon collection from the site within roadway/rear yard catch basins, captured stormwater from the development is directed into the underground storage and allowed to infiltrate into the surrounding soil. A bypass pipe for direct discharge into the existing storm manhole in the future Codd's Road extension has been provided for captured outflow that exceeds the storage capacity of the proposed Cultec unit.

A 4 mm storm event scenario was set up within the supplied PCSWMM model iteratively to size the underground storage unit to ensure no flows exist from the bypass pipe or relief sewer provided at the top of the storage system. This volume was determined to be approximately 66m^3.

Supporting geotechnical studies have identified unfactored infiltration rates between 50-100 mm/hr for the region encompassing the proposed storage and infiltration unit, with seasonal groundwater elevations ranging from 83-83.5m. The proposed system is to maintain a bottom elevation of 95.0m, and a ground surface area of approximately 117m2.

Based on Equation 4.3 from the MECP Stormwater Design Manual and using a porosity of 0.4 for the clear stone layer and a factored infiltration rate of 30mm/hr (average rate of 75mm/hr / 2.5 reduction factor), the estimated drawdown time from the tank is approximately 47 hours.

5.6.6 Water Quality Control

Runoff from the development site will be conveyed to the Eastern Stormwater Management Facility (Eastern Pond) through the proposed 1200 mm diameter concrete storm sewer flowing east to west through the future Codd's Road extension and Kishkaika Park. Per the background Design Brief, the pond will provide an enhanced level of protection for the noted site. As the site was initially assumed to be at an overall 86% imperviousness level (currently modeled at roughly 73%), runoff from the development block is not assumed to have deleterious effects on downstream systems as noted within the 2025 Design Brief.

6 Grading

The proposed Block 23 development site measures approximately 3.69 ha in area. The topography across the site under existing conditions slopes towards the northwest corner of the site in the direction of the Eastern Stormwater Management Pond and the Rockcliffe Parkway.

A detailed grading plan (**Drawing GP-1**) has been provided to satisfy the stormwater management requirements, adhere to any geotechnical restrictions for the site, and provide for minimum cover requirements for storm and sanitary sewers where possible. Site grading has been established to provide emergency overland flow routes required for stormwater management in accordance with City of Ottawa requirements.

The subject site maintains emergency overland flow routes for flows deriving from storm events in excess of the maximum design event to Codd's Road.

7 Utilities

As the subject site lies within a residential development community, Hydro, Bell, Gas, and Cable servicing for the proposed site will be readily available within subsurface infrastructure within the neighbouring rights-of-way. Exact size, location and routing of hydro utilities will be finalized after design circulation.

8 Approvals

An Ontario Ministry of Environment, Conservation, and Parks (MECP) Environmental Compliance Approval (ECA), under the *Ontario Water Resources Act* is not required for the proposed site, as the quality control for the site is accomplished in the Eastern Pond (ECA No. 0824-A8CR5H) and that the proposed works are anticipated to be under single ownership and draining to a municipal separated sewer.

A Ministry of Environment Conservation and Parks (MECP) Permit to Take Water (PTTW) or reporting on the Environmental Activity and Sector Registry (EASR) for construction excavations may be required for the site as some of the proposed works may be below the groundwater elevation shown in the geotechnical report. The geotechnical investigation report has confirmed that the PTTW may be required if more than 400,000 L/day of ground and/or surface water are to be pumped during the construction phase. For ground or surface water volumes pumped at between 50,000 to 400,000 L/day during construction, it is required to register on the EASR.

9 Erosion and Sediment Control During Construction

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

1. Implement best management practices to provide appropriate protection of the existing and proposed drainage system and the receiving water course(s).
2. Limit the extent of the exposed soils at any given time.
3. Re-vegetate exposed areas as soon as possible.
4. Minimize the area to be cleared and grubbed.
5. Protect exposed slopes with geotextiles, geogrid, or synthetic mulches.
6. Install silt barriers/fencing around the perimeter of the site as indicated in **Drawing ECDS-1** to prevent the migration of sediment offsite.
7. Install trackout control mats (mud mats) at the entrance/egress to prevent migration of sediment into the public ROW.
8. Provide sediment traps and basins during dewatering works.
9. Install sediment traps (such as SiltSack® by Terrafix) between catch basins and frames.
10. Schedule the construction works at times which avoid flooding due to seasonal rains.

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

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

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

10 Geotechnical Investigation

A geotechnical investigation for the development was completed by Paterson Group Inc. in December 2024. The report summarizes the existing soil conditions within Phases 6, 7, and 8 of the subdivision and construction recommendations. For details which are not summarized below, please see the Paterson report and memo included in the submission package.

Subsurface soil conditions within the study area were determined through field investigations conducted from October 12, 2022, to November 9, 2022, in addition to supplemental field programs carried out from April 12, 2023, to April 14, 2023, December 21, 2023, and the previous investigations, completed by others within the subdivision between 2013 and 2014. In total, sixty-nine (69) boreholes were drilled in the 2022 investigation, in addition to the thirteen (13) boreholes that were drilled in the April 2023 field program and the nine (9) test pits advanced in the December 2023 field program.

In general, soil stratigraphy consisted of fill underlain by silty sand, silty clay, glacial till, and/or bedrock surface. Bedrock was estimated to occur between depths of 1 to 4 m. Based on moisture levels and colour of the recovered soil samples, the long-term groundwater table is expected to be at a geodetic elevation of around 78.6 to 90.3 m, though as groundwater levels fluctuate seasonally, they could vary at the time of construction.

Based on the observed soil conditions, the site is deemed suitable for the proposed development. The buildings are anticipated to be founded over conventional shallow footings placed on an undisturbed very stiff to stiff brown silty clay, compact to dense silty sand, compact to very dense glacial till, or clean, surface-sounded bedrock bearing surface. No permissible grade raise restriction nor tree planting setback limits foundation walls at adjacent buildings with USFs with at least 2.1 m of cover applies to the Blocks 22 and 23 site.

The recommended rigid pavement structure is further presented in **Table 10.1**.

Table 10.1: Recommended Pavement Structure

Material	Driveways and Car-only Parking Areas	Local Residential Roadways
Wear Course – HL-3 or Superpave 12.5 Asphaltic Concrete	50 mm	40 mm
Binder Course – HL-8 or Superpave 19.0 Asphaltic Concrete	-	50 mm
BASE – OPSS Granular A Crushed Stone	150 mm	
SUBBASE – OPSS Granular B Type II	300 mm	400 mm

11 Conclusion

Based on the preceding information, the following conclusions are summarized below:

11.1 Potable Water Analysis

Based on the findings of the report, operating pressures for watermains within the proposed development are expected to meet City of Ottawa standards under typical demand conditions (peak hour and average day conditions).

The results indicate that sufficient fire flows are available within the proposed watermain network under emergency fire demand conditions (maximum day + fire flow) while meeting the minimum pressure requirements as per City of Ottawa standards.

11.2 Wastewater Servicing

Block 23 will be serviced by a network of gravity sewers which will direct wastewater flows to sanitary sewers within the Codd's Road extension. The receiving sewer system has sufficient available capacity to receive the design flows. Design guidelines for slope and velocity have been met within the proposed sewers.

11.3 Stormwater Management

- The proposed stormwater management plan complies with the goals specified in the background reports and the 2025 City of Ottawa Sewer Design Guidelines.
- Underground storage is proposed to allow for detention and infiltration of the 4 mm storm event.
- All dynamic surface water depths are to be less than 0.35 m during all storm events up to the 100-year storm event.
- The storm sewer hydraulic grade line will be maintained at least 0.30 m below the underside of footing in the subdivision during design storm events.
- Minor system peak flows from the proposed site will be directed to the receiving sewer in Codd's Road and will ultimately discharge into the outlet at the Eastern Stormwater Management Pond.

11.4 Grading

A grading plan has been prepared to account for the required overland flow conveyance, cover over sewers, hydraulic grade line requirements, and grade raise restrictions as identified in the geotechnical investigation.

11.5 Utilities

Electrical, gas, cable, and telephone infrastructure exist within the Wateridge subdivision development and has been designed by their respective utility providers to service the site plan blocks. Private utility servicing for Block 23 will be designed by the respective utilities.

Appendices

Appendix A Water Servicing

A.1 Domestic Water Demands

Wateridge Subdivision Block 23 - Domestic Water Demand Estimates

Site Plan provided by Korsiak Urban Planning (2026-02-11)

Project No. 160402276 Designed by: MW

Date: 2026-02-19 Checked by:

Revision: 01 City File No.: PC2025-0305

Population densities per Table 4.1 City of Ottawa Water Design Guidelines:		
Townhomes	2.7	ppu
Demand conversion factors per Table 4.2 of the City of Ottawa Water Design Guidelines and Technical Bulletin ISTB-2021-03:		
Residential	280	L/cap/day

Townhouse Types	No. of Units	Population	Avg Day Demand		Max Day Demand [1]		Peak Hour Demand [1]	
			(L/min)	(L/s)	(L/min)	(L/s)	(L/min)	(L/s)
Row	91	246	47.8	0.8	119.4	2.0	262.8	4.4
Back-to-Back	94	254	49.4	0.8	123.4	2.1	271.4	4.5
Total Site:	**185**	**500**	**97.1**	**1.6**	**242.8**	**4.0**	**534.2**	**8.9**

1 The City of Ottawa water demand criteria used to estimate peak demand rates for residential areas are as follows:

maximum day demand rate = 2.5 x average day demand rate

peak hour demand rate = 2.2 x maximum day demand rate (as per Technical Bulletin ISD-2010-02)

A.2 Fire Flow Demands (2020 FUS)

Stantec

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402276
Project Name: Wateridge Block 23
Date: 2026-02-19
Fire Flow Calculation #: 1
Description: 8-unit back-to-back townhouse

Notes: Building footprint of 488 m², per site plan provided by Korsiak Urban Planning, dated Feb 11, 2026. Firewall to split block into two 4-unit clusters and reduce footprint to 244 m².

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction										1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas										NO	-
		244	244	244								732	-
3	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min										-	9000
4	Determine Occupancy Charge	Limited Combustible										-15%	7650
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?				-	-
		North	0 to 3	18	3	41-60	Type V	YES				0%	2984
		East	10.1 to 20	13	3	21-49	Type V	NO				11%	
		South	3.1 to 10	18	3	41-60	Type V	NO				17%	
		West	10.1 to 20	13	2	21-49	Type V	NO				11%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											11000
		Total Required Fire Flow in L/s											183.3
		Required Duration of Fire Flow (hrs)											2.00
		Required Volume of Fire Flow (m^3)											1320

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402276
Project Name: Wateridge Block 23
Date: 2026-02-19
Fire Flow Calculation #: 2
Description: 12-unit back-to-back townhouse

Notes: Building footprint of 707 m², per site plan provided by Korsiak Urban Planning, dated Feb 11, 2026. Firewall to split block into two 6-unit clusters and reduce footprint to 354 m².

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction										1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas										NO	-
		354	354	354								1061	-
3	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min										-	11000
4	Determine Occupancy Charge	Limited Combustible										-15%	9350
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?				-	-
		North	0 to 3	18	3	41-60	Type V	YES				0%	3834
		East	10.1 to 20	19	3	41-60	Type V	NO				12%	
		South	3.1 to 10	18	3	41-60	Type V	NO				17%	
		West	10.1 to 20	19	3	41-60	Type V	NO				12%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											13000
		Total Required Fire Flow in L/s											216.7
		Required Duration of Fire Flow (hrs)											2.50
		Required Volume of Fire Flow (m^3)											1950

Stantec

FUS Fire Flow Calculation Sheet - 2020 FUS Guidelines

Stantec Project #: 160402276
Project Name: Wateridge Block 23
Date: 2026-02-19
Fire Flow Calculation #: 13
Description: 14-unit back-to-back townhouse

Notes: Building footprint of 834 m², per site plan provided by Korsiak Urban Planning, dated Feb 11, 2026. Firewall to split block into 6-unit and 8-unit clusters and reduce footprint to 463 m².

Step	Task	Notes										Value Used	Req'd Fire Flow (L/min)
1	Determine Type of Construction	Type V - Wood Frame / Type IV-D - Mass Timber Construction										1.5	-
2	Determine Effective Floor Area	Sum of All Floor Areas										NO	-
		463	463	463								1389	-
3	Determine Required Fire Flow	($F = 220 \times C \times A^{1/2}$). Round to nearest 1000 L/min										-	12000
4	Determine Occupancy Charge	Limited Combustible										-15%	10200
5	Determine Sprinkler Reduction	None										0%	0
		Non-Standard Water Supply or N/A										0%	
		Not Fully Supervised or N/A										0%	
		% Coverage of Sprinkler System										0%	
6	Determine Increase for Exposures (Max. 75%)	Direction	Exposure Distance (m)	Exposed Length (m)	Exposed Height (Stories)	Length-Height Factor (m x stories)	Construction of Adjacent Wall	Firewall / Sprinklered ?				-	-
		North	3.1 to 10	18	3	41-60	Type V	NO				17%	4386
		East	10.1 to 20	26	3	61-80	Type V	NO				13%	
		South	0 to 3	18	3	41-60	Type V	YES				0%	
		West	10.1 to 20	26	3	61-80	Type V	NO				13%	
7	Determine Final Required Fire Flow	Total Required Fire Flow in L/min, Rounded to Nearest 1000L/min											15000
		Total Required Fire Flow in L/s											250.0
		Required Duration of Fire Flow (hrs)											3.00
		Required Volume of Fire Flow (m^3)											2700

A.3 Hydraulic Boundary Conditions

Canada Lands Company

Design Brief

Wateridge Village at Rockcliffe Phases 6 and 7

August 2025

Minimum Pressure	Minimum system pressure under peak hour demand conditions shall not be less than 276 kPa (40 psi)
Fire Flow	During the period of maximum day demand, the system pressure shall not be less than 138 kPa (20 psi) during a fire flow event.
Maximum Pressure	Maximum pressure at any point in the distribution system shall not exceed 689 kPa (100 psi). In accordance with the Ontario Building/Plumbing Code, the maximum pressure should not exceed 552 kPa (80 psi). Pressure reduction controls may be required for buildings where it is not possible/feasible to maintain the system pressure below 552 kPa.

2.3.3 Fire Flow Rate

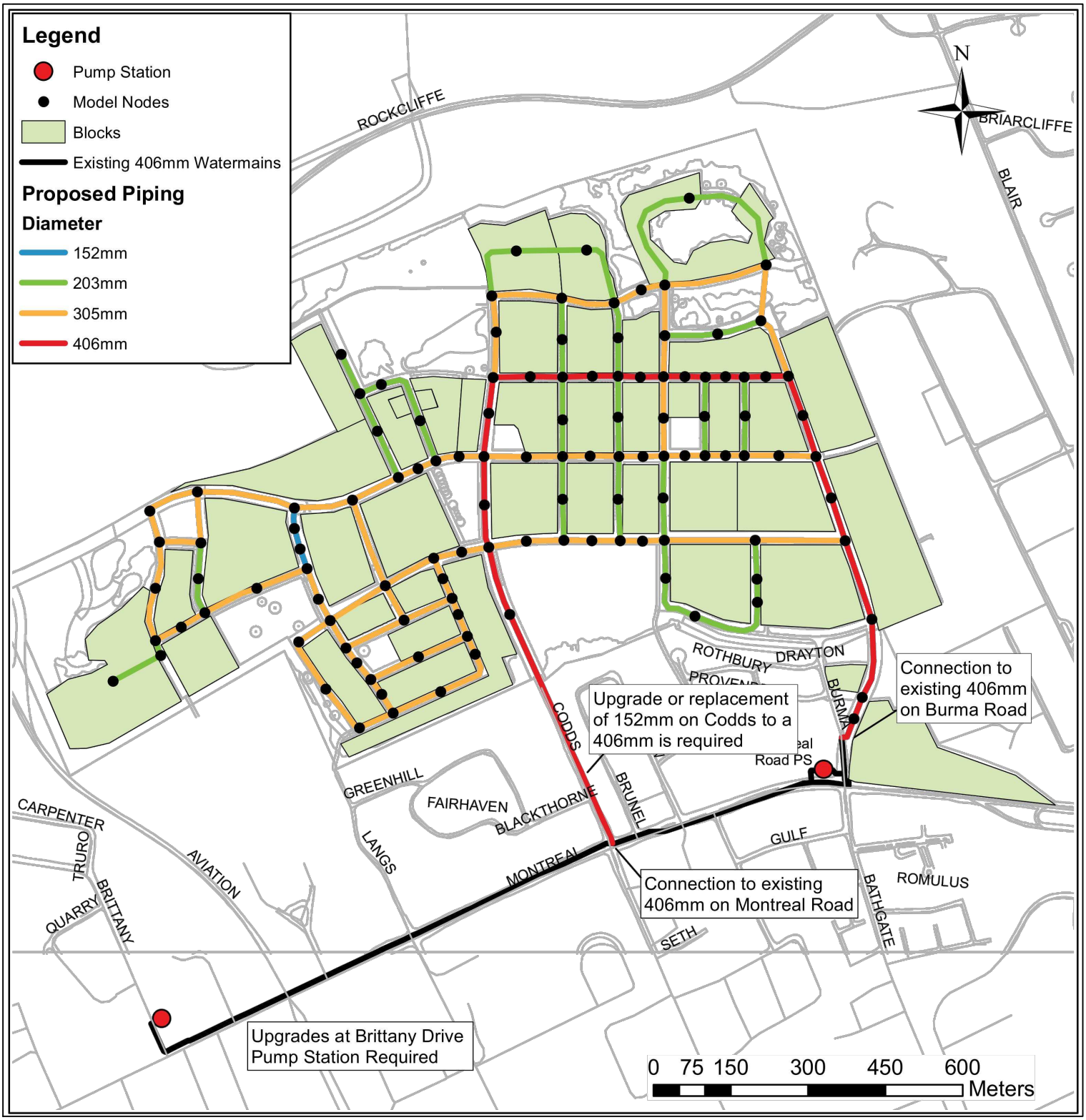
Fire flow calculations have been conducted using the Fire Underwriters Survey (FUS) method for representative buildings shown on the conceptual site plan. A calculation was performed for a townhouse on Block 10 and 31, a 8-storey mixed-use building on Block 30, a 8-storey mixed-use building on Block 29, a 9-storey apartment building on Block 35, a 9-storey apartment building on Block 34, a townhouse on Block 35/44, and a townhouse in Phase 8. Results of the analysis result in fire flows of 216.7 l/s, 200.0 l/s, 150.0 l/s, 150.0 l/s, 183.3 l/s, 166.7 l/s, and 216.7 l/s respectively. To be conservative, a fire flow demand of 250.0 l/s has been added to all the nodes in the InfoWater model. A copy of the FUS calculations is included in **Appendix B**.

2.3.4 Boundary Conditions

The City of Ottawa has provided hydraulic boundary conditions on Tawadina Road for the five watermain connections to Phases 6 and 7.

A copy of the updated boundary conditions contained in a February 18, 2025 email is included in **Appendix B** and summarized as follows:

	Connection 1	Connection 2	Connection 3	Connection 4	Connection 5
Min HGL (m)	143.0	143.0	143.0	143.0	143.0
Max HGL (m)	143.6	143.6	143.6	143.6	143.6
Max Day + FF (150 L/s)	141.7	139.2	139.2	141.7	141.7
Max Day + FF (183.3 L/s)	141.2	137.6	137.6	141.2	141.2
Max Day + FF (216.7 L/s)	140.7	135.7	135.7	140.6	140.6
Max Day + FF (250 L/s)	140.0	133.7	133.7	139.9	140.0



J:\32952-RockcliffeRedev\5.9 Drawings\59civil\current\Report Figures\MSS 2015\Section 4\FIGURE4.4 Proposed Pipe alignment and Diameters-REV.dwg Layout Name: FIGURE4.4

Stantec

IBI

Project Title	Drawing Title	Sheet No.
FORMER CFB ROCKCLIFFE MASTER SERVICING STUDY	PROPOSED PIPE ALIGNMENT AND DIAMETERS	FIGURE 4.4

Labadie, Sam

From: Whelan, Amy <amy.whelan@ottawa.ca>
Sent: February 18, 2025 1:30 PM
To: Labadie, Sam
Cc: Moffatt, Jim; O'Connell, Erin; Taylor Marquis
Subject: RE: Wateridge Phase 6-7 Registration Comments on December 20th submission
Attachments: Wateridge Development Phase 6, 7 and 8 February 2025.pdf; RE: Wateridge Phases 6 and 7 - Boundary Condition Request

Follow Up Flag: Follow up
Flag Status: Completed

Good afternoon Sam,

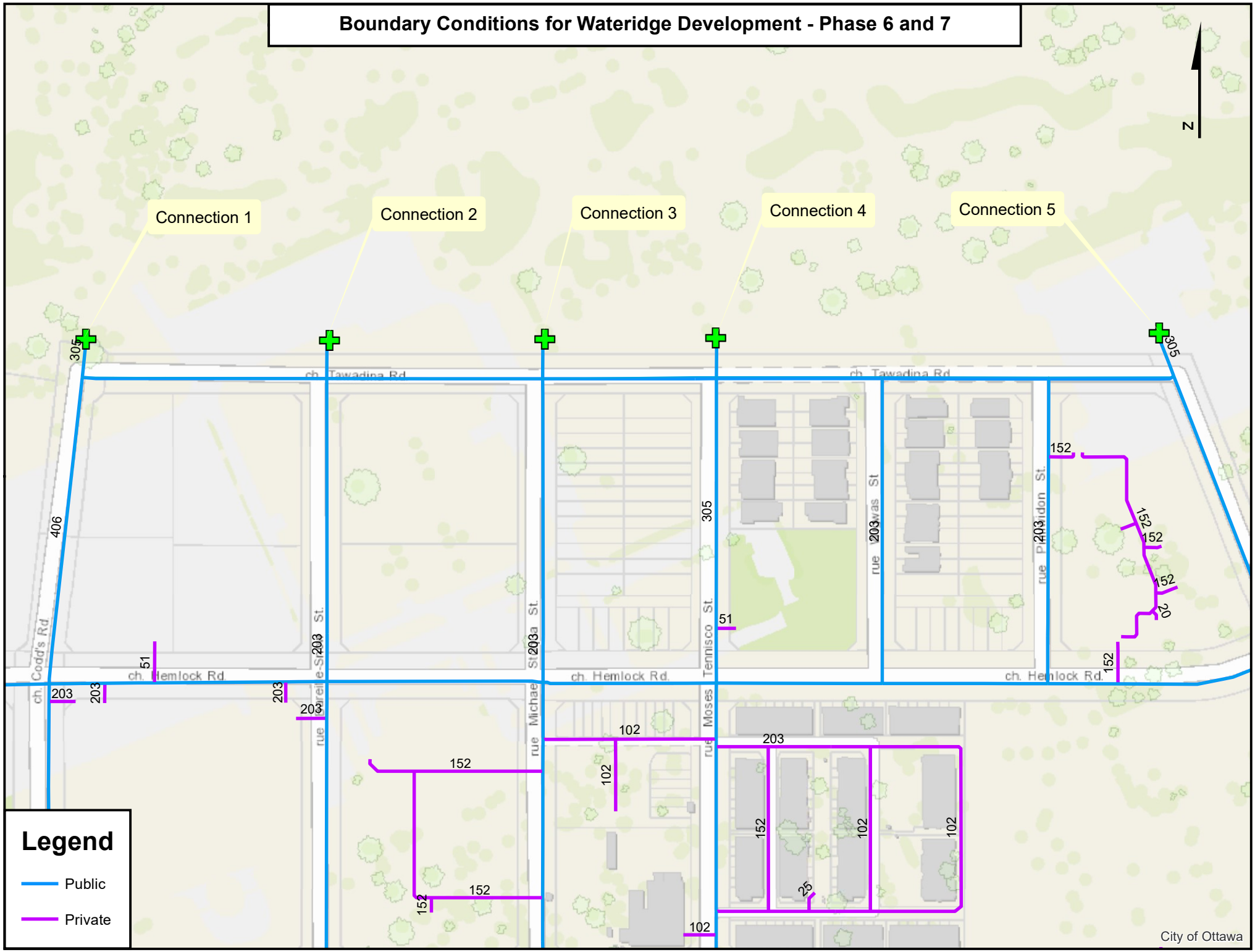
Please add the not that a cap is to be installed on the temporary outlet.

Additionally, please find the boundary condition request results below, initial request email attached for consistency:

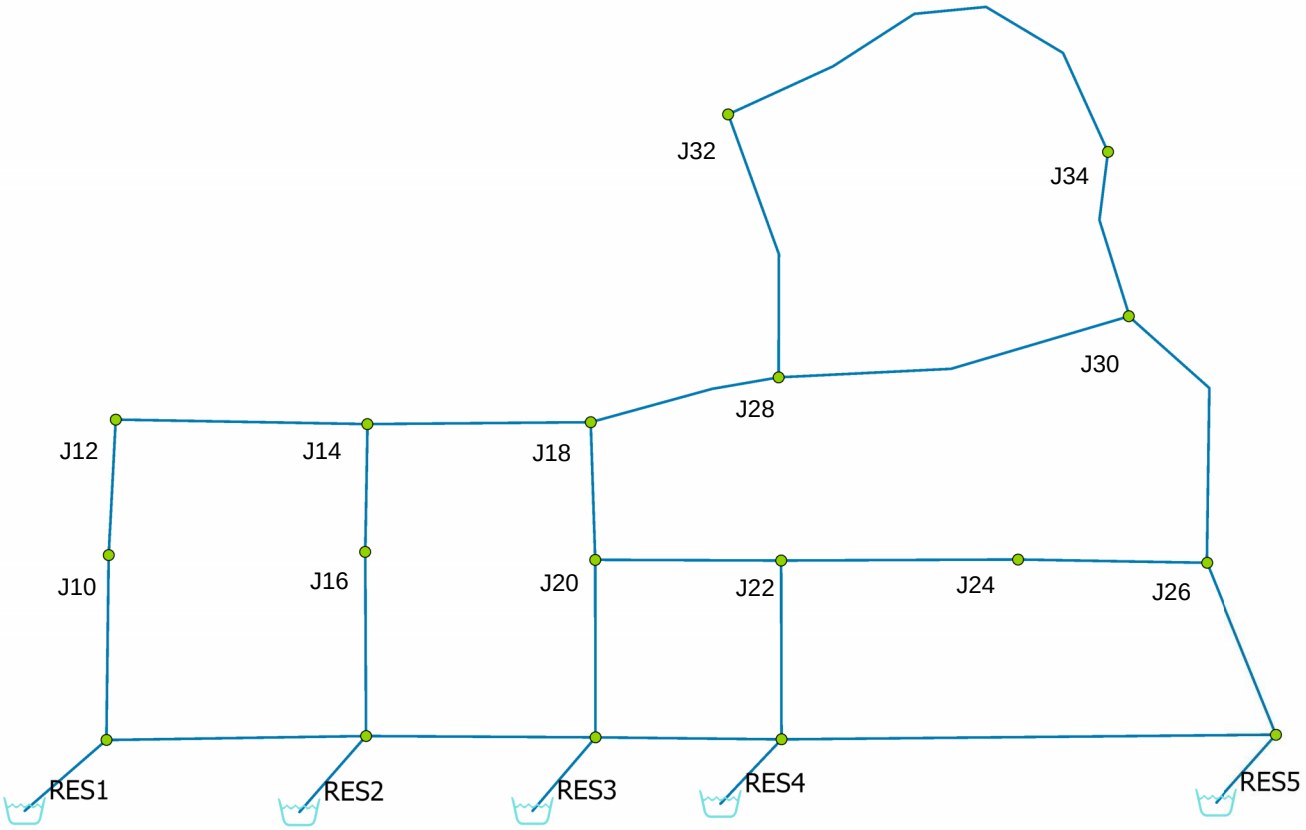
******The following information may be passed on to the consultant, but do NOT forward this e-mail directly.******
The following are boundary conditions, HGL, for hydraulic analysis for Wateridge Development Phase 6, 7 and 8, (zone MONT) assumed to be connected to the public watermain at locations shown on the attached PDF figure.

	Connection 1 305mm on Codd's Rd	Connection 2 203mm on Bareille-Snow	Connection 3 203mm on Codd's Rd	Connection 4 305mm on Moses Tennisco	Connection 5 305mm on Wanaki Rd
Min HGL (m)	143.0	143.0	143.0	143.0	143.0
Max HGL (m)	143.6	143.6	143.6	143.6	143.6
Max Day + FF (150 L/s)	141.7	139.2	139.2	141.7	141.7
Max Day + FF (183.3 L/s)	141.2	137.6	137.6	141.2	141.2
Max Day + FF (216.7 L/s)	140.7	135.7	135.7	140.6	140.6
Max Day + FF (250 L/s)	140.0	133.7	133.7	139.9	140.0

Boundary Conditions for Wateridge Development - Phase 6 and 7

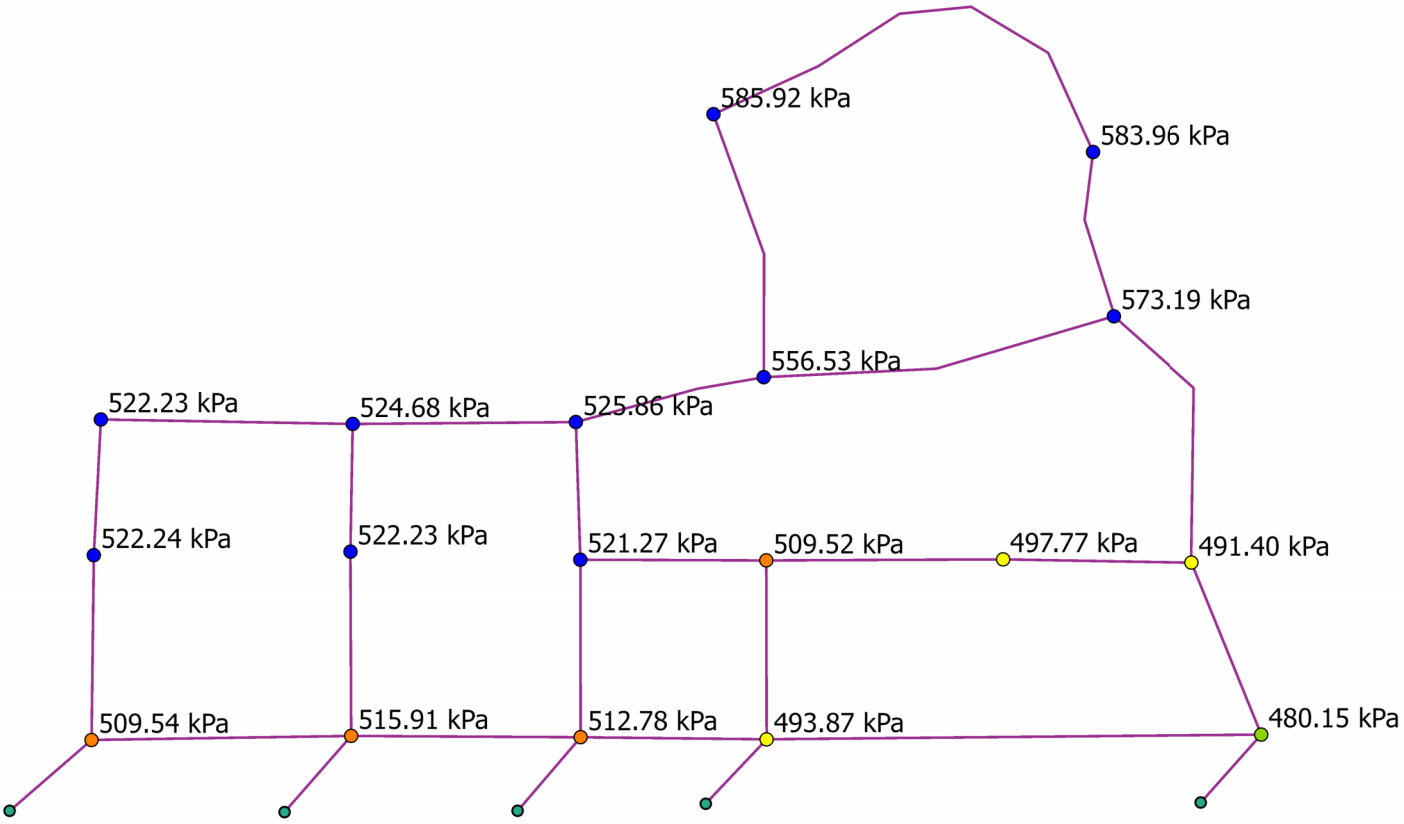


Node IDs


J32
J34
J30
J28
J12
J14
J18
J10
J16
J20
J22
J24
J26
RES1
RES2
RES3
RES4
RES5

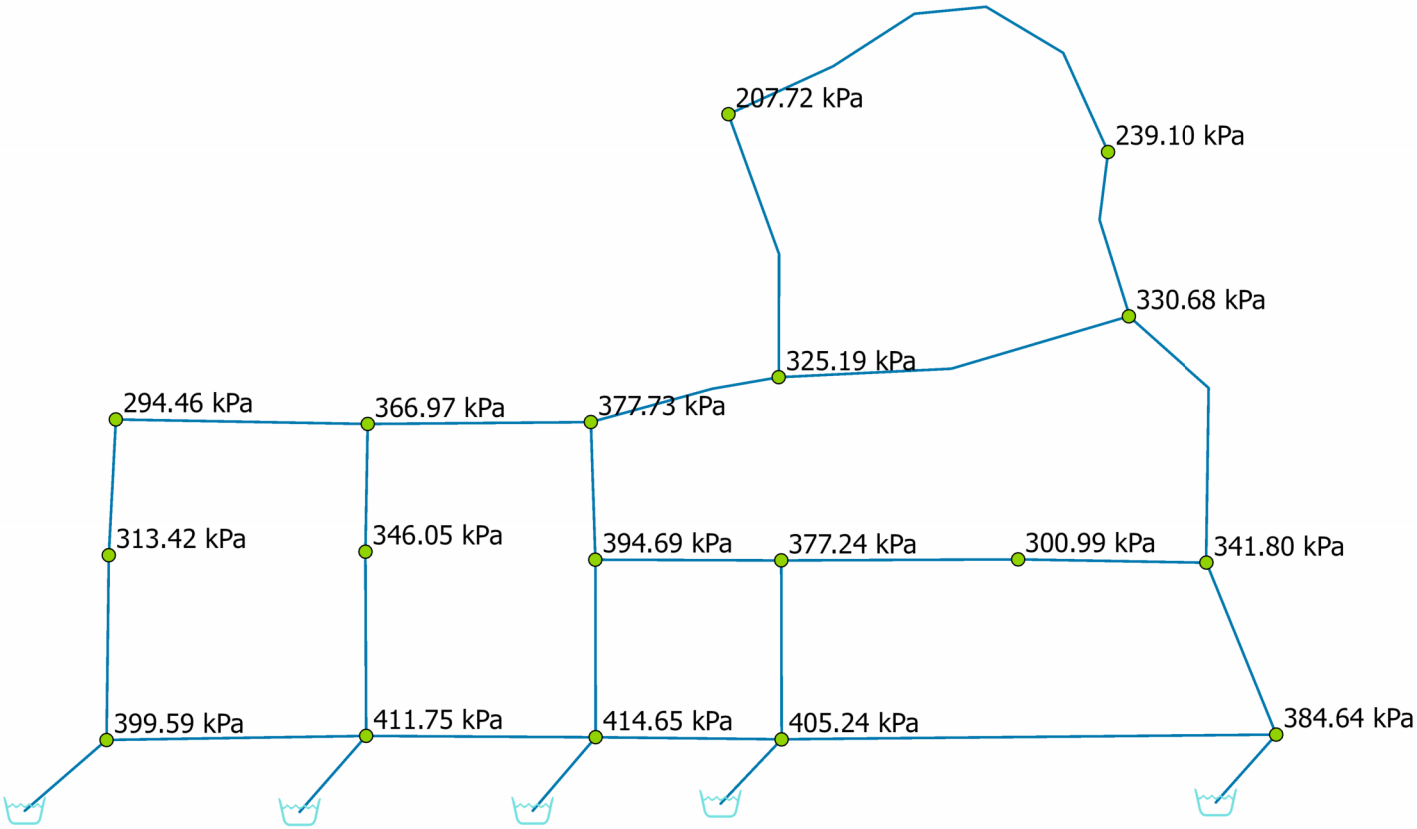
Average Day

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	☐	CONN1	0.00	91.00	143.00	509.54
2	☐	CONN2	0.00	90.35	143.00	515.91
3	☐	CONN3	0.00	90.67	143.00	512.78
4	☐	CONN4	0.00	92.60	143.00	493.87
5	☐	CONN5	0.00	94.00	143.00	480.15
6	☐	J10	1.16	89.70	142.99	522.24
7	☐	J12	1.13	89.70	142.99	522.23
8	☐	J14	0.00	89.45	142.99	524.68
9	☐	J16	2.30	89.70	142.99	522.23
10	☐	J18	1.04	89.33	142.99	525.86
11	☐	J20	1.19	89.80	143.00	521.27
12	☐	J22	0.37	91.00	143.00	509.52
13	☐	J24	0.00	92.20	143.00	497.77
14	☐	J26	0.17	92.85	143.00	491.40
15	☐	J28	0.65	86.20	142.99	556.53
16	☐	J30	0.00	84.50	142.99	573.19
17	☐	J32	0.78	83.20	142.99	585.92
18	☐	J34	0.48	83.40	142.99	583.96


585.92 kPa
583.96 kPa
573.19 kPa
556.53 kPa
522.23 kPa
524.68 kPa
525.86 kPa
522.24 kPa
522.23 kPa
521.27 kPa
509.52 kPa
497.77 kPa
491.40 kPa
509.54 kPa
515.91 kPa
512.78 kPa
493.87 kPa
480.15 kPa

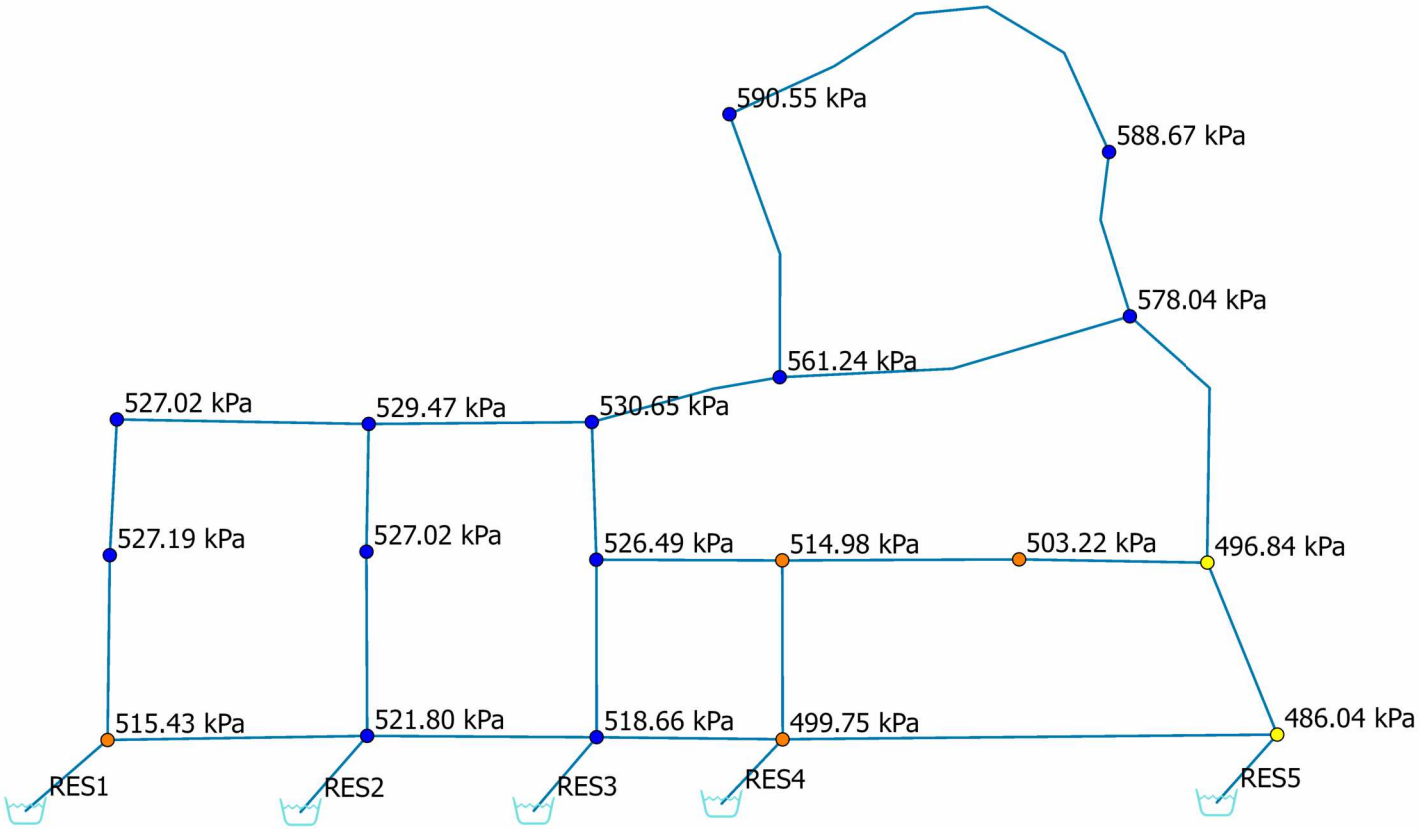
Fireflow - 15000 L/min

		ID	Static Demand (L/s)	Static Pressure (kPa)	Static Head (m)	Fire-Flow Demand (L/s)	Residual Pressure (kPa)	Hydrant Available Flow (L/s)	Hydrant Pressure at Available Flow (kPa)
1	☐	CONN1	0.00	461.60	138.11	250.00	399.59	666.63	149.96
2	☐	CONN2	0.00	447.64	136.03	250.00	411.75	875.37	149.96
3	☐	CONN3	0.00	445.64	136.15	250.00	414.65	970.98	149.96
4	☐	CONN4	0.00	449.66	138.49	250.00	405.24	907.26	149.96
5	☐	CONN5	0.00	442.14	139.12	250.00	384.64	677.95	149.96
6	☐	J10	2.91	469.92	137.65	250.00	313.42	385.35	149.96
7	☐	J12	2.81	467.27	137.38	250.00	294.46	362.42	149.96
8	☐	J14	0.00	465.85	136.99	250.00	366.97	500.35	149.96
9	☐	J16	5.73	458.73	136.51	250.00	346.05	455.76	149.96
10	☐	J18	2.61	468.31	137.12	250.00	377.73	532.79	149.96
11	☐	J20	2.97	463.56	137.11	250.00	394.69	627.02	149.96
12	☐	J22	0.92	460.79	138.02	250.00	377.24	567.81	149.96
13	☐	J24	0.00	450.40	138.16	250.00	300.99	377.30	149.96
14	☐	J26	0.42	445.12	138.27	250.00	341.80	470.73	149.96
15	☐	J28	1.63	501.67	137.39	250.00	325.19	374.44	149.96
16	☐	J30	0.00	521.09	137.68	250.00	330.68	367.48	149.96
17	☐	J32	1.96	531.62	137.45	250.00	207.72	276.26	149.96
18	☐	J34	1.20	531.19	137.61	250.00	239.10	292.01	149.96


207.72 kPa
239.10 kPa
330.68 kPa
325.19 kPa
294.46 kPa
366.97 kPa
377.73 kPa
313.42 kPa
346.05 kPa
394.69 kPa
377.24 kPa
300.99 kPa
341.80 kPa
399.59 kPa
411.75 kPa
414.65 kPa
405.24 kPa
384.64 kPa

Peak Hour

		ID	Demand (L/s)	Elevation (m)	Head (m)	Pressure (kPa)
1	☐	CONN1	0.00	91.00	143.60	515.43
2	☐	CONN2	0.00	90.35	143.60	521.80
3	☐	CONN3	0.00	90.67	143.60	518.66
4	☐	CONN4	0.00	92.60	143.60	499.75
5	☐	CONN5	0.00	94.00	143.60	486.04
6	☐	J10	6.36	89.70	143.50	527.19
7	☐	J12	6.19	89.70	143.48	527.02
8	☐	J14	0.00	89.45	143.48	529.47
9	☐	J16	12.58	89.70	143.48	527.02
10	☐	J18	5.74	89.33	143.48	530.65
11	☐	J20	6.53	89.80	143.53	526.49
12	☐	J22	2.02	91.00	143.55	514.98
13	☐	J24	0.00	92.20	143.55	503.22
14	☐	J26	0.91	92.85	143.55	496.84
15	☐	J28	3.59	86.20	143.47	561.24
16	☐	J30	0.00	84.50	143.49	578.04
17	☐	J32	4.32	83.20	143.47	590.55
18	☐	J34	2.65	83.40	143.47	588.67


590.55 kPa
588.67 kPa
578.04 kPa
561.24 kPa
527.02 kPa
529.47 kPa
530.65 kPa
527.19 kPa
527.02 kPa
526.49 kPa
514.98 kPa
503.22 kPa
496.84 kPa
515.43 kPa
521.80 kPa
518.66 kPa
499.75 kPa
486.04 kPa
RES1
RES2
RES3
RES4
RES5

A.4 Hydrant Coverage Table

Stantec	Project: **Wateridge Block 23**	160402276
	TABLE 1: FIRE HYDRANT COVERAGE TABLE	
	Revision: 01	Prepared By: MW
	Revision Date: 2026-03-20	Checked By:

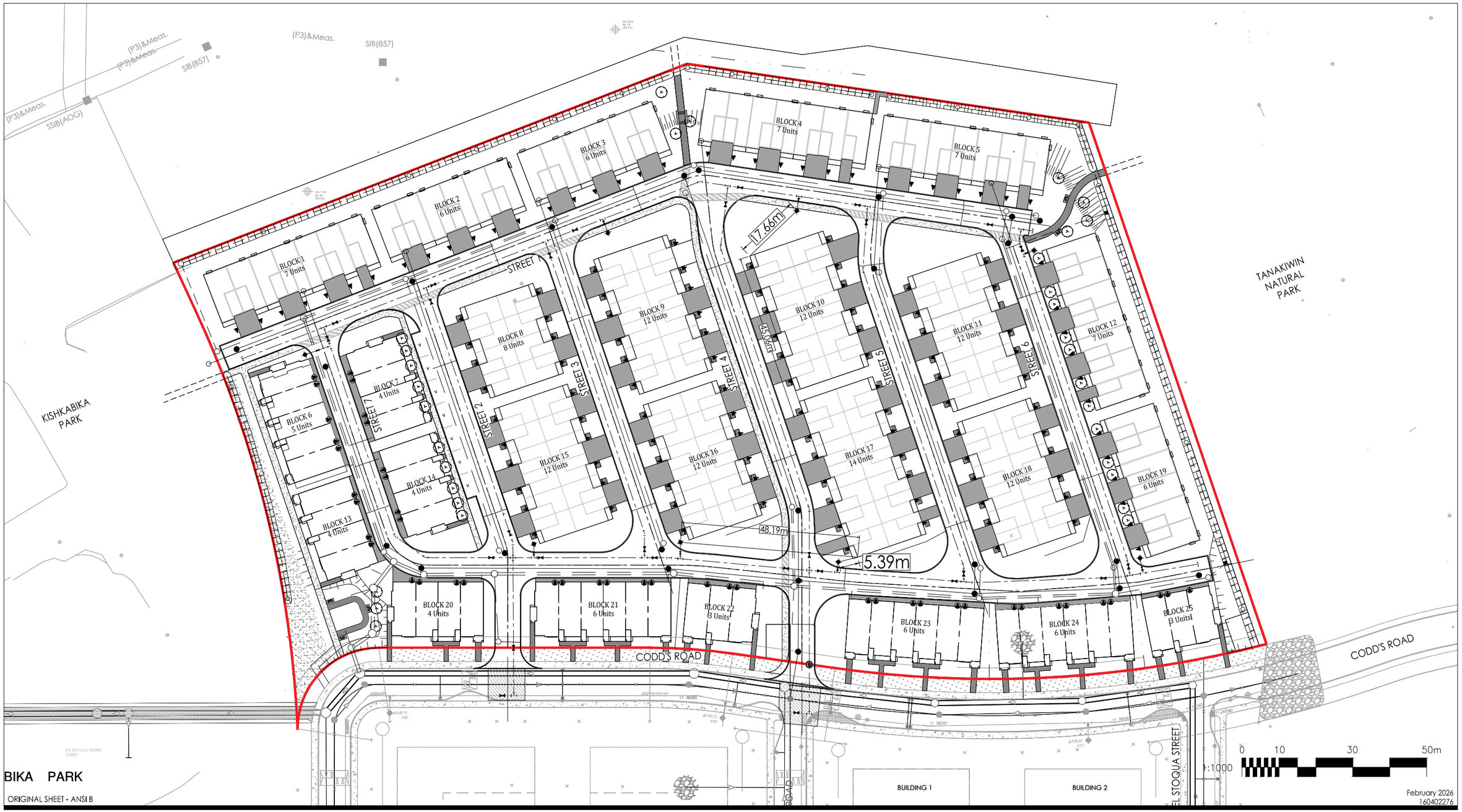
Description	Hydrants[1]			Total Available Fire Flow (L/min)	Total Required Fire Flow[2] (L/min)
	HYD-01	**HYD-02**	**HYD-03**		
Block 17					
Distance from building (m)	5.4	48.2	62.7	-	-
Maximum fire flow capacity[3] (L/min)	5,678	5,678	5,678	**17,034**	15,000

NFPA 1 Table 18.5.4.3	
Distance to Building (m)	Maximum Capacity (L/min)
≤ 76	**5,678**
> 76 and ≤ 152	**3,785**
> 152 and ≤ 305	**2,839**

Notes:

1. Hydrant locations as per Drawing SSP-1. Refer to fire hydrant coverage sketch (Appendix A.5).
2. See FUS Calculations, Appendix A.2 for fire flow requirements.
3. See NFPA 1 Table 18.5.4.3 for maxiumim fire flow capacity of hydrants by distance to building.

A.5 Fire Hydrant Coverage



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2026/03/24 12:12 PM By: Wu, Michael

Legend

Notes

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Stantec
Stantec Consulting Ltd.
400 - 1331 Clyde Avenue
Ottawa ON
Tel. 613.722.4420
www.stantec.com

Client/Project
MATTAMY HOMES LTD.
WATERIDGE SUBDIVISION
BLOCK 23

Figure No.
1.0

Title
BLOCK 8 HYDRANT COVERAGE

Appendix B Wastewater Servicing

B.1 Sanitary Sewer Design Sheet

Stantec

SUBDIVISION: **Wateridge Block 23**

DATE: 2026-02-20
REVISION: 1
DESIGNED BY: JP
CHECKED BY: DT

SANITARY SEWER DESIGN SHEET
(City of Ottawa)

FILE NUMBER: 160402276

DESIGN PARAMETERS

MAX PEAK FACTOR (RES.)=	4.0	AVG. DAILY FLOW / PERSON	280 l/p/day	MINIMUM VELOCITY	0.60 m/s
MIN PEAK FACTOR (RES.)=	2.0	COMMERCIAL	28,000 l/ha/day	MAXIMUM VELOCITY	3.00 m/s
PEAKING FACTOR (INDUSTRIAL):	2.4	INDUSTRIAL (HEAVY)	55,000 l/ha/day	MANNINGS n	0.013
PEAKING FACTOR (ICI >20%):	1.5	INDUSTRIAL (LIGHT)	35,000 l/ha/day	BEDDING CLASS	B
PERSONS / SINGLE	3.4	INSTITUTIONAL	28,000 l/ha/day	MINIMUM COVER	2.50 m
PERSONS / TOWNHOME	2.7	INFILTRATION	0.33 l/s/Ha	HARMON CORRECTION FACTOR	0.8
PERSONS / APARTMENT	1.8				

LOCATION			RESIDENTIAL AREA AND POPULATION									COMMERCIAL		INDUSTRIAL (L)		INDUSTRIAL (H)		INSTITUTIONAL		GREEN / UNUSED		C+I+I	INFILTRATION			TOTAL	PIPE							
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA	SINGLE	UNITS TOWN	APT	POP.	CUMULATIVE AREA	CUMULATIVE POP.	PEAK FACT.	PEAK FLOW	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	AREA	ACCU. AREA	PEAK FLOW	TOTAL AREA	ACCU. AREA	INFILT. FLOW	FLOW	LENGTH	DIA	MATERIAL	CLASS	SLOPE	CAP. (FULL)	CAP. V PEAK FLOW	VEL. (FULL)
			(ha)					(ha)			(l/s)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(ha)	(l/s)	(ha)	(ha)	(l/s)	(l/s)	(m)	(mm)			(%)	(l/s)	(%)	(m/s)
R17B	17	12	0.22	0	7	0	19	0.22	19	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.22	0.22	0.1	0.3	49.3	200	PVC	SDR 35	0.65	27.0	**1.11%**	0.85
	12	8	0.00	0	0	0	0	0.22	19	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.22	0.1	0.3	4.2	200	PVC	SDR 35	0.35	19.8	**1.51%**	0.62
R23A	23	10	0.19	0	10	0	27	0.19	27	3.69	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.19	0.1	0.4	77.8	200	PVC	SDR 35	0.35	19.8	**1.95%**	0.62
R11A	11	10	0.24	0	8	0	22	0.24	22	3.70	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.24	0.24	0.1	0.3	51.0	200	PVC	SDR 35	0.65	27.0	**1.25%**	0.85
R10A	10	9	0.14	0	5	0	14	0.57	62	3.64	0.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.57	0.2	0.9	40.6	200	PVC	SDR 35	0.35	19.8	**4.64%**	0.62
R22A	22	9	0.31	0	22	0	59	0.31	59	3.64	0.7	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.31	0.31	0.1	0.8	92.2	200	PVC	SDR 35	0.35	19.8	**4.05%**	0.62
R9A	9	8	0.17	0	6	0	16	1.04	138	3.56	1.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.17	1.04	0.3	1.9	38.4	200	PVC	SDR 35	0.35	19.8	**9.78%**	0.62
R8A	8	7	0.32	0	22	0	59	1.58	216	3.51	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.32	1.58	0.5	3.0	95.8	200	PVC	SDR 35	0.35	19.8	**15.05%**	0.62
R7A	7	2	0.05	0	3	0	8	1.63	224	3.50	2.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.05	1.63	0.5	3.1	19.0	200	PVC	SDR 35	0.35	19.8	**15.58%**	0.62
R6A	6	5	0.27	0	17	0	46	0.27	46	3.66	0.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.27	0.27	0.1	0.6	49.8	200	PVC	SDR 35	0.35	19.8	**3.20%**	0.62
R5A	5	4	0.10	0	2	0	5	0.37	51	3.65	0.6	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.10	0.37	0.1	0.7	11.2	200	PVC	SDR 35	0.35	19.8	**3.69%**	0.62
R4A	4	3	0.19	0	8	0	22	0.56	73	3.62	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.19	0.56	0.2	1.0	66.9	200	PVC	SDR 35	0.35	19.8	**5.27%**	0.62
R3A	3	2	0.09	0	3	0	8	0.65	81	3.61	0.9	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.65	0.2	1.2	35.4	200	PVC	SDR 35	0.35	19.8	**5.88%**	0.62
R13A	13	17A	0.08	0	1	0	3	0.08	3	3.76	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.08	0.08	0.0	0.1	7.6	200	PVC	SDR 35	0.70	28.0	**0.21%**	0.88
	17A	20	0.00	0	0	0	0	0.08	3	3.76	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	0.08	0.0	0.1	7.3	200	PVC	SDR 35	0.35	19.8	**0.29%**	0.62
R20A	20	19	0.44	0	25	0	68	0.51	70	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.44	0.51	0.2	1.0	91.0	200	PVC	SDR 35	0.35	19.8	**5.03%**	0.62
R19A	19	18	0.01	0	0	0	0	0.52	70	3.63	0.8	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.01	0.52	0.2	1.0	7.4	200	PVC	SDR 35	0.35	19.8	**5.04%**	0.62
R21A	21	18	0.09	0	3	0	8	0.09	8	3.74	0.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.09	0.09	0.0	0.1	21.7	200	PVC	SDR 35	0.35	19.8	**0.64%**	0.62
R18A	18	14	0.14	0	6	0	16	0.75	95	3.60	1.1	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.14	0.75	0.2	1.3	39.3	200	PVC	SDR 35	0.35	19.8	**6.82%**	0.62
R17AA	17A	17	0.15	0	6	0	16	0.15	16	3.71	0.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.15	0.15	0.1	0.2	36.5	200	PVC	SDR 35	0.65	27.0	**0.91%**	0.85
R17A	17	16	0.04	0	2	0	5	0.19	22	3.70	0.3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.04	0.19	0.1	0.3	19.4	200	PVC	SDR 35	0.35	19.8	**1.63%**	0.62
R16A	16	15	0.30	0	23	0	62	0.49	84	3.61	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.30	0.49	0.2	1.1	84.7	200	PVC	SDR 35	0.35	19.8	**5.77%**	0.62
R15A	15	14	0.01	0	0	0	0	0.50	84	3.61	1.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.01	0.50	0.2	1.1	7.9	200	PVC	SDR 35	0.35	19.8	**5.79%**	0.62
R14A	14	2	0.12	0	6	0	16	1.37	194	3.52	2.2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.12	1.37	0.5	2.7	47.8	200	PVC	SDR 35	0.35	19.8	**13.50%**	0.62
R2A	2	1	0.05	0	0	0	0	3.70	500	3.38	5.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.05	3.70	1.2	6.7	19.2	200	PVC	SDR 35	0.35	19.8	**33.82%**	0.62
	1	1A	0.00	0	0	0	0	3.70	500	3.38	5.5	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.00	3.70	1.2	6.7	13.0	200	PVC	SDR 35	0.35	19.8	**33.82%**	0.62

B.2 Background Report Excerpts

Canada Lands Company

Design Brief

Wateridge Village at Rockcliffe Phases 6 and 7

August 2025

3.3 Design Criteria

The City of Ottawa recently revised its wastewater design criteria in 2018. The MSS Report, which was completed in 2015, recommended that the wastewater system proposed for the re-development of the Rockcliffe Airbase site be designed with the City's criteria in effect in 2015. However, because of the recent changes, the Phase 6 and 7 sanitary sewers are proposed to be designed with the current criteria. The below table shows a comparison of the two criteria. Because the new criteria predicts less wastewater flows, the existing downstream sewers will have sufficient capacity for predicted flows from Phases 6 and 7.

Table 3-1 Comparison of City of Ottawa Wastewater Criteria

	City of Ottawa Design Criteria	
	Pre 2018	**2018**
Minimum Velocity	0.60 m/s	0.60 m/s
Maximum Velocity	3.00 m/s	3.00 m/s
Roughness Coefficient	0.013	0.013
Average Residential Flow	350 l/c/r	280 l/c/d
Residential Peaking Factor	Harmon (2.00 – 4.00)	Modified Harmon
Commercial Flow	50,000 l/ha/d	28,000 l/ha/d
Institutional Flow	50,000 l/ha/d	23,000 l/ha/d
Commercial/Institutional Peaking Factor	1.5	1.5
Infiltration Rate	0.28 l/s/ha	0.33 l/s/ha

Minimum allowable slopes remain unchanged and are as listed below.

Table 3-2 Minimum Allowable Slopes

Diameter (mm)	Slope (%)
250	0.240
300	0.186
375	0.140
450	0.111
525 and larger	0.100

Where practical and where there are fewer than 10 residential connections, the first lengths of sanitary sewers are designed with a minimum slope of 0.65%.

The population densities identified in the CFB Rockcliffe MSS are:

- Single Family Units 3.4 ppu
- Semi Detached Units 2.7 ppu
- Freehold Townhouses 2.7 ppu
- Apartments 1.8 ppu

3.4 Proposed Wastewater Plan

The recommended wastewater plan for Phases 6 and 7 is shown on **Figure 3.1** which is included in **Appendix C**. In accordance with the recommendations discussed in Section 3.2, all wastewater flows from Phases 6 and 7 will be directed and connected to the downstream sewers which are presently terminated in Phase 2 in Bareille-Snow Street. Additionally, MH8A will have a secondary plugged outlet for future redirection per Section 3.2. All new sanitary sewers proposed for the subject site will be 250 mm diameter.

Clay seals have been proposed in sensitive soil areas per the geotechnical report prepared by Paterson.

The new sewers are proposed to be fitted with a temporary Inlet Control Device (ICD) at MH 20A on Bareille-Snow Street. The ICD is intended to ensure that existing downstream sewers are not accidently flooded during construction. The ICD will remain in place until the time of preliminary acceptance, at which time it will be removed. The location is shown on **Figure 3.1** and on the working drawings and the detail sizing calculations are included in **Appendix C**.

3.5 Local Extraneous Flows

Ground water levels are expected to be in a clay or rock stratum. All new sanitary sewers will be tested to the City of Ottawa standards prior to being put into service. For the subject site, there are no unusual local conditions that are expected to contribute to extraneous flows that are higher than those noted in the City's guidelines.

3.6 Wastewater Outlet

As stated above, the wastewater outlet for the subject site will be the Ottawa Interceptor Sewer. That sewer bisects the CLC property and previously accepted combined flows from the site and wastewater from the Thorncliffe Village Community. The Phase 1A, 1B, 2 and 4 wastewater plans included new local sewers that were routed through the redevelopment to the reconstructed Codd's Road Shaft. Wastewater flows from Phases 6 and 7 are proposed to connect to the upper reaches of the Phase 2 sewer system. When construction of Phase 8 begins, a temporary plug will be removed from MH8A to allow flows from Wanaki Road and Moses Tennisco Street to outlet to the RCAF Pullback Sewer per the MSS (see Section 3.2 of this report).

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

SANITARY SEWER DESIGN SHEET

Wateridge Village Phase 6, 7
CITY OF OTTAWA
Canada Lands Company

LOCATION				RESIDENTIAL										ICI AREAS								INFILTRATION ALLOWANCE			FIXED FLOW (L/s)		TOTAL FLOW	PROPOSED SEWER DESIGN							
				AREA w/ Units (Ha)	UNIT TYPES			AREA w/o Units (Ha)	POPULATION		RES PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)						ICI PEAK FACTOR	PEAK FLOW (L/s)	AREA (Ha)		FLOW				CAPACITY	LENGTH	DIA	SLOPE	VELOCITY (full)	AVAILABLE CAPACITY	
STREET	AREA ID	FROM MH	TO MH		SF	TH/SD	APT		IND	CUM			INSTITUTIONAL		COMMERCIAL		INDUSTRIAL				IND	CUM	(L/s)	IND	CUM	(L/s)	(L/s)	(m)	(mm)	(%)	(m/s)	L/s	(%)
													IND	CUM	IND	CUM	IND	CUM															
CODDS ROAD	MH1A, Blk21W	MH1A	MH2A	0.84			192		345.6	345.6	3.44	3.85		0.0	0.15	0.15		0.0	1.00	0.05	0.99	0.99	0.33		0.0	4.23	52.06	106.79	250	0.70	1.027	47.83	91.87%
CODDS ROAD	MH2A	MH2A	MH3A	0.03					0.0	345.6	3.44	3.85		0.0		0.15		0.0	1.00	0.05	0.03	1.02	0.34		0.0	4.24	31.80	12.56	250	0.26	0.628	27.56	86.67%
CODDS ROAD	MH3A, Blk23	MH3A	MH4A	2.16		42	130		347.4	693.0	3.32	7.45		0.0		0.15		0.0	1.00	0.05	2.16	3.18	1.05		0.0	8.55	31.05	87.82	250	0.25	0.613	22.50	72.47%
CODDS ROAD	MH4A	MH4A	MH5A	0.05					0.0	693.0	3.32	7.45		0.0		0.15		0.0	1.00	0.05	0.05	3.23	1.07		0.0	8.57	31.17	27.73	250	0.25	0.615	22.60	72.52%
WANAKI ROAD	53A, Com	MH53A	MH52A	0.16					0.0	0.0	3.80	0.00		0.0	0.82	0.82		0.0	1.50	0.40	0.98	0.98	0.32		0.0	0.72	76.03	67.91	250	1.50	1.500	75.31	99.05%
WANAKI ROAD	52A	MH52A	MH51A	0.02					0.0	0.0	3.80	0.00		0.0		0.82		0.0	1.50	0.40	0.02	1.00	0.33		0.0	0.73	76.03	8.85	250	1.50	1.501	75.30	99.04%
WANAKI ROAD	51A, Blk4-19	MH51A	MH50A	1.35		43			116.1	116.1	3.58	1.35		0.0		0.82		0.0	1.50	0.40	1.35	2.35	0.78		0.0	2.52	43.87	103.37	250	0.50	0.866	41.35	94.25%
WANAKI ROAD	50A	MH50A	MH40A	0.19					0.0	116.1	3.58	1.35		0.0		0.82		0.0	1.50	0.40	0.19	2.54	0.84		0.0	2.58	71.01	100.00	250	1.31	1.401	68.42	96.36%
MOSES TENNISCO STRE	41A, Blk2, Blk3	MH41A	MH40A	0.56		18			48.6	48.6	3.65	0.58		0.0		0.00		0.0	1.00	0.00	0.56	0.56	0.18		0.0	0.76	97.70	72.50	250	2.48	1.928	96.94	99.22%
MOSES TENNISCO STRE	40A	MH40A	MH30A	0.17					0.0	164.7	3.54	1.89		0.0		0.82		0.0	1.50	0.40	0.17	3.27	1.08		0.0	3.37	53.73	90.00	250	0.75	1.060	50.36	93.73%
MICHAEL STOQUA STRE	MH31A, Blk20E, Blk1	MH31A	MH30A	0.98		9	190		366.3	366.3	3.43	4.07		0.0		0.00		0.0	1.00	0.00	0.98	0.98	0.32		0.0	4.40	66.26	72.51	250	1.14	1.308	61.86	93.36%
MICHAEL STOQUA STRE	MH30A	MH30A	MH8A	0.12					0.0	531.0	3.37	5.80		0.0		0.82		0.0	1.00	0.27	0.12	4.37	1.44		0.0	7.50	39.01	68.28	250	0.40	0.770	31.51	80.76%
CODDS ROAD (FUTURE)		*MH8A*	*CAP (FUT)*						*0.0*	*531.0*	*3.37*	*5.80*		*0.0*		*0.82*		*0.0*	*1.00*	*0.27*	*0.00*	*4.37*	*1.44*		*0.0*	*7.50*	*116.06*	*18.00*	*250*	*3.50*	*2.291*	*108.56*	*93.53%*
CODDS ROAD	MH8A, Blk22	MH8A	MH7A	1.77		34	128		322.2	853.2	3.27	9.05		0.0		0.82		0.0	1.00	0.27	1.77	6.14	2.03		0.0	11.35	40.93	32.17	250	0.44	0.808	29.58	72.28%
CODDS ROAD	MH7A	MH7A	MH6A	0.08					0.0	853.2	3.27	9.05		0.0		0.82		0.0	1.00	0.27	0.08	6.22	2.05		0.0	11.37	31.10	39.78	250	0.25	0.614	19.73	63.44%
CODDS ROAD	MH6A	MH6A	MH5A	0.08					0.0	853.2	3.27	9.05		0.0		0.82		0.0	1.00	0.27	0.08	6.30	2.08		0.0	11.40	30.80	40.58	250	0.25	0.608	19.40	62.98%
BAREILLE-SNOW STREE	MH5A, Blk21E, Blk20W	MH5A	MH20A	1.31			387		696.6	2242.8	3.04	22.08		0.0	0.13	1.10		0.0	1.00	0.36	1.44	10.97	3.62		0.0	26.05	30.72	73.43	250	0.25	0.606	4.67	15.19%
BAREILLE-SNOW STREE	MH20A	MH20A	BLK304AN	0.12					0.0	2242.8	3.04	22.08		0.0		1.10		0.0	1.00	0.36	0.12	11.09	3.66		0.0	26.09	31.02	60.00	250	0.25	0.612	4.93	15.89%
BAREILLE-SNOW STREE	MH21A	BLK304AN	EXMH304A	0.03					0.0	2242.8	3.04	22.08		0.0		1.10		0.0	1.00	0.36	0.03	11.12	3.67		0.0	26.10	31.02	20.00	250	0.25	0.612	4.92	15.85%

Design Parameters:

Residential			ICI Areas			
SF	3.4	p/p/u				
TH/SD	2.7	p/p/u	INST	28,000	L/Ha/day	
APT	1.8	p/p/u	COM	28,000	L/Ha/day	
MSS	1.0	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
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,

Designed: SEL
Checked: JIM
Dwg. Reference: 139653-400

No.	Revision	Date
1.	Submission No. 1	2023-09-29
2.	Submission No. 2	2024-05-13
3.	Submission No. 3	2024-11-11
1.	Submission No. 4	2025-05-14

File Reference: **Date:** **Sheet No:**

CLIENT

CANADA LANDS COMPANY

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ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2023-10-05
2	ISSUED FOR CLIENT REVIEW	2024-06-12
3	SUBMISSION NO.2 FOR CITY REVIEW	2024-06-21
4	ISSUED FOR GEOTECHNICAL REVIEW	2024-11-26
5	SUBMISSION NO.3 FOR CITY REVIEW	2024-12-20
6	SUBMISSION NO.4 FOR CITY REVIEW	2025-06-27
7	SUBMISSION NO.5 FOR CITY REVIEW	2025-07-31
8		

SEE 010, 011 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS

KEY PLAN

400

SEAL

LICENSED PROFESSIONAL ENGINEER
S. E. LABADIE
100214983
2025/07/31
PROVINCE OF ONTARIO

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

WATERIDGE VILLAGE AT ROCKCLIFFE

PHASES 6 AND 7

PROJECT NO:
139653

DRAWN BY:	CHECKED BY:
M.M.	J.I.M.
PROJECT MGR:	APPROVED BY:
S.L.	S.L.

SHEET TITLE

SANITARY DRAINAGE AREA PLAN

SHEET NUMBER	ISSUE
400	7

CITY PLAN No. 19055 CITY FILE No. D07-16-15-0003

Plotted: July 31, 2025 2:39:53 PM by Milne, Marian Last Saved: June 25, 2025, by milnem4626

Appendix C Stormwater Management

C.1 Storm Sewer Design Sheet

Stantec

Wateridge Block 23

DATE: 2026-03-23
REVISION: 1
DESIGNED BY: JP
CHECKED BY: MW

FILE NUMBER: **160402276**

STORM SEWER DESIGN SHEET
(City of Ottawa)

DESIGN PARAMETERS

$I = a / (t+b)^c$ (As per City of Ottawa Guidelines, 2012)

	1:2 yr	1:5 yr	1:10 yr	1:100 yr
a =	732.951	998.071	1174.184	1735.688
b =	6.199	6.053	6.014	6.014
c =	0.810	0.814	0.816	0.820

MANNING'S n = 0.013 BEDDING CLASS = B
MINIMUM COVER: 2.00 m
TIME OF ENTRY 10 min

LOCATION			DRAINAGE AREA																							PIPE SELECTION									
AREA ID NUMBER	FROM M.H.	TO M.H.	AREA (2-YEAR) (ha)	AREA (5-YEAR) (ha)	AREA (10-YEAR) (ha)	AREA (100-YEAR) (ha)	AREA (ROOF) (ha)	C (2-YEAR) (-)	C (5-YEAR) (-)	C (10-YEAR) (-)	C (100-YEAR) (-)	A x C (2-YEAR) (ha)	ACCUM. AxC (2YR) (ha)	A x C (5-YEAR) (ha)	ACCUM. AxC (5YR) (ha)	A x C (10-YEAR) (ha)	ACCUM. AxC (10YR) (ha)	A x C (100-YEAR) (ha)	ACCUM. AxC (100YR) (ha)	T of C (min)	$I_{2\text{-YEAR}}$ (mm/h)	$I_{5\text{-YEAR}}$ (mm/h)	$I_{10\text{-YEAR}}$ (mm/h)	$I_{100\text{-YEAR}}$ (mm/h)	$Q_{CONTROL}$ (L/s)	ACCUM. $Q_{CONTROL}$ (L/s)	Q_{ACT} (CIA/360) (L/s)	LENGTH (m)	PIPE WIDTH OR DIAMETE (mm)	PIPE HEIGHT (mm)	PIPE SHAPE (-)	MATERIAL (-)	CLASS (-)	SLOPE %	Q_{CAP} (FULL) (L/s)	% FULL (-)	VEL. (FULL) (m/s)
	100A-1	100B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	4.8	300	300	CIRCULAR	PVC	-	1.00	96.2	**0.00%**	1.37
																				10.00															
C117A, C117B	117	116	0.00	0.44	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.328	0.328	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	94.9	89.8	375	375	CIRCULAR	PVC	-	0.40	104.3	**90.98%**	0.99
	116	105	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.328	0.000	0.000	0.000	0.000	11.48	71.56	96.99	113.66	166.10	0.0	0.0	88.3	21.4	450	450	CIRCULAR	CONCRETE	-	0.40	188.1	**46.95%**	1.15
																				11.85															
C115B	115	114	0.00	0.17	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.131	0.131	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	37.8	21.4	300	300	CIRCULAR	PVC	-	0.40	60.9	**62.11%**	0.87
C114A	114	113	0.00	0.24	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.183	0.313	0.000	0.000	0.000	0.000	10.45	75.12	101.87	119.41	174.54	0.0	0.0	88.7	84.7	375	375	CIRCULAR	PVC	-	0.40	104.3	**85.07%**	0.99
	113	106	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.313	0.000	0.000	0.000	0.000	11.88	70.28	95.22	111.58	163.04	0.0	0.0	82.9	8.2	375	375	CIRCULAR	PVC	-	0.40	104.3	**79.52%**	0.99
																				12.02															
C115A	115	111	0.00	0.13	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.000	0.000	0.102	0.102	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	29.6	33.7	375	375	CIRCULAR	PVC	-	0.30	90.3	**32.80%**	0.86
																				10.87															
	112	111	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	8.1	300	300	CIRCULAR	PVC	-	0.65	77.8	**0.00%**	1.11
																				10.00															
	111	110	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.102	0.000	0.000	0.000	0.000	10.87	73.60	99.79	116.95	170.94	0.0	0.0	28.4	7.6	375	375	CIRCULAR	PVC	-	0.30	90.3	**31.42%**	0.86
C110A, C110B, C110C	110	109	0.00	0.50	0.00	0.00	0.00	0.00	0.66	0.00	0.00	0.000	0.000	0.331	0.434	0.000	0.000	0.000	0.000	11.07	72.91	98.84	115.84	169.30	0.0	0.0	119.1	93.9	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	**89.53%**	0.81
	109	107	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.434	0.000	0.000	0.000	0.000	12.98	67.00	90.73	106.29	155.27	0.0	0.0	109.3	7.1	450	450	CIRCULAR	CONCRETE	-	0.20	133.0	**82.18%**	0.81
																				13.12															
C108A	108	107	0.00	0.10	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.000	0.000	0.057	0.057	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	16.5	25.5	300	300	CIRCULAR	PVC	-	0.65	77.6	**21.32%**	1.10
																				10.58															
C107A	107	106	0.00	0.06	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.000	0.000	0.046	0.537	0.000	0.000	0.000	0.000	13.12	66.58	90.16	105.61	154.29	0.0	0.0	134.4	37.0	525	525	CIRCULAR	CONCRETE	-	0.20	200.7	**67.00%**	0.90
																				13.86															
C106A	106	105	0.00	0.02	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.013	0.863	0.000	0.000	0.000	0.000	13.86	64.60	87.44	102.42	149.60	0.0	0.0	209.7	50.2	600	600	CIRCULAR	CONCRETE	-	0.20	286.5	**73.21%**	0.98
																				14.74															
C105AA	105A	105	0.00	0.15	0.00	0.00	0.00	0.00	0.80	0.00	0.00	0.000	0.000	0.117	0.117	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	34.0	10.3	300	300	CIRCULAR	PVC	-	1.00	96.2	**35.35%**	1.37
																				10.16															
	105	104	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.309	0.000	0.000	0.000	0.000	14.74	62.38	84.39	98.84	144.34	0.0	0.0	306.8	32.8	675	675	CIRCULAR	CONCRETE	-	0.20	392.2	**78.23%**	1.06
	104	103	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.309	0.000	0.000	0.000	0.000	15.27	61.14	82.70	96.84	141.41	0.0	0.0	300.6	48.5	675	675	CIRCULAR	CONCRETE	-	0.25	438.5	**68.56%**	1.19
																				15.99															
C103AA	103A	103	0.00	0.13	0.00	0.00	0.00	0.00	0.85	0.00	0.00	0.000	0.000	0.108	0.108	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	31.2	18.4	300	300	CIRCULAR	PVC	-	0.70	80.4	**38.76%**	1.14
																				10.34															
	103	102	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.416	0.000	0.000	0.000	0.000	15.99	59.52	80.48	94.24	137.59	0.0	0.0	316.6	19.2	675	675	CIRCULAR	CONCRETE	-	0.25	438.5	**72.21%**	1.19
	102	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	1.416	0.000	0.000	0.000	0.000	16.27	58.92	79.66	93.27	136.16	0.0	0.0	313.4	8.8	675	675	CIRCULAR	CONCRETE	-	0.30	480.4	**65.24%**	1.30
																				16.40															
C123A, C123B	123	120	0.00	0.31	0.00	0.00	0.00	0.00	0.79	0.00	0.00	0.000	0.000	0.244	0.244	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	70.5	77.8	375	375	CIRCULAR	PVC	-	0.40	104.3	**67.62%**	0.99
																				11.40															
C124B, C124A	124	121	0.00	0.33	0.00	0.00	0.00	0.00	0.75	0.00	0.00	0.000	0.000	0.248	0.248	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	71.7	92.1	375	375	CIRCULAR	PVC	-	0.30	90.3	**79.41%**	0.86
																				11.82															
	115	122	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	0.0	51.9	300	300	CIRCULAR	PVC	-	0.40	60.8	**0.00%**	0.86
C122A	122	121	0.00	0.14	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.000	0.000	0.103	0.103	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	29.9	40.4	300	300	CIRCULAR	PVC	-	0.40	60.7	**49.22%**	0.86
																				10.92															
C121A	121	120	0.00	0.16	0.00	0.00	0.00	0.00	0.76	0.00	0.00	0.000	0.000	0.124	0.475	0.000	0.000	0.000	0.000	11.82	70.46	95.47	111.87	163.47	0.0	0.0	126.1	43.5	450	450	CIRCULAR	CONCRETE	-	0.40	188.1	**67.01%**	1.15
																				12.50															
	120	119	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.719	0.000	0.000	0.000	0.000	12.50	68.39	92.63	108.52	158.56	0.0	0.0	185.0	29.6	525	525	CIRCULAR	CONCRETE	-	0.40	283.8	**65.19%**	1.27
																				12.91															
C119CA	119A	119	0.00	0.28	0.00	0.00	0.00	0.00	0.55	0.00	0.00	0.000	0.000	0.151	0.151	0.000	0.000	0.000	0.000	10.00	76.81	104.19	122.14	178.56	0.0	0.0	43.8	25.1	300	300	CIRCULAR	PVC	-	0.65	77.7	**56.36%**	1.10
																				10.43															
C119A	119	118	0.00	0.15	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.000	0.000	0.123	0.993	0.000	0.000	0.000	0.000	12.91	67.17	90.96	106.57	155.69	0.0	0.0	251.0	66.9	525	525	CIRCULAR	CONCRETE	-	0.40	283.8	**88.47%**	1.27
	118	101	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	0.993	0.000	0.000	0.000	0.000	13.78	64.81	87.72	102.75	150.09	0.0	0.0	242.1	3.8	600	600	CIRCULAR	CONCRETE	-	0.25	320.2	**75.61%**	1.10
																				13.84															
	101	100	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	2.410	0.000	0.000	0.000	0.000	16.40	58.66	79.30	92.85	135.56	0.0	0.0	530.8	9.0	825	825	CIRCULAR	CONCRETE	-	0.25	750.5	**70.73%**	1.36
	100	100A	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	2.410	0.000	0.000	0.000	0.000	16.51	58.41	78.97	92.46	134.98	0.0	0.0	528.6	12.3	825	825	CIRCULAR	CONCRETE	-	0.25	752.6	**70.24%**	1.36
	100A	100B	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	2.410	0.000	0.000	0.000	0.000	16.67	58.09	78.52	91.93	134.21	0.0	0.0	525.6	6.9	825	825	CIRCULAR	CONCRETE	-	0.25	743.7	**70.68%**	1.35
																				16.76															
	100B	MH 3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.000	0.000	0.000	2.410	0.000	0.000	0.000	0.000	16.76	57.90	78.27	91.64	133.77	0.0	0.0	523.9	7.1	825	825	CIRCULAR	CONCRETE	-	0.45	1005.6	**52.10%**	1.82
																				16.84								825	825						

C.2 Sample PCSWMM Output Files

EPA STORM WATER MANAGEMENT MODEL - VERSION 5.2 (Build 5.2.4)

WARNING 03: negative offset ignored for Link C27
WARNING 03: negative offset ignored for Link C30
WARNING 03: negative offset ignored for Link C32
WARNING 03: negative offset ignored for Link C4
WARNING 03: negative offset ignored for Link C48
WARNING 03: negative offset ignored for Link C5
WARNING 03: negative offset ignored for Link C2

****
Element Count
****
Number of rain gages 5
Number of subcatchments ... 25
Number of nodes 79
Number of links 114
Number of pollutants 0
Number of land uses 0

****
Raingage Summary
****

Name	Data Source	Data Type	Recording Interval
4_mm	4_mm	INTENSITY	10 min.
CHI_002	CHI_002	INTENSITY	10 min.
CHI_005	CHI_005	INTENSITY	10 min.
CHI_100	CHI_100	INTENSITY	10 min.
CHI_120	CHI_120	INTENSITY	10 min.

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Subcatchment Summary
****

Name	Area	Width	%Imperv	%Slope	Rain Gage	Outlet
C103AA	0.14	13.87	92.86	2.0000	CHI_100	CB103A1
C105AA	0.15	10.77	85.71	2.0000	CHI_100	CB105A1
C106A	0.02	6.61	78.57	2.0000	CHI_100	CB106A
C107A	0.06	11.26	85.71	2.0000	CHI_100	CB107A
C108A	0.10	12.46	50.00	2.0000	CHI_100	CB108A
C110A	0.19	21.87	78.57	2.0000	CHI_100	CB110A
C110B	0.15	28.52	78.57	2.0000	CHI_100	CB110B
C110C	0.16	19.19	38.57	2.0000	CHI_100	CB110C
C114A	0.24	23.97	78.57	2.0000	CHI_100	CB114A
C115A	0.13	22.57	80.00	2.0000	CHI_100	CB115A
C115B	0.17	23.05	78.57	2.0000	CHI_100	CB115B
C117A	0.24	42.69	78.57	2.0000	CHI_100	CB117A
C117B	0.19	24.09	78.57	2.0000	CHI_100	CB117B
C119A	0.15	16.58	90.00	2.0000	CHI_100	CB119A
C119CA	0.28	16.61	50.00	2.0000	CHI_100	CB119C
C121A	0.16	17.35	80.00	2.0000	CHI_100	CB121A
C122A	0.14	20.48	80.00	2.0000	CHI_100	CB122A
C123A	0.15	16.24	90.00	2.0000	CHI_100	CB123A
C123B	0.16	30.63	78.57	2.0000	CHI_100	CB123B
C124A	0.14	23.73	78.57	2.0000	CHI_100	CB124A
C124B	0.19	34.74	78.57	2.0000	CHI_100	CB124B
TANK-1	0.11	12.55	42.86	2.0000	CHI_100	CULTEC
UNC-1	0.14	31.07	57.14	2.0000	CHI_100	UNC-1OF
UNC-2	0.06	14.05	57.14	2.0000	CHI_100	UNC-2OF
UNC-3	0.07	15.11	42.86	2.0000	CHI_100	UNC-3OF

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Node Summary
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Name	Type	Invert Elev.	Max. Depth	Ponded Area	External Inflow
C108A-OF	OUTFALL	88.49	0.00	0.0	
C110C-OF	OUTFALL	88.49	0.00	0.0	
C119C-OF	OUTFALL	87.83	0.00	0.0	

CODD-E	OUTFALL	89.20	0.30	0.0
CODD-W	OUTFALL	89.31	0.13	0.0
J7	OUTFALL	83.54	2.79	0.0
UNC-1OF	OUTFALL	0.00	0.00	0.0
UNC-2OF	OUTFALL	0.00	0.00	0.0
UNC-3OF	OUTFALL	0.00	0.00	0.0
100	STORAGE	85.50	4.28	0.0
100A	STORAGE	85.00	3.50	0.0
100B	STORAGE	85.00	4.85	0.0
101	STORAGE	85.44	4.24	0.0
102	STORAGE	85.54	4.09	0.0
103	STORAGE	85.62	3.95	0.0
104	STORAGE	85.81	3.83	0.0
105	STORAGE	85.89	3.64	0.0
106	STORAGE	85.99	3.70	0.0
107	STORAGE	86.14	3.74	0.0
108	STORAGE	86.47	3.58	0.0
109	STORAGE	86.23	3.57	0.0
110	STORAGE	86.43	3.21	0.0
111	STORAGE	86.77	2.79	0.0
112	STORAGE	86.86	3.09	0.0
113	STORAGE	86.25	3.33	0.0
114	STORAGE	86.60	2.92	0.0
115	STORAGE	86.76	2.92	0.0
116	STORAGE	86.27	3.13	0.0
117	STORAGE	86.64	2.98	0.0
118	STORAGE	85.60	4.09	0.0
119	STORAGE	85.97	4.19	0.0
119A	STORAGE	86.22	4.26	0.0
120	STORAGE	86.15	3.74	0.0
121	STORAGE	86.40	3.28	0.0
122	STORAGE	86.71	2.89	0.0
123	STORAGE	86.61	2.98	0.0
124	STORAGE	86.75	2.79	0.0
CB103A1	STORAGE	86.92	2.87	0.0
CB105A1	STORAGE	87.19	2.53	0.0
CB106A	STORAGE	88.10	1.78	0.0
CB107A	STORAGE	88.37	1.78	0.0
CB108A	STORAGE	87.00	1.59	0.0

CB110A	STORAGE	88.25	1.78	0.0
CB110B	STORAGE	88.16	1.78	0.0
CB110C	STORAGE	87.27	1.32	0.0
CB114A	STORAGE	87.92	1.78	0.0
CB115A	STORAGE	88.13	1.78	0.0
CB115B	STORAGE	88.08	1.78	0.0
CB117A	STORAGE	87.88	1.78	0.0
CB117B	STORAGE	88.00	1.78	0.0
CB119A	STORAGE	88.35	1.78	0.0
CB119C	STORAGE	86.48	1.45	0.0
CB121A	STORAGE	88.18	1.78	0.0
CB122A	STORAGE	88.11	1.78	0.0
CB123A	STORAGE	88.08	1.78	0.0
CB123B	STORAGE	88.08	1.78	0.0
CB124A	STORAGE	88.06	1.78	0.0
CB124B	STORAGE	88.03	1.78	0.0
CULTEC	STORAGE	85.00	3.50	0.0
SU10	STORAGE	89.81	0.08	0.0
SU12	STORAGE	89.91	0.08	0.0
SU13	STORAGE	89.68	0.08	0.0
SU14	STORAGE	89.62	0.08	0.0
SU15	STORAGE	89.58	0.08	0.0
SU17	STORAGE	89.53	0.08	0.0
SU18	STORAGE	89.42	0.08	0.0
SU19	STORAGE	89.61	0.08	0.0
SU2	STORAGE	90.12	0.08	0.0
SU20	STORAGE	89.62	0.08	0.0
SU21	STORAGE	89.64	0.08	0.0
SU22	STORAGE	89.60	0.08	0.0
SU23	STORAGE	89.63	0.08	0.0
SU25	STORAGE	89.74	0.08	0.0
SU3	STORAGE	89.83	0.08	0.0
SU4	STORAGE	89.66	0.08	0.0
SU5	STORAGE	89.60	0.08	0.0
SU6	STORAGE	89.81	0.08	0.0
SU7	STORAGE	89.66	0.08	0.0
SU8	STORAGE	89.67	0.08	0.0

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Link Summary
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Name	From Node	To Node	Type	Length	%Slope	Roughness
103	105	104	CONDUIT	32.8	0.2012	0.0130
120-123	123	120	CONDUIT	77.8	0.3998	0.0130
C1	CULTEC	100B	CONDUIT	4.8	1.0439	0.0130
C10	SU6	SU7	CONDUIT	23.2	0.6034	0.0130
C11	CB115A	SU7	CONDUIT	23.7	-0.6754	0.0130
C12	SU8	CB115A	CONDUIT	11.3	1.4123	0.0130
C14	CB110B	SU8	CONDUIT	21.7	-0.6002	0.0130
C15	SU10	CB110B	CONDUIT	26.1	1.0330	0.0130
C16	SU10	CB110A	CONDUIT	26.4	0.6805	0.0130
C17	CB110A	SU12	CONDUIT	29.6	-0.9444	0.0130
C19	SU19	SU17	CONDUIT	37.7	0.2123	0.0130
C20	SU25	SU19	CONDUIT	8.5	1.5224	0.0130
C21	SU25	SU22	CONDUIT	30.8	0.4553	0.0130
C22	SU23	SU22	CONDUIT	20.8	0.1441	0.0130
C23	CB119A	SU22	CONDUIT	43.6	0.2982	0.0130
C24	SU2	CB119A	CONDUIT	53.5	0.8045	0.0130
C27	SU13	CB106A	CONDUIT	36.6	0.5471	0.0130
C28	CB106A	SU17	CONDUIT	12.0	-0.4153	0.0130
C29	SU12	CB107A	CONDUIT	24.6	0.6091	0.0130
C30	CB107A	SU13	CONDUIT	16.3	0.4899	0.0130
C32	SU3	CB123B	CONDUIT	23.3	1.5875	0.0130
C33	CB123B	SU21	CONDUIT	24.1	-0.7469	0.0130
C34	SU21	CB123A	CONDUIT	18.3	0.9858	0.0130
C35	CB123A	SU22	CONDUIT	14.4	-0.9729	0.0130
C36	SU4	CB124B	CONDUIT	24.7	1.0134	0.0130
C37	CB124B	SU20	CONDUIT	32.8	-0.6408	0.0130
C38	SU20	CB124A	CONDUIT	21.4	0.8430	0.0130
C39	CB124A	SU19	CONDUIT	16.6	-1.0242	0.0130
C4	SU2	SU3	CONDUIT	29.0	1.1388	0.0130
C40	SU5	CB117B	CONDUIT	24.8	0.8878	0.0130
C41	CB117B	SU15	CONDUIT	26.4	-0.7567	0.0130
C42	SU15	CB117A	CONDUIT	28.6	1.1170	0.0130
C43	CB117A	SU17	CONDUIT	32.7	-0.8260	0.0130
C45	SU7	CB115B	CONDUIT	17.6	1.1967	0.0130
C46	CB115B	SU14	CONDUIT	31.5	-0.7612	0.0130
C47	SU14	CB114A	CONDUIT	42.2	0.7339	0.0130
C48	CB114A	SU13	CONDUIT	18.6	-1.5593	0.0130
C49	100A	100B	CONDUIT	6.9	0.2467	0.0130
C5	SU3	CB121A	CONDUIT	23.3	1.1584	0.0130
C51	SU17	CB105A1	CONDUIT	12.9	1.6294	0.0130
C52	CB105A1	SU18	CONDUIT	7.5	-1.3406	0.0130
C53	SU18	CODD-E	CONDUIT	9.0	2.4506	0.0130
C56	SU22	CB103A1	CONDUIT	20.7	1.0145	0.0130
C57	CB103A1	CODD-W	CONDUIT	7.2	1.1112	0.0130
C6	CB121A	SU4	CONDUIT	16.0	-0.6238	0.0130
C7	SU4	CB122A	CONDUIT	25.4	0.6704	0.0130
C8	CB122A	SU5	CONDUIT	19.4	-0.5673	0.0130
C9	SU6	SU5	CONDUIT	23.6	0.8913	0.0130
Pipe_14	124	121	CONDUIT	92.1	0.3007	0.0130
Pipe_15	104	103	CONDUIT	48.5	0.2493	0.0130
Pipe_15_(1)	103	102	CONDUIT	19.2	0.2506	0.0130
Pipe_18	102	101	CONDUIT	8.8	0.2940	0.0130
Pipe_18_(2)	118	101	CONDUIT	3.8	0.2381	0.0130
Pipe_19	119	118	CONDUIT	66.9	0.4004	0.0130
Pipe_20	120	119	CONDUIT	29.6	0.3993	0.0130
Pipe_20_(1)	121	120	CONDUIT	43.5	0.3998	0.0130
Pipe_20_(2)	119A	119	CONDUIT	25.1	0.6533	0.0130
Pipe_30	106	105	CONDUIT	50.2	0.1993	0.0130
Pipe_31	113	106	CONDUIT	8.2	0.4039	0.0130
Pipe_32	114	113	CONDUIT	84.7	0.4001	0.0130
Pipe_33	115	114	CONDUIT	21.4	0.4014	0.0130
Pipe_35	107	106	CONDUIT	37.0	0.2024	0.0130
Pipe_35_(1)	108	107	CONDUIT	25.5	0.6512	0.0130
Pipe_36	109	107	CONDUIT	7.1	0.1964	0.0130
Pipe_37	110	109	CONDUIT	93.9	0.2002	0.0130
Pipe_39	122	121	CONDUIT	40.4	0.3988	0.0130
Pipe_40	115	111	CONDUIT	33.7	0.2999	0.0130
Pipe_40_(2)	112	111	CONDUIT	8.1	0.3086	0.0130
Pipe_40_(3)	115	122	CONDUIT	51.9	0.4011	0.0130
Pipe_6	100B	J7	CONDUIT	7.1	0.4510	0.0130
Pipe_7	100	100A	CONDUIT	12.3	0.2525	0.0130
Pipe_8	116	105	CONDUIT	21.4	0.4014	0.0130
Pipe_9	117	116	CONDUIT	89.8	0.3997	0.0130

Pipe_94	101	100	CONDUIT	9.0	0.2545	0.0130
Pipe_95	111	110	CONDUIT	7.6	0.2893	0.0130
C2	100	CULTEC	ORIFICE			
OL1	CB119C	119A	ORIFICE			
OL10	CB122A	122	ORIFICE			
OL11	CB117B	117	ORIFICE			
OL12	CB117A	117	ORIFICE			
OL13	CB105A1	105	ORIFICE			
OL15	CB106A	106	ORIFICE			
OL16	CB107A	107	ORIFICE			
OL17	CB108A	108	ORIFICE			
OL18	CB114A	114	ORIFICE			
OL19	CB110A	110	ORIFICE			
OL2	CB119A	119	ORIFICE			
OL20	CB115B	115	ORIFICE			
OL21	CB110B	110	ORIFICE			
OL22	CB115A	115	ORIFICE			
OL23	CB110C	110	ORIFICE			
OL3	CB123A	123	ORIFICE			
OL4	CB123B	123	ORIFICE			
OL5	CB103A1	103	ORIFICE			
OL7	CB124A	124	ORIFICE			
OL8	CB124B	124	ORIFICE			
OL9	CB121A	121	ORIFICE			
OR10	CB117A	117	ORIFICE			
OR11	CB115B	115	ORIFICE			
OR12	CB115A	115	ORIFICE			
OR13	CB114A	114	ORIFICE			
OR14	CB110B	110	ORIFICE			
OR15	CB110A	110	ORIFICE			
OR2	CB124B	124	ORIFICE			
OR3	CB124A	124	ORIFICE			
OR4	CB123A	123	ORIFICE			
OR5	CB123B	123	ORIFICE			
OR6	CB119A	119	ORIFICE			
OR7	CB121A	121	ORIFICE			
OR8	CB122A	122	ORIFICE			
OR9	CB117B	117	ORIFICE			
W1	CB110C	C110C-OF	WEIR			

W3	CB108A	C108A-OF	WEIR
W4	CB119C	C119C-OF	WEIR

****
Cross Section Summary
****

Conduit	Shape	Full Depth	Full Area	Hyd. Rad.	Max. Width	No. of Barrels	Full Flow
103	CIRCULAR	0.68	0.36	0.17	0.68	1	377.10
120-123	CIRCULAR	0.38	0.11	0.09	0.38	1	110.87
C1	CIRCULAR	0.30	0.07	0.07	0.30	1	98.81
C10	RL	0.30	2.85	0.11	17.60	1	3924.12
C11	RL	0.30	2.85	0.11	17.60	1	4151.82
C12	RL	0.30	2.85	0.11	17.60	1	6003.62
C14	RL	0.30	2.85	0.11	17.60	1	3913.75
C15	RL	0.30	2.85	0.11	17.60	1	5134.37
C16	RL	0.30	2.85	0.11	17.60	1	4167.50
C17	RL	0.30	2.85	0.11	17.60	1	4909.34
C19	BTB	0.13	0.60	0.07	9.20	1	345.39
C20	BTB	0.13	0.60	0.07	9.20	1	924.88
C21	BTB	0.13	0.60	0.07	9.20	1	505.78
C22	BTB	0.13	0.60	0.07	9.20	1	284.54
C23	BTB	0.13	0.60	0.07	9.20	1	409.30
C24	BTB	0.13	0.60	0.07	9.20	1	672.33
C27	BTB	0.13	0.60	0.07	9.20	1	554.41
C28	BTB	0.13	0.60	0.07	9.20	1	483.05
C29	BTB	0.13	0.60	0.07	9.20	1	585.02
C30	BTB	0.13	0.60	0.07	9.20	1	524.65
C32	RL	0.30	2.85	0.11	17.60	1	6365.08
C33	RL	0.30	2.85	0.11	17.60	1	4365.97
C34	RL	0.30	2.85	0.11	17.60	1	5015.84
C35	RL	0.30	2.85	0.11	17.60	1	4983.00
C36	RL	0.30	2.85	0.11	17.60	1	5085.61
C37	RL	0.30	2.85	0.11	17.60	1	4044.11
C38	RL	0.30	2.85	0.11	17.60	1	4638.22
C39	RL	0.30	2.85	0.11	17.60	1	5112.45
C4	RL	0.30	2.85	0.11	17.60	1	5390.99

C40	RL	0.30	2.85	0.11	17.60	1	4760.10
C41	RL	0.30	2.85	0.11	17.60	1	4394.60
C42	RL	0.30	2.85	0.11	17.60	1	5339.16
C43	RL	0.30	2.85	0.11	17.60	1	4591.23
C45	RL	0.30	2.85	0.11	17.60	1	5526.29
C46	RL	0.30	2.85	0.11	17.60	1	4407.55
C47	RL	0.30	2.85	0.11	17.60	1	4327.69
C48	RL	0.30	2.85	0.11	17.60	1	6308.35
C49	CIRCULAR	0.82	0.53	0.21	0.82	1	713.06
C5	RL	0.30	2.85	0.11	17.60	1	5437.16
C51	RL	0.30	2.85	0.11	17.60	1	6448.50
C52	RL	0.30	2.85	0.11	17.60	1	5849.21
C53	RL	0.30	2.85	0.11	17.60	1	7908.34
C56	BTB	0.13	0.60	0.07	9.20	1	755.01
C57	BTB	0.13	0.60	0.07	9.20	1	790.15
C6	RL	0.30	2.85	0.11	17.60	1	3990.10
C7	RL	0.30	2.85	0.11	17.60	1	4136.20
C8	RL	0.30	2.85	0.11	17.60	1	3805.03
C9	RL	0.30	2.85	0.11	17.60	1	4769.45
Pipe_14	CIRCULAR	0.38	0.11	0.09	0.38	1	96.14
Pipe_15	CIRCULAR	0.68	0.36	0.17	0.68	1	419.74
Pipe_15_(1)	CIRCULAR	0.68	0.36	0.17	0.68	1	420.81
Pipe_18	CIRCULAR	0.68	0.36	0.17	0.68	1	455.77
Pipe_18_(2)	CIRCULAR	0.60	0.28	0.15	0.60	1	299.63
Pipe_19	CIRCULAR	0.53	0.22	0.13	0.53	1	272.13
Pipe_20	CIRCULAR	0.53	0.22	0.13	0.53	1	271.77
Pipe_20_(1)	CIRCULAR	0.45	0.16	0.11	0.45	1	180.28
Pipe_20_(2)	CIRCULAR	0.30	0.07	0.07	0.30	1	78.16
Pipe_30	CIRCULAR	0.60	0.28	0.15	0.60	1	274.15
Pipe_31	CIRCULAR	0.38	0.11	0.09	0.38	1	111.44
Pipe_32	CIRCULAR	0.38	0.11	0.09	0.38	1	110.91
Pipe_33	CIRCULAR	0.30	0.07	0.07	0.30	1	61.27
Pipe_35	CIRCULAR	0.53	0.22	0.13	0.53	1	193.51
Pipe_35_(1)	CIRCULAR	0.30	0.07	0.07	0.30	1	78.04
Pipe_36	CIRCULAR	0.45	0.16	0.11	0.45	1	126.35
Pipe_37	CIRCULAR	0.45	0.16	0.11	0.45	1	127.59
Pipe_39	CIRCULAR	0.30	0.07	0.07	0.30	1	61.07
Pipe_40	CIRCULAR	0.38	0.11	0.09	0.38	1	96.01
Pipe_40_(2)	CIRCULAR	0.38	0.11	0.09	0.38	1	97.41
Pipe_40_(3)	CIRCULAR	0.30	0.07	0.07	0.30	1	61.25
Pipe_6	CIRCULAR	0.82	0.53	0.21	0.82	1	964.01
Pipe_7	CIRCULAR	0.82	0.53	0.21	0.82	1	721.41
Pipe_8	CIRCULAR	0.45	0.16	0.11	0.45	1	180.65
Pipe_9	CIRCULAR	0.38	0.11	0.09	0.38	1	110.85
Pipe_94	CIRCULAR	0.82	0.53	0.21	0.82	1	724.13
Pipe_95	CIRCULAR	0.38	0.11	0.09	0.38	1	94.31

****
Transect Summary
****

Transect BTB
Area:

0.0004	0.0015	0.0034	0.0060	0.0094
0.0136	0.0185	0.0242	0.0306	0.0378
0.0457	0.0544	0.0638	0.0740	0.0849
0.0967	0.1091	0.1223	0.1363	0.1510
0.1665	0.1827	0.1997	0.2175	0.2360
0.2552	0.2752	0.2960	0.3175	0.3398
0.3628	0.3870	0.4126	0.4394	0.4676
0.4971	0.5279	0.5600	0.5934	0.6275
0.6622	0.6975	0.7333	0.7697	0.8067
0.8442	0.8823	0.9210	0.9602	1.0000

Hrad:

0.0190	0.0381	0.0571	0.0762	0.0952
0.1143	0.1333	0.1524	0.1714	0.1905
0.2095	0.2286	0.2476	0.2667	0.2857
0.3048	0.3238	0.3429	0.3619	0.3809
0.4000	0.4190	0.4381	0.4571	0.4762
0.4952	0.5143	0.5333	0.5524	0.5714
0.5906	0.6092	0.6266	0.6429	0.6583
0.6728	0.6866	0.6997	0.7183	0.7479
0.7765	0.8044	0.8314	0.8576	0.8831
0.9078	0.9319	0.9552	0.9779	1.0000

Width:

0.0188	0.0377	0.0565	0.0754	0.0942
0.1130	0.1319	0.1507	0.1696	0.1884

```
            0.2072     0.2261     0.2449     0.2638     0.2826
            0.3014     0.3203     0.3391     0.3580     0.3768
            0.3957     0.4145     0.4333     0.4522     0.4710
            0.4899     0.5087     0.5275     0.5464     0.5652
            0.5873     0.6203     0.6533     0.6862     0.7192
            0.7522     0.7851     0.8181     0.8446     0.8587
            0.8728     0.8870     0.9011     0.9152     0.9293
            0.9435     0.9576     0.9717     0.9859     1.0000

Transect RL
Area:
            0.0004     0.0017     0.0037     0.0067     0.0104
            0.0150     0.0204     0.0266     0.0337     0.0416
            0.0503     0.0599     0.0703     0.0816     0.0943
            0.1085     0.1241     0.1407     0.1579     0.1757
            0.1941     0.2132     0.2329     0.2532     0.2741
            0.2957     0.3178     0.3406     0.3641     0.3881
            0.4128     0.4381     0.4640     0.4905     0.5177
            0.5455     0.5739     0.6029     0.6326     0.6629
            0.6938     0.7253     0.7575     0.7902     0.8236
            0.8577     0.8923     0.9276     0.9635     1.0000
Hrad:
            0.0260     0.0520     0.0780     0.1041     0.1301
            0.1561     0.1821     0.2081     0.2341     0.2601
            0.2862     0.3122     0.3382     0.3639     0.3866
            0.4065     0.4274     0.4670     0.5041     0.5387
            0.5710     0.6013     0.6298     0.6564     0.6814
            0.7049     0.7270     0.7478     0.7673     0.7857
            0.8031     0.8194     0.8349     0.8495     0.8632
            0.8762     0.8885     0.9002     0.9112     0.9216
            0.9315     0.9408     0.9496     0.9580     0.9660
            0.9735     0.9807     0.9875     0.9939     1.0000
Width:
            0.0226     0.0452     0.0677     0.0903     0.1129
            0.1355     0.1580     0.1806     0.2032     0.2258
            0.2483     0.2709     0.2935     0.3258     0.3653
            0.4048     0.4412     0.4582     0.4751     0.4920
            0.5090     0.5259     0.5428     0.5598     0.5767
            0.5936     0.6106     0.6275     0.6444     0.6614
```

```
            0.6783     0.6952     0.7122     0.7291     0.7460
            0.7630     0.7799     0.7968     0.8138     0.8307
            0.8476     0.8645     0.8815     0.8984     0.9153
            0.9323     0.9492     0.9661     0.9831     1.0000


***************
Analysis Options
***************
Flow Units ............... LPS
Process Models:
  Rainfall/Runoff ........ YES
  RDII ................... NO
  Snowmelt ............... NO
  Groundwater ............ NO
  Flow Routing ........... YES
  Ponding Allowed ........ YES
  Water Quality .......... NO
Infiltration Method ...... HORTON
Flow Routing Method ...... DYNWAVE
Surcharge Method ......... EXTRAN
Starting Date ............ 02/23/2026 00:00:00
Ending Date .............. 02/23/2026 06:00:00
Antecedent Dry Days ...... 0.0
Report Time Step ......... 00:01:00
Wet Time Step ............ 00:01:00
Dry Time Step ............ 00:01:00
Routing Time Step ........ 1.00 sec
Variable Time Step ....... NO
Maximum Trials ........... 8
Number of Threads ........ 16
Head Tolerance ........... 0.001500 m


*************************        Volume         Depth
Runoff Quantity Continuity     hectare-m            mm
*************************     ---------       -------
Total Precipitation ......         0.265        71.667
Evaporation Loss .........         0.000         0.000
```

```
  Infiltration Loss ........          0.046        12.517
  Surface Runoff ...........          0.215        58.039
  Final Storage ............          0.004         1.162
  Continuity Error (%) .....         -0.073

  **************************        Volume        Volume
  Flow Routing Continuity        hectare-m      10^6 ltr
  **************************     ---------     ---------
  Dry Weather Inflow .......          0.000         0.000
  Wet Weather Inflow .......          0.215         2.146
  Groundwater Inflow .......          0.000         0.000
  RDII Inflow ..............          0.000         0.000
  External Inflow ..........          0.000         0.000
  External Outflow .........          0.207         2.071
  Flooding Loss ............          0.000         0.000
  Evaporation Loss .........          0.000         0.000
  Exfiltration Loss ........          0.000         0.000
  Initial Stored Volume ....          0.000         0.000
  Final Stored Volume ......          0.007         0.075
  Continuity Error (%) .....          0.013


  ************************
  Highest Continuity Errors
  ************************
  Node SU7 (-219.42%)
  Node SU13 (-4.89%)
  Node SU5 (3.00%)


  *******************************
  Highest Flow Instability Indexes
  *******************************
  Link OL1 (59)
  Link C2 (33)
  Link C1 (9)
```

```
  *********************************
  Most Frequent Nonconverging Nodes
  *********************************
  Convergence obtained at all time steps.


  ************************
  Routing Time Step Summary
  ************************
  Minimum Time Step           :     1.00 sec
  Average Time Step           :     1.00 sec
  Maximum Time Step           :     1.00 sec
  % of Time in Steady State   :     0.00
  Average Iterations per Step :     2.03
  % of Steps Not Converging   :     0.05


  ***************************
  Subcatchment Runoff Summary
  ***************************

-----------------------------------------------------------------------------------------------------------
-------------------
                           Total      Total      Total      Total     Imperv       Perv      Total
Total     Peak  Runoff
                          Precip      Runon       Evap      Infil     Runoff     Runoff     Runoff
Runoff   Runoff   Coeff
  Subcatchment                mm         mm         mm         mm         mm         mm         mm    10^6
ltr      LPS

-----------------------------------------------------------------------------------------------------------
-------------------
  C103AA                   71.67       0.00       0.00       3.17      65.10       1.95      67.05
0.09    66.31   0.936
  C105AA                   71.67       0.00       0.00       6.50      60.07       3.74      63.81
0.09    66.98   0.890
  C106A                    71.67       0.00       0.00       9.48      55.15       5.89      61.04
0.01     8.34   0.852
```

C107A			71.67	0.00	0.00	6.34	60.13	3.90	64.03
0.04	27.50	0.893							
C108A			71.67	0.00	0.00	23.64	35.08	12.20	47.28
0.05	33.90	0.660							
C110A			71.67	0.00	0.00	9.74	55.10	5.62	60.72
0.12	85.38	0.847							
C110B			71.67	0.00	0.00	9.60	55.12	5.77	60.89
0.09	68.87	0.850							
C110C			71.67	0.00	0.00	29.45	27.06	14.58	41.65
0.07	43.81	0.581							
C114A			71.67	0.00	0.00	9.80	55.09	5.56	60.66
0.15	107.20	0.846							
C115A			71.67	0.00	0.00	8.97	56.12	5.37	61.49
0.08	62.10	0.858							
C115B			71.67	0.00	0.00	9.69	55.11	5.67	60.78
0.11	78.36	0.848							
C117A			71.67	0.00	0.00	9.62	55.12	5.75	60.87
0.15	112.09	0.849							
C117B			71.67	0.00	0.00	9.71	55.10	5.65	60.76
0.12	86.18	0.848							
C119A			71.67	0.00	0.00	4.46	63.10	2.72	65.82
0.10	71.28	0.918							
C119CA			71.67	0.00	0.00	24.90	35.06	10.94	45.99
0.13	80.31	0.642							
C121A			71.67	0.00	0.00	9.09	56.10	5.24	61.34
0.10	73.28	0.856							
C122A			71.67	0.00	0.00	8.99	56.11	5.35	61.46
0.08	62.30	0.858							
C123A			71.67	0.00	0.00	4.46	63.10	2.71	65.82
0.10	71.84	0.918							
C123B			71.67	0.00	0.00	9.59	55.12	5.77	60.89
0.10	73.35	0.850							
C124A			71.67	0.00	0.00	9.62	55.12	5.75	60.86
0.08	63.25	0.849							
C124B			71.67	0.00	0.00	9.61	55.12	5.76	60.88
0.12	88.12	0.849							
TANK-1			71.67	0.00	0.00	27.40	30.07	13.56	43.63
0.05	32.63	0.609							
UNC-1			71.67	0.00	0.00	19.50	40.10	11.23	51.33
0.07	54.54	0.716							
UNC-2			71.67	0.00	0.00	19.50	40.10	11.23	51.33
0.03	24.67	0.716							
UNC-3			71.67	0.00	0.00	26.30	30.08	14.66	44.75
0.03	22.73	0.624							

****
Node Depth Summary
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Node	Type	Average Depth Meters	Maximum Depth Meters	Maximum HGL Meters	Time of Max Occurrence days hr:min	Reported Max Depth Meters
C108A-OF	OUTFALL	0.00	0.00	88.49	0 00:00	0.00
C110C-OF	OUTFALL	0.00	0.00	88.49	0 00:00	0.00
C119C-OF	OUTFALL	0.00	0.00	87.83	0 00:00	0.00
CODD-E	OUTFALL	0.00	0.04	89.24	0 01:10	0.04
CODD-W	OUTFALL	0.00	0.05	89.36	0 01:10	0.05
J7	OUTFALL	0.00	0.00	83.54	0 00:00	0.00
UNC-1OF	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
UNC-2OF	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
UNC-3OF	OUTFALL	0.00	0.00	0.00	0 00:00	0.00
100	STORAGE	0.23	0.75	86.25	0 01:12	0.75
100A	STORAGE	0.62	1.15	86.15	0 01:12	1.15
100B	STORAGE	0.57	1.03	86.03	0 01:10	1.03
101	STORAGE	0.33	0.87	86.31	0 01:12	0.87
102	STORAGE	0.39	0.89	86.43	0 01:13	0.89
103	STORAGE	0.39	0.86	86.48	0 01:12	0.86
104	STORAGE	0.31	0.74	86.55	0 01:12	0.74
105	STORAGE	0.32	0.73	86.62	0 01:12	0.73
106	STORAGE	0.37	0.73	86.72	0 01:11	0.73
107	STORAGE	0.34	0.63	86.77	0 01:12	0.63
108	STORAGE	0.35	0.46	86.93	0 01:07	0.46
109	STORAGE	0.34	0.63	86.86	0 01:13	0.63
110	STORAGE	0.34	0.58	87.01	0 01:13	0.58
111	STORAGE	0.25	0.36	87.13	0 01:14	0.36

112	STORAGE	0.00	0.00	86.86	0	00:00	0.00
113	STORAGE	0.35	0.67	86.92	0	01:15	0.67
114	STORAGE	0.34	0.59	87.19	0	01:14	0.59
115	STORAGE	0.33	0.54	87.30	0	01:14	0.54
116	STORAGE	0.20	0.42	86.69	0	01:13	0.42
117	STORAGE	0.27	0.46	87.11	0	01:16	0.46
118	STORAGE	0.38	0.84	86.44	0	01:13	0.84
119	STORAGE	0.34	0.74	86.71	0	01:13	0.74
119A	STORAGE	0.42	0.61	86.84	0	01:04	0.61
120	STORAGE	0.36	0.74	86.89	0	01:14	0.74
121	STORAGE	0.34	0.60	87.00	0	01:14	0.60
122	STORAGE	0.31	0.47	87.18	0	01:13	0.47
123	STORAGE	0.32	0.52	87.14	0	01:03	0.52
124	STORAGE	0.33	0.56	87.31	0	01:13	0.56
CB103A1	STORAGE	0.18	2.52	89.44	0	01:10	2.52
CB105A1	STORAGE	0.21	2.27	89.46	0	01:10	2.27
CB106A	STORAGE	0.03	0.69	88.79	0	01:10	0.68
CB107A	STORAGE	0.09	1.42	89.79	0	01:10	1.42
CB108A	STORAGE	0.12	1.51	88.51	0	01:10	1.51
CB110A	STORAGE	0.20	1.56	89.81	0	01:15	1.56
CB110B	STORAGE	0.15	1.53	89.69	0	01:11	1.53
CB110C	STORAGE	0.49	1.24	88.51	0	01:10	1.24
CB114A	STORAGE	0.21	1.67	89.59	0	01:14	1.67
CB115A	STORAGE	0.14	1.54	89.67	0	01:12	1.54
CB115B	STORAGE	0.18	1.56	89.64	0	01:13	1.56
CB117A	STORAGE	0.20	1.59	89.47	0	01:13	1.59
CB117B	STORAGE	0.21	1.58	89.58	0	01:16	1.58
CB119A	STORAGE	0.11	1.44	89.79	0	01:10	1.44
CB119C	STORAGE	0.25	1.38	87.86	0	01:10	1.38
CB121A	STORAGE	0.14	1.52	89.70	0	01:10	1.52
CB122A	STORAGE	0.14	1.52	89.63	0	01:11	1.52
CB123A	STORAGE	0.15	1.57	89.65	0	01:11	1.57
CB123B	STORAGE	0.16	1.55	89.63	0	01:12	1.55
CB124A	STORAGE	0.14	1.54	89.60	0	01:11	1.54
CB124B	STORAGE	0.22	1.59	89.62	0	01:16	1.59
CULTEC	STORAGE	0.63	1.15	86.15	0	01:10	1.15
SU10	STORAGE	0.00	0.01	89.82	0	01:13	0.01
SU12	STORAGE	0.00	0.00	89.91	0	00:00	0.00
SU13	STORAGE	0.00	0.02	89.70	0	01:10	0.02
SU14	STORAGE	0.00	0.00	89.62	0	00:00	0.00
SU15	STORAGE	0.00	0.00	89.58	0	01:14	0.00
SU17	STORAGE	0.00	0.00	89.53	0	00:00	0.00
SU18	STORAGE	0.00	0.04	89.46	0	01:10	0.04
SU19	STORAGE	0.00	0.00	89.61	0	00:00	0.00
SU2	STORAGE	0.00	0.00	90.12	0	00:00	0.00
SU20	STORAGE	0.00	0.00	89.62	0	00:00	0.00
SU21	STORAGE	0.00	0.01	89.65	0	01:10	0.01
SU22	STORAGE	0.00	0.05	89.65	0	01:11	0.05
SU23	STORAGE	0.00	0.02	89.65	0	01:12	0.02
SU25	STORAGE	0.00	0.00	89.74	0	00:00	0.00
SU3	STORAGE	0.00	0.00	89.83	0	00:00	0.00
SU4	STORAGE	0.00	0.03	89.69	0	01:11	0.03
SU5	STORAGE	0.00	0.03	89.63	0	01:12	0.03
SU6	STORAGE	0.00	0.00	89.81	0	00:00	0.00
SU7	STORAGE	0.00	0.01	89.67	0	01:14	0.01
SU8	STORAGE	0.00	0.02	89.69	0	01:11	0.02

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Node Inflow Summary
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Node	Type	Maximum Lateral Inflow LPS	Maximum Total Inflow LPS	Time of Max Occurrence days hr:min		Lateral Inflow Volume 10^6 ltr	Total Inflow Volume 10^6 ltr	Flow Balance Error Percent
C108A-OF	OUTFALL	0.00	17.24	0	01:10	0	0.00621	0.000
C110C-OF	OUTFALL	0.00	23.87	0	01:10	0	0.00993	0.000
C119C-OF	OUTFALL	0.00	33.71	0	01:10	0	0.012	0.000
CODD-E	OUTFALL	0.00	39.20	0	01:10	0	0.0152	0.000
CODD-W	OUTFALL	0.00	69.66	0	01:10	0	0.0273	0.000
J7	OUTFALL	0.00	685.35	0	01:10	0	1.87	0.000
UNC-1OF	OUTFALL	54.54	54.54	0	01:10	0.0709	0.0709	0.000
UNC-2OF	OUTFALL	24.67	24.67	0	01:10	0.0321	0.0321	0.000
UNC-3OF	OUTFALL	22.73	22.73	0	01:10	0.0301	0.0301	0.000
100	STORAGE	0.00	661.81	0	01:13	0	1.89	0.190

100A	STORAGE	0.00	562.18	0	01:12	0	1.27	0.008	
100B	STORAGE	0.00	685.21	0	01:10	0	1.87	-0.002	
101	STORAGE	0.00	661.79	0	01:13	0	1.89	0.028	
102	STORAGE	0.00	378.67	0	01:13	0	1.11	-0.041	
103	STORAGE	0.00	378.73	0	01:12	0	1.11	-0.030	
104	STORAGE	0.00	342.53	0	01:12	0	1.03	0.043	
105	STORAGE	0.00	342.69	0	01:11	0	1.03	0.086	
106	STORAGE	0.00	238.23	0	01:10	0	0.683	0.018	
107	STORAGE	0.00	124.40	0	01:12	0	0.345	-0.017	
108	STORAGE	0.00	16.63	0	01:10	0	0.0429	0.057	
109	STORAGE	0.00	92.03	0	01:13	0	0.269	-0.474	
110	STORAGE	0.00	92.05	0	01:12	0	0.269	0.177	
111	STORAGE	0.00	5.05	0	01:14	0	0.00755	0.124	
112	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
113	STORAGE	0.00	104.40	0	01:14	0	0.327	-0.069	
114	STORAGE	0.00	104.40	0	01:14	0	0.327	0.050	
115	STORAGE	0.00	67.43	0	01:13	0	0.19	0.188	
116	STORAGE	0.00	78.59	0	01:16	0	0.269	-0.027	
117	STORAGE	0.00	78.60	0	01:15	0	0.269	0.004	
118	STORAGE	0.00	283.12	0	01:13	0	0.772	-0.199	
119	STORAGE	0.00	283.30	0	01:12	0	0.773	0.106	
119A	STORAGE	0.00	46.58	0	01:10	0	0.114	0.257	
120	STORAGE	0.00	205.30	0	01:13	0	0.577	-0.196	
121	STORAGE	0.00	137.80	0	01:13	0	0.386	0.124	
122	STORAGE	0.00	37.03	0	01:12	0	0.0898	0.008	
123	STORAGE	0.00	67.57	0	01:11	0	0.193	0.059	
124	STORAGE	0.00	67.58	0	01:13	0	0.206	-0.108	
CB103A1	STORAGE	66.31	107.24	0	01:10	0.0917	0.112	0.637	
CB105A1	STORAGE	66.98	66.98	0	01:10	0.0937	0.0937	-0.016	
CB106A	STORAGE	8.34	12.10	0	01:10	0.0107	0.0123	0.001	
CB107A	STORAGE	27.50	27.50	0	01:10	0.0368	0.0368	-0.183	
CB108A	STORAGE	33.90	33.90	0	01:10	0.0491	0.0491	0.001	
CB110A	STORAGE	85.38	85.38	0	01:10	0.117	0.117	-0.088	
CB110B	STORAGE	68.87	68.87	0	01:10	0.0911	0.0914	-0.239	
CB110C	STORAGE	43.81	43.81	0	01:10	0.0667	0.0667	0.795	
CB114A	STORAGE	107.20	114.10	0	01:10	0.148	0.151	0.173	
CB115A	STORAGE	62.10	64.66	0	01:10	0.0828	0.0845	-0.021	
CB115B	STORAGE	78.36	78.36	0	01:10	0.106	0.106	-0.003	
CB117A	STORAGE	112.09	112.09	0	01:10	0.149	0.149	-0.115	

CB117B	STORAGE	86.18	89.08	0	01:10	0.117	0.121	-0.072	
CB119A	STORAGE	71.28	71.28	0	01:10	0.0977	0.0977	-0.620	
CB119C	STORAGE	80.31	80.31	0	01:10	0.127	0.127	0.172	
CB121A	STORAGE	73.28	73.28	0	01:10	0.1	0.101	-0.088	
CB122A	STORAGE	62.30	72.90	0	01:10	0.0835	0.0887	-0.181	
CB123A	STORAGE	71.84	85.73	0	01:08	0.0986	0.102	0.060	
CB123B	STORAGE	73.35	73.41	0	01:10	0.097	0.0972	-0.083	
CB124A	STORAGE	63.25	63.25	0	01:10	0.0841	0.0841	0.035	
CB124B	STORAGE	88.12	101.16	0	01:10	0.117	0.122	0.235	
CULTEC	STORAGE	32.63	124.43	0	01:10	0.0493	0.658	-0.531	
SU10	STORAGE	0.00	6.62	0	01:12	0	0.000434	114.742	
SU12	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU13	STORAGE	0.00	11.28	0	01:10	0	0.00416	-4.658	
SU14	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU15	STORAGE	0.00	7.72	0	01:14	0	0.000544	154.652	
SU17	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU18	STORAGE	0.00	39.29	0	01:10	0	0.0153	0.144	
SU19	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU2	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU20	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU21	STORAGE	0.00	9.78	0	01:10	0	0.000684	52.003	
SU22	STORAGE	0.00	70.66	0	01:09	0	0.0231	-0.860	
SU23	STORAGE	0.00	1.71	0	01:10	0	0.000239	29.388	
SU25	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU3	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU4	STORAGE	0.00	31.96	0	01:10	0	0.0104	-1.812	
SU5	STORAGE	0.00	17.90	0	01:10	0	0.00441	3.091	
SU6	STORAGE	0.00	0.00	0	00:00	0	0	0.000	ltr
SU7	STORAGE	0.00	0.09	0	01:11	0	4.44e-06	-9.742	ltr
SU8	STORAGE	0.00	11.72	0	01:09	0	0.002	7.197	

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Node Surcharge Summary
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No nodes were surcharged.

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Node Flooding Summary
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No nodes were flooded.

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Storage Volume Summary
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Storage Unit	Average Volume 1000 m	Avg Pcnt Full	Evap Pcnt Loss	Exfil Pcnt Loss	Maximum Volume 1000 m	Max Pcnt Full	Time of Max Occurrence days hr:min	Maximum Outflow LPS
100	0.000	5.4	0.0	0.0	0.001	17.5	0 01:12	661.85
100A	0.001	17.6	0.0	0.0	0.001	33.0	0 01:12	562.18
100B	0.001	11.7	0.0	0.0	0.001	21.3	0 01:10	685.35
101	0.000	7.9	0.0	0.0	0.001	20.5	0 01:12	661.81
102	0.000	9.5	0.0	0.0	0.001	21.7	0 01:13	378.68
103	0.000	9.8	0.0	0.0	0.001	21.7	0 01:12	378.67
104	0.000	8.0	0.0	0.0	0.001	19.3	0 01:12	342.31
105	0.000	8.7	0.0	0.0	0.001	20.2	0 01:12	342.53
106	0.000	9.9	0.0	0.0	0.001	19.8	0 01:11	237.87
107	0.000	9.2	0.0	0.0	0.001	16.8	0 01:12	124.51
108	0.000	9.8	0.0	0.0	0.001	12.9	0 01:07	16.64
109	0.000	9.6	0.0	0.0	0.001	17.7	0 01:13	92.33
110	0.000	10.5	0.0	0.0	0.001	18.2	0 01:13	92.03
111	0.000	9.0	0.0	0.0	0.000	12.9	0 01:14	5.05
112	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
113	0.000	10.5	0.0	0.0	0.001	20.2	0 01:15	104.39
114	0.000	11.6	0.0	0.0	0.001	20.2	0 01:14	104.40
115	0.000	11.2	0.0	0.0	0.001	18.3	0 01:14	67.42
116	0.000	6.3	0.0	0.0	0.000	13.3	0 01:13	78.67
117	0.000	8.9	0.0	0.0	0.001	15.6	0 01:16	78.59
118	0.000	9.2	0.0	0.0	0.001	20.5	0 01:13	283.13
119	0.000	8.0	0.0	0.0	0.001	17.7	0 01:13	283.12
119A	0.000	9.8	0.0	0.0	0.001	14.4	0 01:04	46.60
120	0.000	9.6	0.0	0.0	0.001	19.9	0 01:14	205.59
121	0.000	10.3	0.0	0.0	0.001	18.4	0 01:14	137.77
122	0.000	10.7	0.0	0.0	0.001	16.3	0 01:13	37.02
123	0.000	10.9	0.0	0.0	0.001	17.6	0 01:03	67.79
124	0.000	12.0	0.0	0.0	0.001	19.9	0 01:13	67.58
CB103A1	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	106.15
CB105A1	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	66.10
CB106A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	11.02
CB107A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	27.40
CB108A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	33.88
CB110A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	40.44
CB110B	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	45.08
CB110C	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	43.79
CB114A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	45.76
CB115A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	33.69
CB115B	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	33.81
CB117A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	44.55
CB117B	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	41.76
CB119A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	70.34
CB119C	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	80.29
CB121A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	65.29
CB122A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	51.19
CB123A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	69.06
CB123B	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	33.71
CB124A	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	33.57
CB124B	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	34.07
CULTEC	0.057	86.4	0.0	0.0	0.066	100.0	0 00:54	124.36
SU10	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.23
SU12	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
SU13	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	10.78
SU14	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
SU15	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.18
SU17	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
SU18	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	39.20
SU19	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
SU2	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
SU20	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	0.00
SU21	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	1.14
SU22	0.000	0.0	0.0	0.0	0.000	0.0	0 00:00	47.93

SU23	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	1.21
SU25	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
SU3	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
SU4	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	28.35
SU5	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	10.17
SU6	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	0.00
SU7	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	5.49
SU8	0.000	0.0	0.0	0.0	0.000	0.0	0	00:00	6.04

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Outfall Loading Summary
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Outfall Node	Flow Freq Pcnt	Avg Flow LPS	Max Flow LPS	Total Volume 10^6 ltr
C108A-OF	2.84	10.12	17.24	0.006
C110C-OF	5.03	9.14	23.87	0.010
C119C-OF	2.72	20.48	33.71	0.012
CODD-E	4.95	14.24	39.20	0.015
CODD-W	3.72	33.92	69.66	0.027
J7	86.47	99.95	685.35	1.867
UNC-1OF	54.30	6.04	54.54	0.071
UNC-2OF	51.22	2.90	24.67	0.032
UNC-3OF	49.81	2.79	22.73	0.030
System	29.01	199.58	969.19	2.071

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Link Flow Summary
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Link	Type	Maximum |Flow| LPS	Time of Max Occurrence days	Time of Max Occurrence hr:min	Maximum |Veloc| m/sec	Max/ Full Flow	Max/ Full Depth
103	CONDUIT	342.53	0	01:12	1.23	0.91	0.75
120-123	CONDUIT	67.79	0	01:04	1.00	0.61	0.67
C1	CONDUIT	124.36	0	01:10	1.76	1.26	1.00
C10	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C11	CHANNEL	5.49	0	01:14	0.02	0.00	0.32
C12	CHANNEL	6.04	0	01:11	0.15	0.00	0.31
C14	CHANNEL	11.72	0	01:09	0.06	0.00	0.29
C15	CHANNEL	0.13	0	01:13	0.07	0.00	0.26
C16	CHANNEL	6.62	0	01:12	0.03	0.00	0.32
C17	CHANNEL	0.00	0	00:00	0.00	0.00	0.31
C19	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C20	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C21	CHANNEL	0.00	0	00:00	0.00	0.00	0.18
C22	CHANNEL	1.71	0	01:10	0.07	0.01	0.25
C23	CHANNEL	37.94	0	01:09	0.54	0.09	0.40
C24	CHANNEL	0.00	0	00:00	0.00	0.00	0.22
C27	CHANNEL	3.81	0	01:10	0.28	0.01	0.16
C28	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C29	CHANNEL	0.00	0	00:00	0.00	0.00	0.13
C30	CHANNEL	11.28	0	01:10	0.56	0.02	0.21
C32	CHANNEL	0.00	0	00:00	0.00	0.00	0.29
C33	CHANNEL	0.53	0	01:10	0.05	0.00	0.30
C34	CHANNEL	9.78	0	01:10	0.05	0.00	0.33
C35	CHANNEL	32.82	0	01:09	0.14	0.01	0.39
C36	CHANNEL	15.63	0	01:11	0.04	0.00	0.38
C37	CHANNEL	0.00	0	00:00	0.00	0.00	0.34
C38	CHANNEL	0.00	0	00:00	0.00	0.00	0.27
C39	CHANNEL	0.00	0	00:00	0.00	0.00	0.27
C4	CHANNEL	0.00	0	00:00	0.00	0.00	0.00
C40	CHANNEL	10.17	0	01:12	0.05	0.00	0.38
C41	CHANNEL	7.72	0	01:14	0.04	0.00	0.35
C42	CHANNEL	0.10	0	01:14	0.06	0.00	0.35
C43	CHANNEL	0.00	0	00:00	0.00	0.00	0.34
C45	CHANNEL	0.00	0	00:00	0.00	0.00	0.30
C46	CHANNEL	0.00	0	00:00	0.00	0.00	0.30
C47	CHANNEL	0.00	0	00:00	0.00	0.00	0.33
C48	CHANNEL	6.97	0	01:10	0.05	0.00	0.36

C49	CONDUIT	562.18	0	01:12	1.67	0.79	0.60
C5	CHANNEL	0.00	0	00:00	0.00	0.00	0.23
C51	CHANNEL	0.00	0	00:00	0.00	0.00	0.24
C52	CHANNEL	39.29	0	01:10	0.14	0.01	0.30
C53	CHANNEL	39.20	0	01:10	0.83	0.00	0.13
C56	CHANNEL	46.54	0	01:11	0.61	0.06	0.38
C57	CHANNEL	69.66	0	01:10	0.71	0.09	0.42
C6	CHANNEL	31.96	0	01:10	0.13	0.01	0.28
C7	CHANNEL	12.72	0	01:11	0.12	0.00	0.28
C8	CHANNEL	17.90	0	01:10	0.13	0.00	0.28
C9	CHANNEL	0.00	0	00:00	0.00	0.00	0.05
Pipe_14	CONDUIT	67.58	0	01:13	0.92	0.70	0.65
Pipe_15	CONDUIT	342.31	0	01:12	1.16	0.82	0.79
Pipe_15_(1)	CONDUIT	378.67	0	01:13	1.20	0.90	0.82
Pipe_18	CONDUIT	378.68	0	01:13	1.30	0.83	0.80
Pipe_18_(2)	CONDUIT	283.13	0	01:13	1.24	0.94	0.80
Pipe_19	CONDUIT	283.12	0	01:13	1.41	1.04	0.89
Pipe_20	CONDUIT	205.59	0	01:15	1.26	0.76	0.78
Pipe_20_(1)	CONDUIT	137.77	0	01:13	1.14	0.76	0.74
Pipe_20_(2)	CONDUIT	46.60	0	01:10	1.03	0.60	0.71
Pipe_30	CONDUIT	237.87	0	01:11	1.13	0.87	0.72
Pipe_31	CONDUIT	104.39	0	01:15	1.09	0.94	0.81
Pipe_32	CONDUIT	104.40	0	01:14	1.07	0.94	0.86
Pipe_33	CONDUIT	58.65	0	01:13	1.07	0.96	0.75
Pipe_35	CONDUIT	124.51	0	01:12	0.87	0.64	0.65
Pipe_35_(1)	CONDUIT	16.64	0	01:10	0.88	0.21	0.33
Pipe_36	CONDUIT	92.33	0	01:15	0.91	0.73	0.65
Pipe_37	CONDUIT	92.03	0	01:13	0.84	0.72	0.67
Pipe_39	CONDUIT	37.02	0	01:13	0.97	0.61	0.54
Pipe_40	CONDUIT	5.05	0	01:14	0.48	0.05	0.15
Pipe_40_(2)	CONDUIT	0.00	0	00:00	0.00	0.00	0.00
Pipe_40_(3)	CONDUIT	3.72	0	01:14	0.19	0.06	0.32
Pipe_6	CONDUIT	685.35	0	01:10	2.02	0.71	0.61
Pipe_7	CONDUIT	562.18	0	01:12	1.60	0.78	0.63
Pipe_8	CONDUIT	78.67	0	01:16	0.99	0.44	0.61
Pipe_9	CONDUIT	78.59	0	01:16	1.16	0.71	0.59
Pipe_94	CONDUIT	661.81	0	01:13	1.52	0.91	0.76
Pipe_95	CONDUIT	5.05	0	01:14	0.51	0.05	0.14
C2	ORIFICE	101.35	0	00:54			1.00

OL1	ORIFICE	46.58	0	01:10	1.00
OL10	ORIFICE	16.66	0	01:12	1.00
OL11	ORIFICE	17.03	0	01:16	1.00
OL12	ORIFICE	22.27	0	01:13	1.00
OL13	ORIFICE	26.80	0	01:10	1.00
OL15	ORIFICE	11.02	0	01:10	1.00
OL16	ORIFICE	16.12	0	01:10	1.00
OL17	ORIFICE	16.63	0	01:10	1.00
OL18	ORIFICE	22.88	0	01:14	1.00
OL19	ORIFICE	16.92	0	01:15	1.00
OL2	ORIFICE	16.20	0	01:10	1.00
OL20	ORIFICE	16.91	0	01:13	1.00
OL21	ORIFICE	16.73	0	01:11	1.00
OL22	ORIFICE	16.81	0	01:12	1.00
OL23	ORIFICE	19.92	0	01:10	1.00
OL3	ORIFICE	16.94	0	01:11	1.00
OL4	ORIFICE	16.85	0	01:12	1.00
OL5	ORIFICE	36.49	0	01:10	1.00
OL7	ORIFICE	16.78	0	01:11	1.00
OL8	ORIFICE	17.04	0	01:16	1.00
OL9	ORIFICE	16.67	0	01:10	1.00
OR10	ORIFICE	22.27	0	01:13	1.00
OR11	ORIFICE	16.91	0	01:13	1.00
OR12	ORIFICE	16.81	0	01:12	1.00
OR13	ORIFICE	22.88	0	01:14	1.00
OR14	ORIFICE	16.73	0	01:11	1.00
OR15	ORIFICE	16.92	0	01:15	1.00
OR2	ORIFICE	17.04	0	01:16	1.00
OR3	ORIFICE	16.78	0	01:11	1.00
OR4	ORIFICE	16.94	0	01:11	1.00
OR5	ORIFICE	16.85	0	01:12	1.00
OR6	ORIFICE	16.20	0	01:10	1.00
OR7	ORIFICE	16.67	0	01:10	1.00
OR8	ORIFICE	16.66	0	01:12	1.00
OR9	ORIFICE	17.03	0	01:16	1.00
W1	WEIR	23.87	0	01:10	0.20
W3	WEIR	17.24	0	01:10	0.23
W4	WEIR	33.71	0	01:10	0.25

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Flow Classification Summary
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Conduit	Adjusted /Actual Length	Fraction of Time in Flow Class: Dry	Up Dry	Down Dry	Sub Crit	Sup Crit	Up Crit	Down Crit	Norm Ltd	Inlet Ctrl
103	1.00	0.09	0.00	0.00	0.86	0.00	0.00	0.05	0.00	0.00
120-123	1.00	0.09	0.00	0.00	0.08	0.00	0.00	0.83	0.06	0.00
C1	1.00	0.14	0.01	0.00	0.15	0.01	0.01	0.69	0.00	0.00
C10	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C11	1.00	0.93	0.05	0.00	0.00	0.00	0.01	0.00	0.00	0.00
C12	1.00	0.17	0.02	0.00	0.05	0.00	0.00	0.76	0.05	0.00
C14	1.00	0.17	0.02	0.00	0.06	0.00	0.00	0.75	0.04	0.00
C15	1.00	0.17	0.03	0.00	0.05	0.00	0.00	0.75	0.05	0.00
C16	1.00	0.17	0.03	0.00	0.08	0.00	0.00	0.72	0.08	0.00
C17	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C19	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C20	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C21	1.00	0.17	0.83	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C22	1.00	0.17	0.01	0.00	0.81	0.00	0.00	0.00	0.80	0.00
C23	1.00	0.17	0.79	0.00	0.02	0.02	0.00	0.00	0.80	0.00
C24	1.00	0.96	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C27	1.00	0.18	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00
C28	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C29	1.00	0.97	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C30	1.00	0.18	0.80	0.00	0.00	0.02	0.00	0.00	0.80	0.00
C32	1.00	0.91	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C33	1.00	0.17	0.02	0.00	0.07	0.00	0.00	0.74	0.07	0.00
C34	1.00	0.17	0.02	0.00	0.06	0.00	0.00	0.75	0.05	0.00
C35	1.00	0.17	0.00	0.00	0.08	0.00	0.00	0.75	0.04	0.00
C36	1.00	0.17	0.01	0.00	0.11	0.00	0.00	0.71	0.11	0.00
C37	1.00	0.88	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C38	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C39	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C4	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C40	1.00	0.17	0.02	0.00	0.10	0.00	0.00	0.71	0.10	0.00
C41	1.00	0.17	0.03	0.00	0.08	0.00	0.00	0.71	0.07	0.00
C42	1.00	0.17	0.03	0.00	0.07	0.00	0.00	0.72	0.07	0.00
C43	1.00	0.89	0.11	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C45	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C46	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C47	1.00	0.90	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C48	1.00	0.17	0.01	0.00	0.10	0.00	0.00	0.72	0.10	0.00
C49	1.00	0.13	0.00	0.00	0.28	0.00	0.00	0.59	0.03	0.00
C5	1.00	0.93	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C51	1.00	0.94	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00
C52	1.00	0.17	0.01	0.00	0.06	0.00	0.00	0.76	0.02	0.00
C53	1.00	0.18	0.00	0.00	0.68	0.14	0.00	0.00	0.08	0.00
C56	1.00	0.17	0.00	0.00	0.02	0.01	0.00	0.80	0.02	0.00
C57	1.00	0.96	0.00	0.00	0.00	0.04	0.00	0.00	0.02	0.00
C6	1.00	0.17	0.01	0.00	0.06	0.00	0.00	0.76	0.02	0.00
C7	1.00	0.17	0.01	0.00	0.06	0.00	0.00	0.76	0.06	0.00
C8	1.00	0.17	0.01	0.00	0.05	0.00	0.00	0.76	0.03	0.00
C9	1.00	0.19	0.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Pipe_14	1.00	0.08	0.00	0.00	0.08	0.00	0.00	0.84	0.00	0.00
Pipe_15	1.00	0.10	0.01	0.00	0.90	0.00	0.00	0.00	0.72	0.00
Pipe_15_(1)	1.00	0.10	0.00	0.00	0.27	0.00	0.00	0.63	0.00	0.00
Pipe_18	1.00	0.11	0.00	0.00	0.09	0.00	0.00	0.81	0.00	0.00
Pipe_18_(2)	1.00	0.10	0.00	0.00	0.08	0.00	0.00	0.81	0.00	0.00
Pipe_19	1.00	0.09	0.00	0.00	0.10	0.00	0.00	0.81	0.00	0.00
Pipe_20	1.00	0.10	0.00	0.00	0.07	0.00	0.00	0.84	0.00	0.00
Pipe_20_(1)	1.00	0.09	0.00	0.00	0.09	0.00	0.00	0.81	0.02	0.00
Pipe_20_(2)	1.00	0.10	0.00	0.00	0.07	0.00	0.00	0.83	0.00	0.00
Pipe_30	1.00	0.10	0.00	0.00	0.14	0.00	0.00	0.76	0.00	0.00
Pipe_31	1.00	0.10	0.00	0.00	0.00	0.00	0.00	0.90	0.00	0.00
Pipe_32	1.00	0.09	0.00	0.00	0.45	0.00	0.00	0.46	0.29	0.00
Pipe_33	1.00	0.09	0.00	0.00	0.11	0.00	0.00	0.81	0.01	0.00
Pipe_35	1.00	0.10	0.00	0.00	0.14	0.00	0.00	0.76	0.00	0.00
Pipe_35_(1)	1.00	0.10	0.00	0.00	0.01	0.02	0.00	0.87	0.01	0.00
Pipe_36	1.00	0.10	0.00	0.00	0.08	0.00	0.00	0.82	0.00	0.00
Pipe_37	1.00	0.09	0.00	0.00	0.83	0.00	0.00	0.08	0.46	0.00
Pipe_39	1.00	0.09	0.00	0.00	0.06	0.00	0.00	0.85	0.00	0.00
Pipe_40	1.00	0.90	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.00
Pipe_40_(2)	1.00	1.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Pipe_40_(3)	1.00	0.56	0.36	0.00	0.08	0.00	0.00	0.00	0.83	0.00
Pipe_6	1.00	0.14	0.00	0.00	0.00	0.00	0.00	0.86	0.00	0.00
Pipe_7	1.00	0.56	0.00	0.00	0.09	0.00	0.00	0.35	0.00	0.00
Pipe_8	1.00	0.09	0.00	0.00	0.08	0.00	0.00	0.83	0.00	0.00
Pipe_9	1.00	0.08	0.00	0.00	0.00	0.00	0.00	0.92	0.00	0.00
Pipe_94	1.00	0.11	0.00	0.00	0.33	0.00	0.00	0.56	0.00	0.00
Pipe_95	1.00	0.18	0.00	0.00	0.00	0.00	0.00	0.82	0.00	0.00

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Conduit Surcharge Summary
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Conduit	Hours Full: Both Ends	Hours Full: Upstream	Hours Full: Dnstream	Hours Above Full Normal Flow	Hours Capacity Limited
C1	0.67	0.70	0.67	0.54	0.67
Pipe_19	0.01	0.01	0.01	0.20	0.01

Analysis begun on: Fri Mar 20 15:22:17 2026
Analysis ended on: Fri Mar 20 15:22:19 2026
Total elapsed time: 00:00:02

C.3 Background Report Excerpts

Canada Lands Company

Design Brief

Wateridge Village at Rockcliffe Phases 6 and 7

August 2025

Drainage Area ID	Continuous/Sag[1],[2]	Road Type	Minor System Design Target	Generated Flow on Individual Segment for Minor System Design Target (DDSWMM Simulation) (l/s)	ICD (l/s)	Note
S50	Continuous	20m Row, 8.5m asphalt	100	84	25	
S51	Sag	20m Row, 8.5m asphalt	100	95	416	
S53	Continuous	20m Row, 8.5m asphalt	100	55	76	
S5A	Sag	20m Row, 8.5m asphalt	100	5	6	
S6	Sag	20m Row, 8.5m asphalt	100	59	228	
S6A	Sag	20m Row, 8.5m asphalt	100	31	86	
S8	Sag	20m Row, 8.5m asphalt	100	10	19	
S8B	Continuous	20m Row, 8.5m asphalt	100	21	57	
Park & Development Blocks						
Park	Rear Yard	Rear Yard	5	200	200	
B1A	Rear Yard	Rear Yard	5	142	142	
B21	Rear Yard	Rear Yard	5	144	144	
B21B	Rear Yard	Rear Yard	5	120	120	
B31A	Rear Yard	Rear Yard	5	31	31	
B31B	Rear Yard	Rear Yard	5	120	120	
B41A	Rear Yard	Rear Yard	5	31	31	
B5	Rear Yard	Rear Yard	5	338	338	
B51A	Rear Yard	Rear Yard	5	215	215	

Drainage Area ID	Continuous/Sag[(1),(2)]	Road Type	Minor System Design Target	Generated Flow on Individual Segment for Minor System Design Target (DDSWMM Simulation) (l/s)	ICD (l/s)	Note
B53A	Rear Yard	Rear Yard	5	118	118	
B60	Rear Yard	Rear Yard	5	48	48	
B8A	Rear Yard	Rear Yard	5	299	299	

(1) Capture on continuous grade is limited to capacity of grate
(2) The minor flow restriction has been increased in sags to allow full capture of overflow from upstream segments on continuous grade during the design storm event without ponding.

5.4.2 Results of Hydrological Modeling

5.4.2.1 Street Segment Storage

The storage available on-site storage and the results of the DDSWMM major system evaluation for the design storm are presented in Table 5-4. The minor system design identified in the below table corresponds to the target storm event per OSDG, and the storm event for which it is demonstrated that no ponding is utilized. However, as noted above, the minor system capture across the Phase 6, 7 street segments has generally been increased to the 100 year to minimize major flow leaving the site. The ponding plan for the subject site is presented in **Appendix F** on **Drawing 139653-600**.

Table 5-4 On-site Storage during Target Minor System Design Storm per OSDG

Street Segment ID	Minor System Design Storm per OSDG	Available Static Storage (m^3)	Total Storage Used During 2 Year Storm (DDSWMM Simulation) (m^3)	Overflow (DDSWMM Simulation) (l/s)
S1B	2	43.46	0	0
S20	2	0.50	0	0
S30	2	28.34	0	0
S31A	2	0.28	0	0
S31B	2	0.20	0	0
S4	2	52.09	0	0

5.6 Eastern SWM Facility and Outlet Pipe

5.6.1 Water Quality Control

The Eastern SWM Facility is designed to provide an Enhanced Level of Protection. According to the MOE Stormwater Management Planning and Design Manual, March 2003, the treatment volume is a function of the drainage area, the urban imperviousness ratio and the level of protection.

The water quality calculations have been updated as the detailed design of various phases has been completed. Corresponding water quality volume requirements are summarized in the below table.

Table 5-9 Water Quality Volume Calculations

Level of Protection	Urban Drainage Area, Type of Facility, %IMP	Permanent Storage (ha-m)		Extended Storage (ha-m)		Total Storage (ha-m)	
		Req.	Prov.(1)	Req.	Prov.(1)	Req.	Prov.(1)
Enhanced	163.83 ha Wet Pond 71 %	2.81	2.95	0.91	1.92	3.72	4.87

(1) From 2016 Pond Design Brief

As development within the Eastern SWM Facility drainage area has progressed, there have been minor changes to the overall contributing drainage area and corresponding imperviousness. The above table indicates that the Eastern SWM Facility is adequately sized to provide water quality treatment for the contributing drainage area.

5.6.2 Hydraulic Evaluation of the SWM Facility and Outlet Pipe

The hydraulic evaluation of the Eastern SWM Facility and receiving outlet pipe has been updated to reflect the most up-to-date hydrograph from the contributing development. The pond and outlet pipe are evaluated in a standalone XPSWMM model, a schematic of which is included in **Appendix F**. In accordance with the MSS, the model includes an allocation for the overflow from the future Western SWM Facility system.

The performance of the Eastern SWM Facility is summarized in the below table, compared to the evaluation completed to support its detailed design in February 2016.

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

STORM SEWER DESIGN SHEET

Wateridge Village Phase 6, 7
CITY OF OTTAWA
Canada Lands Company

LOCATION				AREA (Ha)										RATIONAL DESIGN FLOW													SEWER DATA								
STREET	AREA ID	FROM	TO	C= 0.20	C= 0.25	C= 0.30	C= 0.50	C= 0.57	C= 0.65	C= 0.69	C= 0.70	C= 0.75	C= 0.80	IND 2.78AC	CUM 2.78AC	INLET (min)	TIME IN PIPE	TOTAL (min)	i (2) (mm/hr)	i (5) (mm/hr)	i (10) (mm/hr)	i (100) (mm/hr)	2yr PEAK FLOW (L/s)	5yr PEAK FLOW (L/s)	10yr PEAK FLOW (L/s)	100yr PEAK FLOW (L/s)	FIXED FLOW IND	FIXED FLOW CUM	DESIGN FLOW (L/s)	CAPACITY (L/s)	LENGTH (m)	PIPE SIZE (mm) DIA	PIPE SIZE (mm) W	PIPE SIZE (mm) H	SLOPE (%)	VELOCITY (m/s)	AVAIL CAP (2yr) (L/s)	AVAIL CAP (2yr) (%)
CODDS ROAD	S1, S1A, S1B	MH1	MH2						0.30				0.70	2.10	2.10	10.00	1.18	11.18	76.81	104.19	122.14	178.56	161.21	218.69	256.36	374.78		0.00	161.21	248.81	107.18	450			0.70	1.516	87.61	35.21%
BAREILLE-SNOW ST	S21, S21A, S21B	MH21	MH20						0.08				1.30	3.04	3.04	10.00	0.53	10.53	76.81	104.19	122.14	178.56	233.16	316.31	370.79	542.06		0.00	233.16	425.62	60.00	525			0.90	1.905	192.46	45.22%
BAREILLE-SNOW ST	S20, S20A	MH20	MH5						0.16					0.29	3.32	10.53	0.40	10.93	74.85	101.50	118.97	173.90	248.85	337.47	395.56	578.19		0.00	248.85	906.40	75.16	600			2.00	3.106	657.55	72.54%
TRANSITWAY	S60	MH60	MH53									0.25		0.52	0.52	12.11	0.18	12.29	69.56	94.24	110.42	161.35	36.26	49.12	57.56	84.10		0.00	36.26	71.62	10.71	300			0.50	0.982	35.36	49.37%
WANAKI ROAD	S53, S53A	MH53	MH52						0.16				0.58	1.58	2.10	12.29	0.69	12.98	69.01	93.48	109.53	160.03	144.93	196.33	230.03	336.11		0.00	144.93	224.04	81.65	375			1.50	1.965	79.11	35.31%
WANAKI ROAD		MH52	MH51											0.00	2.10	12.98	0.07	13.05	66.98	90.70	106.26	155.23	140.68	190.50	223.17	326.03		0.00	140.68	224.10	7.79	375			1.50	1.966	83.41	37.22%
WANAKI ROAD	S51, S51A	MH51	MH50						0.28				1.06	2.86	4.96	13.05	0.99	14.03	66.80	90.45	105.96	154.79	331.55	448.94	525.93	768.32		0.00	331.55	820.89	106.49	750			0.50	1.800	489.34	59.61%
WANAKI ROAD	S50	MH50	MH40						0.25					0.45	5.42	14.03	0.56	14.60	64.15	86.81	101.68	148.52	347.38	470.14	550.66	804.29		0.00	347.38	1,349.45	100.00	750			1.35	2.959	1002.07	74.26%
MOSES TENNISCO ST	S41, S41A	MH41	MH40						0.28				0.15	0.84	0.84	10.00	0.55	10.55	76.81	104.19	122.14	178.56	64.48	87.48	102.55	149.91		0.00	64.48	158.87	72.50	300			2.48	2.177	94.39	59.41%
WANAKI ROAD	S40	MH40	MH30						0.21					0.38	6.63	14.60	0.65	15.25	62.74	84.88	99.41	145.18	416.21	563.15	659.53	963.20		0.00	416.21	1,047.42	90.00	750			0.81	2.297	631.21	60.26%
MICHAEL STOQUA ST	S31, S31A, S31B	MH31	MH30						0.19				0.74	1.99	1.99	10.00	0.60	10.60	76.81	104.19	122.14	178.56	152.77	207.25	242.95	355.17		0.00	152.77	332.30	72.50	450			1.25	2.024	179.53	54.03%
MICHAEL STOQUA ST	S30	MH30	MH8						0.14					0.25	8.88	15.25	0.52	15.77	61.18	82.76	96.91	141.51	543.10	734.60	860.24	1,256.16		0.00	543.10	2,602.73	69.60	1200			0.41	2.229	2059.63	79.13%
CODDS ROAD	S8, S8A, S8B	MH8	MH7						0.09				1.48	3.45	12.33	15.77	0.26	16.03	60.01	81.15	95.02	138.74	739.93	1,000.61	1,171.65	1,710.72		0.00	739.93	2,390.10	31.85	1200			0.35	2.047	1650.17	69.04%
CODDS ROAD		MH7	MH6											0.00	12.33	16.03	0.32	16.35	59.44	80.37	94.11	137.40	732.93	991.04	1,160.39	1,694.20		0.00	732.93	2,408.23	39.93	1200			0.35	2.063	1675.30	69.57%
CODDS ROAD	S6, S6A	MH6	MH5						0.27					0.49	12.82	16.35	0.33	16.68	58.75	79.43	93.00	135.77	753.09	1,018.16	1,192.08	1,740.38		0.00	753.09	2,422.13	40.89	1200			0.35	2.075	1669.05	68.91%
CODDS ROAD	S5, S5A	MH5	MH4						0.01				1.68	3.75	19.90	16.68	0.22	16.90	58.07	78.49	91.90	134.16	1,155.38	1,561.84	1,828.55	2,669.42		0.00	1,155.38	2,237.75	24.78	1200			0.30	1.917	1082.37	48.37%
CODDS ROAD	S4, S4A	MH4	MH3						0.20					0.36	20.26	16.90	0.96	17.85	57.63	77.89	91.19	133.12	1,167.47	1,578.04	1,847.46	2,696.93		0.00	1,167.47	1,838.53	90.54	1200			0.20	1.575	671.06	36.50%
CODDS ROAD		MH3	MH2											0.00	20.26	17.85	0.15	18.01	55.76	75.34	88.19	128.72	1,129.65	1,526.36	1,786.71	2,607.83		0.00	1,129.65	1,815.62	14.05	1200			0.20	1.555	685.97	37.78%
PHASE 4 PARK	S2	MH2	MH334			1.28								1.07	21.33	18.01	0.58	18.58	55.48	74.96	87.74	128.06	1,183.18	1,598.60	1,871.23	2,731.12		0.00	1,183.18	1,802.28	53.48	1200			0.20	1.544	619.10	34.35%
		MH334	STUB																												200						
		MH334	MH333											0.00	21.33	18.58	0.08	18.67	54.43	73.52	86.06	125.59	1,160.80	1,568.04	1,835.31	2,678.44		0.00	1,160.80	1,976.44	8.47	1200			0.24	1.693	815.64	41.27%
	S333	MH333	MH331			1.25								1.04	22.37	18.67	0.44	19.11	54.28	73.32	85.82	125.24	1,214.24	1,640.17	1,919.72	2,801.58		0.00	1,214.24	2,170.89	49.14	1200			0.28	1.860	956.65	44.07%
	S331	MH331	MH332			2.45								2.04	24.41	19.11	1.08	20.18	53.51	72.28	84.59	123.44	1,306.43	1,764.44	2,065.05	3,013.46		0.00	1,306.43	2,164.98	120.00	1200			0.28	1.854	858.54	39.66%
		MH332	EXSTMH											0.00	24.41	20.18	0.18	20.36	51.74	69.85	81.74	119.26	1,263.01	1,705.17	1,995.41	2,911.35		0.00	1,263.01	3,699.47	17.84	1650			0.15	1.676	2436.46	65.86%

Definitions:
Q = 2.78CiA, where:
Q = Peak Flow in Litres per Second (L/s)
A = Area in Hectares (Ha)
i = Rainfall intensity in millimeters per hour (mm/hr)
[i = 732.951 / (TC+6.199)^0.810] 2 YEAR
[i = 998.071 / (TC+6.053)^0.814] 5 YEAR
[i = 1174.184 / (TC+6.014)^0.816] 10 YEAR
[i = 1735.688 / (TC+6.014)^0.820] 100 YEAR

Notes:
1. Mannings coefficient (n) = 0.013

Designed: SEL
Checked: JIM
Dwg. Reference: 139653-500

No.	Revision	Date
1.	Submission No. 1	2023-09-11
2.	Submission No. 2	2024-05-13
3.	Submission No. 4	2025-05-14

File Reference: 139653.6.04.04
Date: 2025-05-14
Sheet No: 1 of 1

CLIENT

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ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2023-10-05
2	ISSUED FOR CLIENT REVIEW	2024-06-12
3	SUBMISSION NO.2 FOR CITY REVIEW	2024-06-21
4	ISSUED FOR GEOTECHNICAL REVIEW	2024-11-26
5	SUBMISSION NO.3 FOR CITY REVIEW	2024-12-20
6	SUBMISSION NO.4 FOR CITY REVIEW	2025-06-27
7	SUBMISSION NO.5 FOR CITY REVIEW	2025-07-31
8		

SEE 010, 011 FOR NOTES, LEGEND, CB TABLE, STREET SECTIONS AND DETAILS

KEY PLAN

500

1:1250 0 12.5 37.5 62.5m

SEAL

LICENSED PROFESSIONAL ENGINEER
S. E. LABADIE
100214983
2025/07/31
PROVINCE OF ONTARIO

ARCADIS

333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT

WATERIDGE VILLAGE AT ROCKCLIFFE

PHASES 6 AND 7

PROJECT NO:
139653

DRAWN BY:	CHECKED BY:
M.M.	J.I.M.
PROJECT MGR:	APPROVED BY:
S.L.	S.L.

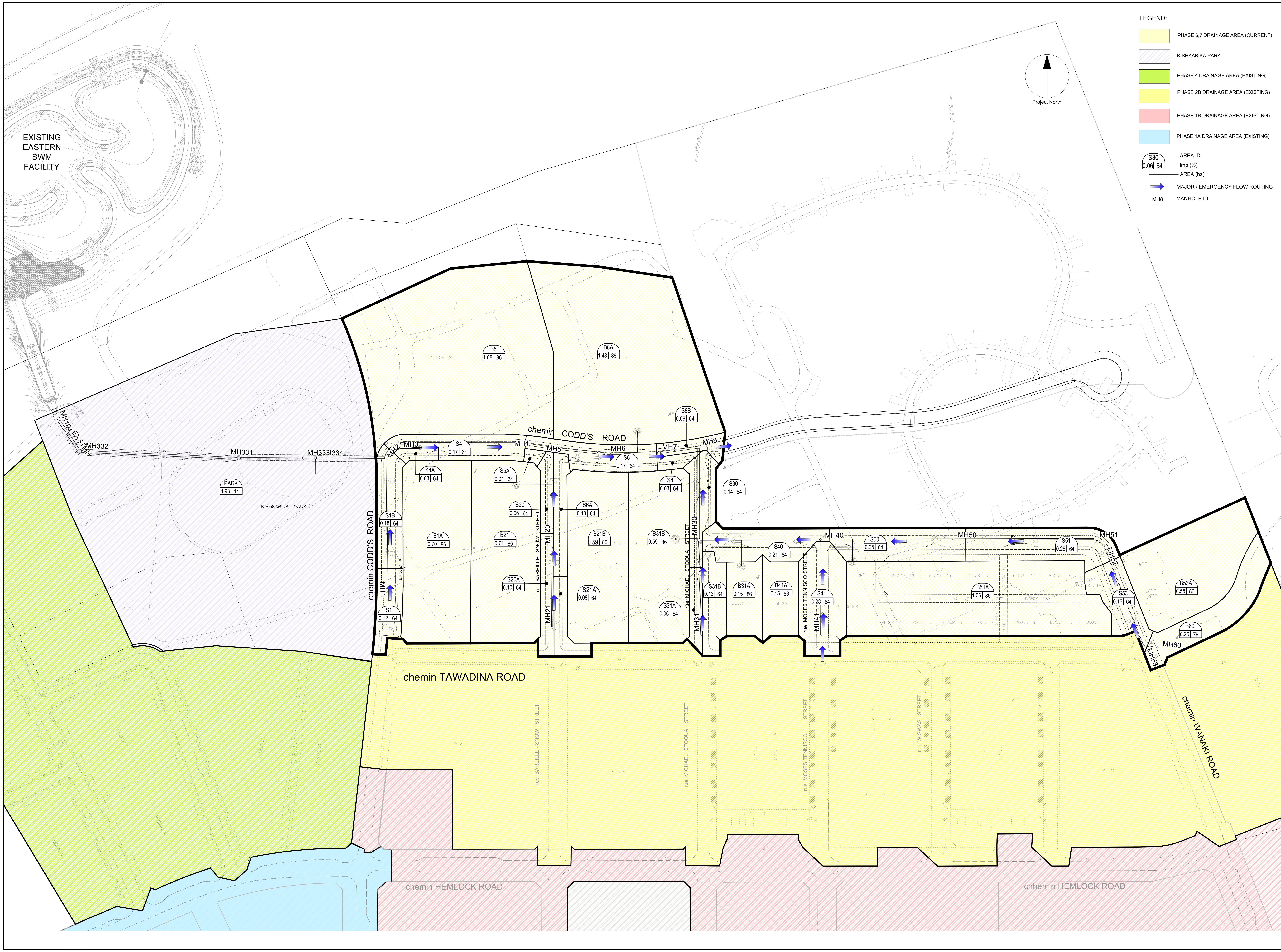
SHEET TITLE

STORM DRAINAGE AREA PLAN

SHEET NUMBER
500

ISSUE
7

CITY PLAN No. 19055 CITY FILE No. D07-16-15-0003



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WATERIDGE VILLAGE PHASE 6 & 7

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ISSUES

No.	DESCRIPTION	DATE
1	SUBMISSION NO.1 FOR CITY REVIEW	2023-10-05
2	SUBMISSION NO.2 FOR CITY REVIEW	2024-06-14
3	SUBMISSION NO.4 FOR CITY REVIEW	2025-06-27
4		
5		
6		
7		
8		

KEY PLAN

SEAL

LICENSED PROFESSIONAL ENGINEER
M.S. BLACK
100101736
27/06/2025
PROVINCE OF ONTARIO

ARCADIS
333 Preston Street - Suite 500
Ottawa ON K1S 5N4 Canada
tel 613 225 1311
www.arcadis.com

PROJECT
WATERIDGE VILLAGE AT ROCKCLIFFE

PROJECT NO:
139653

DRAWN BY: S.V.	CHECKED BY: M.B.
PROJECT MGR: M.B.	APPROVED BY: P.S.

SHEET TITLE
DDSWMM MODEL SCHEMATIC

SHEET NUMBER	ISSUE
750	3

CITY PLAN No. _____ CITY FILE No. D07-16-15-0003

Storm Hydraulic Grade Line Summary of Results

XPSWMM NODE ID	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		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)
S113		84.51	83.48	1.03	83.80	0.71	83.06	1.45	83.43	1.08	83.12	1.39	83.05	1.46
S114		83.91	83.11	0.80	83.38	0.53	82.67	1.24	83.07	0.84	82.90	1.01	82.49	1.42
S115		83.56	83.11	0.45	83.38	0.18	82.65	0.91	83.04	0.52	82.89	0.67	82.45	1.11
S116		83.71	82.93	0.78	83.22	0.49	82.52	1.19	82.88	0.83	82.75	0.96	82.10	1.61
S120		83.96	82.90	1.07	83.15	0.81	82.50	1.46	82.85	1.11	82.72	1.24	82.06	1.90
Phase 2B, 4														
MH317	94.08	91.68	91.17	0.51	91.18	0.50	91.14	0.54	91.15	0.53	91.14	0.54	91.11	0.57
MH316	94.09	91.69	90.96	0.73	90.96	0.73	90.95	0.74	90.95	0.74	90.95	0.74	90.92	0.77
MH315	93.39	91.36	90.28	1.08	90.29	1.07	90.25	1.11	90.27	1.09	90.27	1.09	90.26	1.10
MH314	93.00	91.16	89.91	1.25	89.91	1.25	89.91	1.25	89.91	1.25	89.91	1.25	89.89	1.27
MH313	92.62	90.71	89.35	1.36	89.34	1.37	89.35	1.36	89.35	1.36	89.35	1.36	89.34	1.37
MH312	91.36	89.68	88.42	1.26	88.42	1.26	88.41	1.27	88.42	1.26	88.42	1.26	88.38	1.30
MH311	90.69	88.29	87.44	0.85	87.56	0.73	87.40	0.89	87.45	0.84	87.47	0.82	87.38	0.91
MH310	90.04	87.64	87.28	0.36	87.42	0.22	87.25	0.39	87.30	0.34	87.33	0.31	87.06	0.58
MH309	90.15	87.75	87.44	0.31	87.08	0.67	87.33	0.42	87.41	0.34	87.43	0.32	87.22	0.53
MH308	89.68	87.28	86.88	0.40	86.69	0.59	86.81	0.47	86.87	0.41	86.88	0.40	86.76	0.52
MH326	94.76	92.36	91.33	1.03	91.33	1.03	91.32	1.04	91.32	1.04	91.32	1.04	91.33	1.03
MH318	94.40	92.00	91.03	0.97	91.03	0.97	91.00	1.00	91.00	1.00	91.00	1.00	91.00	1.00
MH300	94.00	91.60	90.71	0.89	90.70	0.90	90.67	0.93	90.68	0.92	90.68	0.92	90.68	0.92
MH301	93.73	91.33	90.21	1.12	90.21	1.12	90.20	1.13	90.21	1.12	90.20	1.13	90.20	1.13
MH302	92.80	90.40	88.64	1.76	88.64	1.76	88.63	1.77	88.64	1.76	88.63	1.77	88.63	1.77
MH303	90.67	88.27	87.80	0.47	87.81	0.46	87.63	0.64	87.79	0.48	87.72	0.55	87.64	0.63
MH304	90.30	87.90	87.39	0.51	87.38	0.52	87.30	0.60	87.38	0.52	87.34	0.56	87.30	0.60
MH305	91.00	88.60	86.54	2.06	86.56	2.04	86.61	1.99	86.69	1.91	86.65	1.95	86.60	2.00
MH319	88.81	86.61	86.13	0.48	86.12	0.49	86.12	0.49	86.12	0.49	86.12	0.49	86.12	0.49
MH320	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
MH321	87.67	85.47	84.18	1.29	84.39	1.08	84.10	1.37	84.11	1.36	84.13	1.34	84.09	1.38
MH322	87.50	85.30	84.18	1.12	84.39	0.91	84.10	1.20	84.10	1.20	84.12	1.18	84.09	1.21
MH323	86.57	84.37	83.40	0.97	83.48	0.89	83.31	1.06	83.32	1.05	83.34	1.03	83.30	1.07
Phase 6 &7														
MH1	90.50	88.10	86.68	1.42	86.67	1.43	86.56	1.54	86.65	1.45	86.67	1.43	86.43	1.67
MH2	90.60	88.20	84.81	3.39	84.88	3.32	84.61	3.59	84.65	3.55	84.68	3.52	84.49	3.71
MH3	89.55	87.15	85.13	2.02	85.22	1.93	84.85	2.30	84.90	2.25	84.94	2.21	84.67	2.48
MH4	89.47	87.07	85.74	1.33	85.88	1.19	85.32	1.75	85.39	1.68	85.45	1.62	85.04	2.03
MH5	89.38	86.98	85.90	1.08	86.05	0.93	85.44	1.54	85.52	1.46	85.58	1.40	85.13	1.85
MH6	89.19	86.79	86.07	0.72	86.24	0.55	85.57	1.22	85.65	1.14	85.72	1.07	85.23	1.56
MH7	89.40	87.00	86.14	0.86	86.31	0.69	85.63	1.37	85.71	1.29	85.77	1.23	85.27	1.73
MH8	89.20	86.80	86.23	0.57	86.42	0.38	85.70	1.10	85.78	1.02	85.85	0.95	85.32	1.48
MH20	89.70	87.30	86.46	0.84	86.56	0.74	86.33	0.97	86.34	0.96	86.36	0.94	86.32	0.98
MH21	90.08	87.68	86.98	0.70	86.98	0.70	86.98	0.70	86.98	0.70	86.98	0.70	86.98	0.70
MH30	89.72	87.32	86.43	0.89	86.64	0.68	85.84	1.48	85.92	1.40	86.01	1.31	85.46	1.86
MH31	90.44	88.04	87.29	0.75	87.59	0.45	86.89	1.15	86.89	1.14	86.92	1.11	86.88	1.16
MH40	90.46	88.06	87.57	0.49	87.82	0.24	86.68	1.38	86.81	1.25	86.96	1.10	86.53	1.53
MH41	92.37	89.97	88.32	1.65	88.37	1.60	88.32	1.65	88.32	1.66	88.32	1.65	88.31	1.66
MH50	92.12	89.72	88.20	1.52	88.48	1.24	87.81	1.91	87.81	1.91	87.82	1.90	87.79	1.93
MH51	92.72	90.32	88.85	1.47	89.17	1.15	88.59	1.73	88.60	1.72	88.64	1.68	88.54	1.78
MH52	92.82	90.42	89.08	1.34	89.41	1.01	88.87	1.55	88.88	1.54	88.89	1.53	88.86	1.56
MH53	93.86	91.46	90.78	0.67	91.03	0.42	90.50	0.95	90.56	0.89	90.57	0.89	90.48	0.97
MH60	93.77	91.37	90.90	0.47	91.07	0.30	90.90	0.47	90.90	0.47	90.90	0.47	90.90	0.47
MH334	n/a	N/A	84.16	N/A	84.18	N/A	84.09	N/A	84.10	N/A	84.11	N/A	84.03	N/A
MH333	n/a	N/A	82.99	N/A	83.02	N/A	82.87	N/A	82.91	N/A	82.93	N/A	82.77	N/A
MH331	n/a	N/A	81.62	N/A	81.83	N/A	81.22	N/A	81.32	N/A	81.36	N/A	81.07	N/A
MH332	n/a	N/A	80.66	N/A	80.77	N/A	80.46	N/A	80.60	N/A	80.56	N/A	80.27	N/A

Appendix D Geotechnical Report Excerpts

PATERSON GROUP

Geotechnical Investigation

Proposed Residential Development

Wateridge Village Phases 6, 7 & 8
Ottawa, Ontario

Prepared for Canada Lands Company c/o Arcadis IBI Group

Report PG6331-1 Revision 5 dated December 10, 2024

4.0 Observations

4.1 Surface Conditions

The subject site was part of the lots acquired by the Department of National Defense in the 1890's and used as a military base known as CFB Rockcliffe until the early 2010's.

The subject site was occupied by single family dwellings, residential buildings, car parking areas, in addition to some landscaped areas with scattered mature trees and grass covered surface. However, during the construction of various stages of the Wateridge development, several areas of the subject site had been utilized by the local contractors by placing construction trailers, generators and stockpiling fill and blast rock material and equipment for the installation of the municipal services and construction of the proposed roadways surrounding the subject site.

Historical aerial photographs of the subject site and its surroundings are provided in Figures 2, 3, and 4 - Aerial Photographs, in Appendix 2.

A steep escarpment covered by tall mature trees was observed along the north boundary of the site. The ground surface across this slope generally slopes down towards the north direction from approximate geodetic elevations of 86.8 to 54.9 m.

The site is generally bordered by the above noted slope and further by Sir-George-Etienne-Cartier Road and Rockcliffe Waterfall and Pond to the north, undeveloped land and commercial developments to the east, and by future residential development to the south and west.

The ground surface across the subject site generally slopes down toward the north and east directions, from approximate geodetic elevations 93.2 to 81.9 m.

4.2 Subsurface Profile

Overburden

Generally, the subsurface soil profile encountered at the test hole locations consists of fill extending to a maximum depth of 3.3 m below existing grade, underlain by silty sand, silty clay, glacial till and/or bedrock surface.

The silty clay deposit was encountered within the central-east and western portions of the site, and it was observed to consist of a hard to stiff brown silty clay crust underlain by a stiff to firm grey silty clay and/or a deposit of very dense to compact glacial till.

Loose to compact brown silty sand was encountered below the fill in some boreholes. The glacial till deposit was generally observed to consist of compact to very dense silty sand to silty clay with gravel, cobbles, and boulders.

Practical refusal to augering, DCPT testing, and excavation was encountered at depths ranging from 0.3 to 13.64 m below the existing ground surface at various boreholes locations across the subject site.

Reference should be made to the Soil Profile and Test Data sheets in Appendix 1 for the details of the soil profile encountered at each test hole location.

Bedrock

Based on available geological mapping, the bedrock across the majority of the site consists of shale of the Rockcliffe formation and interbedded limestone and dolomite of the Gull River formation in the south portion of the site with an approximate overburden thickness across the majority of the subject site ranging between 1 to 4 m.

Atterberg Limit Tests

Atterberg limits testing, as well as associated moisture content testing, was completed on the recovered silty clay samples. The results of the Atterberg limits test are presented in Table 1 and on the Atterberg Limits Results sheet in Appendix 1. The tested silty clay samples classify as inorganic silts of high plasticity (MH), inorganic clays of low plasticity (CL), and inorganic clays of high plasticity (CH) in accordance with the Unified Soil Classification System.

Shrinkage Testing

Linear shrinkage testing was completed on samples recovered from 1.07 m depth from boreholes BH 21-22 and BH 40-22 and from 1.83 m depth from borehole BH 65-22. The shrinkage limit and shrinkage ratio of the tested silty clay sample (BH 21-22) were found to be 21.22% and 1.72, respectively. The shrinkage limit and shrinkage ratio of the tested silty clay sample (BH 40-22) were found to be 20.59% and 1.75, respectively.

4.3 Low Impact Development Feasibility (LID)

It is understood that Low Impact Development Measures (LID) are being considered to be implemented for the proposed development. In order to assess the feasibility of LID measures, permeameter testing and long-term groundwater monitoring have been completed at the subject site. Testing was completed between September 6 and September 7, 2022 and in dry conditions (greater than 48 hours removed from any significant rainfall events of 15 mm depth or more).

Permeameter Testing Results

Preparation and testing of this investigation was done in accordance with the Canadian Standards Association (CSA) B65-12-Annex E. Field saturated hydraulic conductivity (K_{fs}) values and estimated infiltration values are presented in Table 3 below.

Field saturated hydraulic conductivity values were determined using the Engineering Technologies Canada (ETC) Ltd. Reference tables provided in the most recent ETC Past Permeameter User Guide dated July 2018. Infiltration rates have been determined based on the relationship described in Appendix C of the Credit Valley Conservation Authority and Toronto and Region Conservation Authority Low Impact Development Stormwater Management Planning and Design Guide (2011). The testing locations are presented on Drawing PG6331-5 – In-Situ Infiltration Testing Location Plan included in Appendix 2.

The measured K_{fs} values are consistent with similar material Paterson has encountered on other sites which generally range from 1.4×10^{-8} to 2.4×10^{-5} m/sec for silty sand to sandy silt and glacial till, and from 1.4×10^{-8} to 5.3×10^{-7} m/sec for silty clay. The range in K_{fs} values is generally due to the variability in composition and consistency of the material encountered.

It is important to note that the infiltration rates derived from the K_{fs} values in the table below are unfactored. Prior to use for design purposes, a safety correction factor will need to be applied to the above infiltration rates to account for a number of factors including variations in soil composition and anticipated accumulation of fine-grained material over time. For use in the design of Low Impact Development measures (LID's), the safety correction factor to be incorporated will be dependent on the size and invert depth of the system relative to the infiltration rates observed up to 1.5 m below the base of the system. It should also be noted that for most infiltration-based LID measures, the bottom of the facility should be separated at least 1 m from the bedrock surface and from the seasonally high groundwater table.

Table 3 – Summary of Field Saturated Hydraulic Conductivity Values and Infiltration Rates.

Test Location ID	Ground Surface Elevation (m)	Depth of Permeameter Testing (m)	Elevation of Permeameter Testing (m asl)	K_{fs} (m/sec)	Infiltration Rate (mm/hr)	Soil Type
PT 1	89.50	0.20	89.30	7.50×10^{-06}	79.24	Silty sand with rocks
		0.50	89.00	5.30×10^{-06}	72.21	Silty Sand with Gravel
PT 2	87.74	0.30	87.44	1.10×10^{-06}	47.41	Clayey Silt
		0.80	86.94	1.40×10^{-08}	14.74	Silty Clay
PT 3	89.81	0.25	89.56	2.70×10^{-06}	60.28	Silty Sand with Clay
		0.75	89.06	1.90×10^{-05}	101.62	Silty Sand
PT 4	91.29	0.25	91.04	8.20×10^{-07}	43.82	Clayey Silt
		0.75	90.54	1.10×10^{-05}	87.80	Silty Sand
PT 5	87.46	0.20	87.26	4.30×10^{-06}	68.28	Silty Sand
		0.60	86.86	5.30×10^{-08}	21.05	Silty Clay
PT 6	84.97	0.30	84.67	5.30×10^{-07}	38.99	Silty Clay
		0.80	84.17	8.00×10^{-07}	43.53	Clayey Silt
PT 7	85.63	0.20	85.43	1.60×10^{-06}	52.41	Clayey Silt
		0.60	85.03	5.30×10^{-07}	38.99	Silty Clay
PT 8	85.36	0.30	85.06	2.70×10^{-06}	60.28	Silty Sand with Clay
		0.75	84.66	2.70×10^{-08}	17.58	Silty Clay
PT 9	89.28	0.25	89.03	5.90×10^{-06}	74.31	Silty Sand
		0.50	88.78	1.10×10^{-05}	87.80	Silty Sand
PT 10	88.78	0.30	88.48	2.20×10^{-05}	105.69	Silty Sand
		0.80	87.98	8.50×10^{-06}	81.94	Silty Sand
PT 11	89.22	0.30	88.92	2.40×10^{-05}	108.18	Silty Sand
		0.80	88.42	1.60×10^{-05}	97.06	Silty Sand
PT 12	88.57	0.20	88.37	7.50×10^{-06}	79.24	Silty Sand
		0.60	87.97	1.10×10^{-06}	47.41	Silty Sand
PT 13	91.39	0.30	91.09	2.70×10^{-06}	60.28	Sand with Gravel
		0.75	90.64	6.40×10^{-06}	75.95	Silty Sand

Table 3 – Summary of Field Saturated Hydraulic Conductivity Values and Infiltration Rates.

Test Location ID	Ground Surface Elevation (m)	Depth of Permeameter Testing (m)	Elevation of Permeameter Testing (m asl)	K_{fs} (m/sec)	Infiltration Rate (mm/hr)	Soil Type
PT14	82.55	0.30	82.25	1.40×10^{-07}	27.30	Silty Clay
		0.80	81.75	1.40×10^{-08}	14.74	Glacial Till
PT15	83.49	0.20	83.29	8.50×10^{-06}	81.94	Silty Sand
		0.60	82.89	1.75×10^{-07}	28.94	Silty Clay

Groundwater

Groundwater levels were manually measured in the installed piezometers and monitoring wells on November 18, 2022, March 24, 2023, April 20, 2023, May 30, 2023, and September 20, 2023.

In addition, data loggers were installed in the monitoring wells to record seasonal fluctuations and precipitation collected within the upper portion of the subsurface profile across the site.

The manual groundwater level (GWL) readings are presented in Table 4 below and are shown on the Soil Profile and Test Data sheets in Appendix 1.

Table 4 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Date Recorded
		Depth (m)	Elevation (m)	
BH1-23	89.02	dry	NA	September 20, 2023
BH 2-23	84.89	1.94	82.95	
BH4-23	88.23	2.23	86.01	
BH5-23	87.65	dry	NA	
BH6-23	90.99	dry	NA	
BH7-23	83.5	2.32	81.18	
BH8-23	82.3	2.13	80.17	
BH9-23	83.46	2.92	80.54	
BH11-23	85.81	2.99	82.82	
BH12-23	88.72	3.94	84.78	
BH13A-23	92.11	dry	NA	
BH1-23	89.02	dry	NA	May 30, 2023
BH4-23	88.23	2.53	85.70	

Table 4 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Date Recorded
		Depth (m)	Elevation (m)	
Bh5-23	87.65	1.84	85.81	May 30, 2023
BH6-23	90.99	dry	NA	
BH7-23	83.5	3.02	80.48	
BH8-23	82.3	2.82	79.48	
BH11-23	85.81	3.45	82.36	
BH13A-23	92.11	dry	NA	
BH1-23	89.02	1.57	87.45	April 20, 2023
BH2-23	84.89	1.82	83.07	
BH4-23	88.23	1.3	86.93	
BH5-23	87.65	dry	NA	
BH6-23	90.99	dry	NA	
BH7-23	83.5	1.71	81.79	
BH8-23	82.3	1.68	80.62	
BH9-23	83.46	2.25	81.21	
BH11-23	85.81	2.4	83.41	
BH12-23	88.72	3.71	85.01	
BH13A-23	92.11	dry	NA	
BH8-22	88.82	0.54	88.28	March 24, 2023
BH10-22	89.53	dry	NA	
BH11-22	84.89	1.24	83.65	
BH21-22	86.35	2.76	83.59	
BH47-22	90.33	dry	NA	
BH48-22	91.08	dry	NA	
BH50-22	92.04	dry	NA	
BH53-22	87.50	2.97	84.53	
BH54-22	88.10	dry	NA	
BH55-22	88.53	dry	NA	
BH56-22	88.84	dry	NA	
BH57-22	89.64	dry	NA	
BH58-22	89.35	1.68	87.67	
BH69-22	92.46	2.14	90.32	
BH 1-22	87.85	1.54	86.31	November 18, 2022
BH 2-22	89.20	Dry	NA	
BH 3-22	88.44	0.56	87.88	

Table 4 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Date Recorded
		Measured Groundwater Level	Elevation (m)	
BH 4-22	89.20	Dry	NA	November 18, 2022
BH 5-22	89.30	Dry	NA	
BH 8-22	88.82	Dry	NA	
BH 9-22	90.68	Dry	NA	
BH 10-22	89.53	Dry	NA	
BH 11-22	84.89	2.12	82.77	
BH 12-22	85.38	2.62	82.76	
BH 13-22	84.92	Dry	NA	
BH 14-22	84.40	Dry	NA	
BH 16-22	87.86	Dry	NA	
BH 17-22	88.75	Dry	NA	
BH 18-22	91.05	Dry	NA	
BH 19-22	91.06	Dry	NA	
BH 20-22	86.55	0.71	85.84	
BH 21-22	86.35	3.05	83.3	
BH 22-22	87.59	Dry	NA	
BH 23-22	87.88	Dry	NA	
BH 24-22	88.34	Dry	NA	
BH 25-22	89.17	Dry	NA	
BH 26-22	87.96	Dry	NA	
BH 28-22	88.17	Dry	NA	
BH 29-22	83.17	1.9	81.27	
BH 30-22	82.54	Dry	NA	
BH 31-22	82.67	2.86	79.81	
BH 32-22	82.22	3.06	79.16	
BH 33-22	81.99	3.38	78.61	
BH 34-22	82.20	1.93	80.27	
BH 35-22	83.74	Dry	NA	
BH 36-22	83.51	2.35	81.16	
BH 37-22	84.52	3.37	81.15	
BH 38-22	83.51	3.01	80.5	
BH 39-22	83.92	4.88	79.04	
BH 40-22	83.72	4.69	79.03	
BH 43-22	84.73	3.41	81.32	
BH 44-22	85.94	3.21	82.73	
BH 45-22	90.37	Dry	NA	
BH 47-22	90.33	Dry	NA	
BH 48-22	91.08	Dry	NA	
BH 49-22	91.34	Dry	NA	

Table 4 – Summary of Groundwater Levels

Borehole Number	Ground Surface Elevation (m)	Measured Groundwater Level		Date Recorded
		Measured Groundwater Level	Elevation (m)	
BH 50-22	92.04	Dry	NA	November 18, 2022
BH 51-22	90.53	Dry	NA	
BH 52-22	89.98	Dry	NA	
BH 53-22	87.50	3.45	84.05	
BH 54-22	88.10	Dry	NA	
BH 55-22	88.53	Dry	NA	
BH 56-22	88.84	Dry	NA	
BH 57-22	89.64	Dry	NA	
BH 58-22	89.35	Dry	NA	
BH 61-22	89.78	Dry	NA	
BH 62-22	85.57	2.9	82.67	
BH 63-22	82.75	1.83	80.92	
BH 64-22	82.24	2.12	80.12	
BH 65-22	83.21	2.76	80.45	
BH 66-22	92.85	1.14	91.71	
BH 67-22	93.15	Dry	NA	
BH 68-22	91.47	Dry	NA	
BH 69-22	92.46	Dry	NA	

Note: The ground surface elevation at each borehole location was surveyed using a handheld GPS using a geodetic datum.

In addition to manual water level measurements, a groundwater monitoring program was carried out at the subject site. The groundwater monitoring program provides an overview of the variations of the monitoring well water levels based on seasonal fluctuations. The monitoring wells were equipped with submersible dataloggers (TD-Diver, VanEssen Instruments) to accurately monitor fluctuations in the water levels. Dataloggers were programmed to continuously measure and record water levels at a fixed rate of one (1) reading every 24 hours for approximately 13 months.

The monitoring program was undertaken from April 2023 to May 2024. The monitoring data was compared with Environment and Natural Resources Canada precipitation data from the Ottawa International Airport over the same timeframe as part of the monitoring program. The groundwater monitoring results are presented in Appendix 1.

5.0 Discussion

5.1 Geotechnical Assessment

The details of the future development were not known at the time of writing this report. It is assumed that the development will generally consist of conventional two to three-storey single and townhouse style residential dwellings in addition to low and medium rise residential buildings of slab-on-grade construction and/or with one basement level and local roadways. From a geotechnical perspective, the subject site is considered suitable for the proposed development.

It is anticipated that the future buildings will be founded over conventional shallow footings placed on an undisturbed very stiff to stiff brown silty clay, compact to dense silty sand, compact to very dense glacial till, or clean, surface-sounded bedrock bearing surface.

Due to the presence of the sensitive silty clay deposit, the proposed development will be subjected to a permissible grade raise restrictions. Permissible grade raise recommendations have been provided for the subject site. If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements.

The above and other considerations are discussed in the following sections.

5.2 Site Grading and Preparation

Stripping Depth

Topsoil and deleterious fill, such as those containing significant amounts of organic materials, or construction debris/remnants should be stripped from under any buildings, paved areas, pipe bedding and other settlement sensitive structures. Care should be taken not to disturb subgrade soils during site preparation activities.

Existing foundation walls and other construction debris should be entirely removed from within the building perimeters. Under paved areas, existing construction remnants such as foundation walls should be excavated to a minimum of 1 m below final grade.

Permissible Grade Raise Restrictions

Based on the undrained shear strength values of the silty clay deposit encountered throughout the subject site, the recommended permissible grade raise areas for buildings are defined in Drawing PG6331-2 - Permissible Grade Raise Plan in Appendix 2.

In addition, it should be noted that an additional 500 mm can be implemented for the permissible grade raise for the proposed roads at the subject site, for a total PGR of 2.5 m.

If higher than permissible grade raises are required, preloading with or without a surcharge, lightweight fill, and/or other measures should be investigated to reduce the risks of unacceptable long-term post construction total and differential settlements. Provided sufficient time is available to induce the required settlements, consideration could be given to surcharging the subject site.

A silty clay deposit was encountered at the location of TP 6-23, TP 7-23, and TP 8-23 within the Kishkabika Park Block on the western portion of the subject site. Based on the undrained shear strength values, gravel and cobble content, color and consistency of the silty clay deposit encountered within this portion of the site, the permissible grade raise for this location is greater than 5 meters. Therefore, consolidation of the silty clay deposit as a result of raising the grade is not expected to be an issue within the subject park block. For settlement sensitive structures proposed within the park, it is recommended that Paterson review the final grading and backfill operations recommended for these structures from a geotechnical perspective prior to construction.

5.4 Design for Earthquakes

The site class for seismic site response can be taken as **Class C** for foundations constructed at the subject site. If a higher seismic site class such as Class A or B is required, a site specific shear wave velocity testing will be required. The soils underlying the subject site are not susceptible to liquefaction. Reference should be made to the latest revision of the 2012 Ontario Building Code for a full discussion of the earthquake design requirements.

5.5 Floor Slab Construction

With the removal of all topsoil and deleterious fill from within the footprints of the proposed buildings, the native soil surface or approved engineered fill surface will be considered to be an acceptable subgrade on which to commence backfilling for floor slab construction.

Where the subgrade consists of existing fill, a vibratory drum roller should complete several passes over the subgrade surface as a proof-rolling program. Any poor performing areas should be removed and reinstated with an engineered fill, such as Granular B Type II.

Where existing fill, free of deleterious material and significant organic content, is encountered below the floor slab, provisions should be made to removing the existing fill from within the building footprint and replacing the fill with OPSS Granular A or Granular B Type II compacted to a minimum 98% of the material's SPMDD.

It is also acceptable to use workable, site excavated brown silty clay material, free of deleterious materials and organics, below the floor slab and outside the lateral support zone of the proposed footings provided the material is placed under dry conditions and above freezing temperatures, reviewed and approved by Paterson prior to placement. The silty clay backfill should be compacted using a sheepsfoot roller making several passes under the full supervision of Paterson field personnel. A minimum 500 mm thick cap layer of OPSS Granular A or Granular B Type II should be placed over the silty clay and compacted to a minimum 98% of the material's SPMDD. it is recommended that the upper 200 mm of sub- floor fill consists of 19 mm clear crushed stone.

All backfill material within the footprint of the proposed buildings should be placed in maximum 300 mm thick loose layers and compacted to a minimum of 98% of the SPMDD.

5.6 Pavement Structure

For design purposes, the following pavement structures, presented below, are recommended for the design of car parking areas, local and collector roadways.

Table 6 - Recommended Pavement Structure - Car Only Parking Areas and Driveways

Thickness (mm)	Material Description
50	**Wear Course** - HL 3 or Superpave 12.5 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
300	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill. **Note:** Minimum Performance Graded (PG) 58-34 asphalt cement should be used for driveways.	

Table 7 - Recommended Pavement Structure - Access Lanes, Heavy Vehicle Loading, and Local Residential Roadways	
Thickness (mm)	**Material Description**
40	**Wear Course** - HL3 or Superpave 12.5 Asphaltic Concrete
50	**Binder Course** - HL8 or Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
450	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill. **Note**: Minimum Performance Graded (PG) 58-34 asphalt cement should be used for local roadways.	

Table 8 - Recommended Pavement Structure - Roadways with Bus Traffic and Fire Routs	
Thickness (mm)	**Material Description**
40	**Wear Course -** HL3 or Superpave 12.5 Asphaltic Concrete
50	**Upper Binder Course** - HL8 or Superpave 19.0 Asphaltic Concrete
50	**Lower Binder Course - HL8 or** Superpave 19.0 Asphaltic Concrete
150	**BASE** - OPSS Granular A Crushed Stone
600	**SUBBASE** - OPSS Granular B Type II
SUBGRADE - Either fill, in situ soil or OPSS Granular B Type I or II material placed over in situ soil or fill **Note:** Minimum Performance Graded (PG) 64-34 asphalt cement should be used for roadways with bus traffic.	

If soft spots develop in the subgrade during compaction or due to construction traffic, the affected areas should be excavated and replaced with OPSS Granular B Type II material. Weak subgrade conditions may be experienced over service trench fill materials. This may require the use of a geotextile, thicker subbase or other measures that can be recommended at the time of construction as part of the field observation program.

Minimum Performance Graded (PG) 58-34 asphalt cement should be used for driveways and local roadways and PG 64-34 asphalt cement should be used for roadways with bus traffic. The pavement granular base and subbase should be placed in maximum 300 mm thick lifts and compacted to a minimum of 100% of the material's SPMDD using suitable vibratory equipment.

7.0 Recommendations

The following is recommended to be completed once the preliminary site plan and site development are determined:

- ❑ Review detailed grading plan(s) from a geotechnical perspective, once available.
- ❑ Observation of all bearing surfaces prior to the placement of concrete.
- ❑ Periodic observation of the condition of unsupported excavation side slopes in excess of 3 m in height, if applicable.
- ❑ Observation of all subgrades prior to backfilling.
- ❑ Field density tests to ensure that the specified level of compaction has been achieved.
- ❑ Sampling and testing of the bituminous concrete including mix design reviews.

All excess soils must be handled as per ***Ontario Regulation 406/19: On-Site and Excess Soil Management.***

A report confirming that these works have been conducted in general accordance with our recommendations could be issued upon the completion of a satisfactory inspection program by the geotechnical consultant.

8.0 Statement of Limitations

The recommendations provided are in accordance with the present understanding of the project. Paterson requests permission to review the recommendations when the drawings and specifications are completed.

A soils investigation is a limited sampling of a site. Should any conditions at the site be encountered which differ from those at the test locations, Paterson requests immediate notification to permit reassessment of our recommendations.

The recommendations provided herein should only be used by the design professionals associated with this project. They are not intended for contractors bidding on or undertaking the work. The latter should evaluate the factual information provided in this report and determine the suitability and completeness for their intended construction schedule and methods. Additional testing may be required for their purposes.

The present report applies only to the project described in this document. Use of this report for purposes other than those described herein or by person(s) other than Canada Lands Company, C/O Arcadis IBI Group or their agents is not authorized without review by Paterson for the applicability of our recommendations to the alternative use of the report.

Paterson Group Inc.

Nicole Patey, P.Eng.

Faisal I. Abou-Seido, P.Eng.

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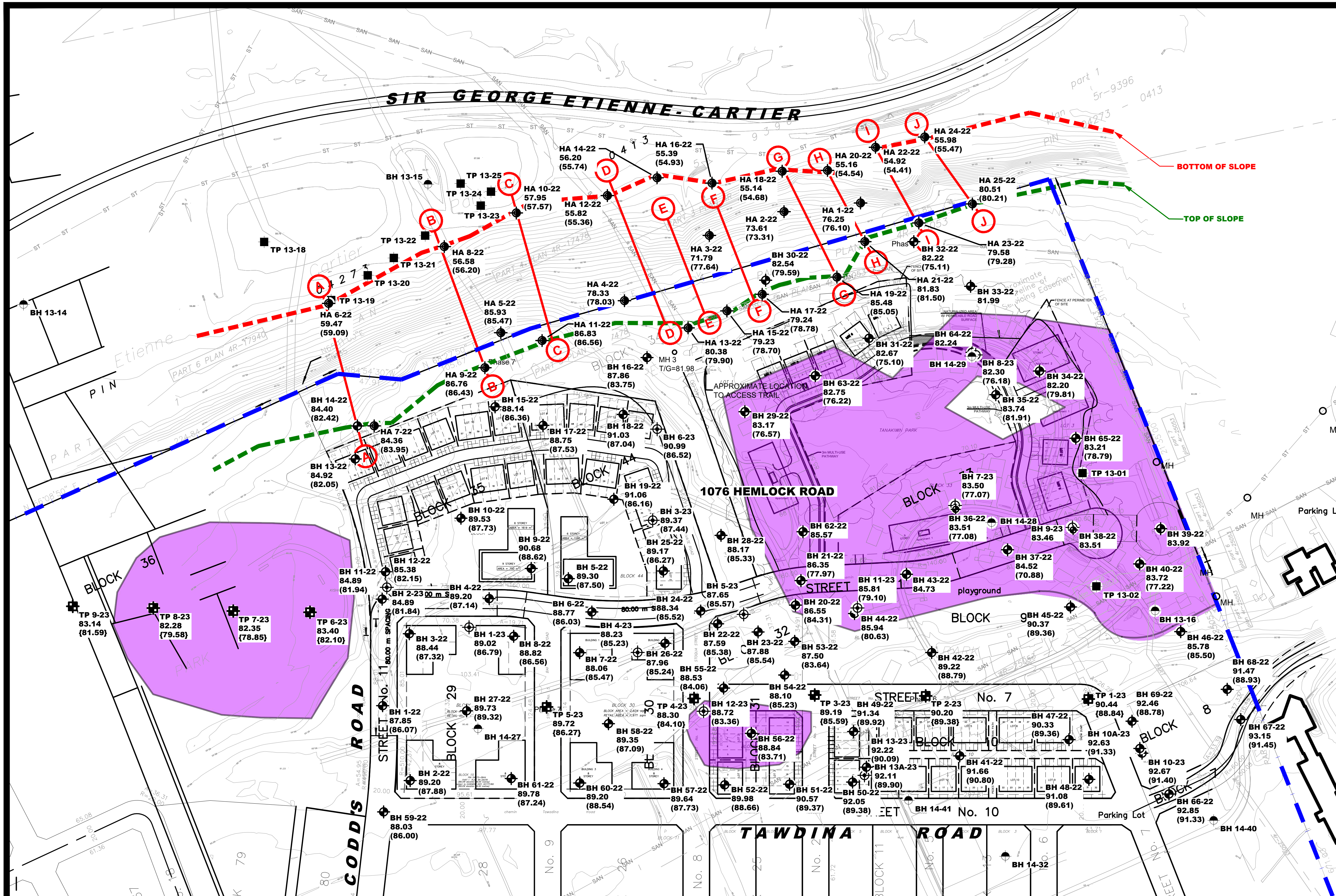

LEGEND:

- BOREHOLE WITH MONITORING WELL LOCATION
- BOREHOLE LOCATION
- HAND AUGER LOCATION
- TEST PIT LOCATION
- BOREHOLE LOCATION BY OTHERS (MARCH, 2014)
- TEST PIT LOCATION BY OTHERS (MARCH, 2014)
- A—A CROSS-SECTION LOCATION
- 87.85 GROUND SURFACE ELEVATION (m)
- (70.88) PRACTICAL REFUSAL TO AUGERING / DCPT ELEVATION (m)
- {82.10} PRACTICAL REFUSAL TO EXCAVATION ON BEDROCK ELEVATION (m)

GROUND SURFACE ELEVATIONS AT TEST HOLE LOCATIONS ARE REFERENCED TO A GEODETIC DATUM.

NOTE: THE TOP AND BOTTOM OF SLOPE HAVE BEEN DEFINED BASED ON A SITE REVIEW.

PERMISSIBLE GRADE RAISE

UP TO 2.0 m

PROPOSED ROADS WILL HAVE AN ADDITIONAL PERMISSIBLE GRADE RAISE OF 0.5 m FOR A TOTAL PERMISSIBLE GRADE RAISE OF 2.5 m

SCALE: 1:3000

0 25 50 75 100 125 150 200m

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
5.	ADDED UPDATED CONCEPTUAL PLAN	25/11/2024	NP
4.	REVISED AS PER CITY COMMENTS	19/06/2024	YZ
3.	ADDED 2023 TEST PITS LOCATION TP1-23 TO TP9-23 AND UPDATED PERMISSIBLE GRADE RAISE AREA	05/01/2024	YZ
2.	ADDED BOREHOLES AND TEST PITS LOCATION BY OTHERS AND UPDATED PERMISSIBLE GRADE RAISE AREA	05/12/2023	YZ
1.	ADDED 2023 MONITORING WELL BOREHOLE LOCATION TO PLAN	24/04/2023	YZ

CANADA LANDS COMPANY, C/O IBI GROUP

GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT
WATERIDGE VILLAGE - PHASE 6, 7 AND 8

OTTAWA, ONTARIO

Title:

PERMISSIBLE GRADE RAISE PLAN

Scale: 1:3000	Date: 02/2023
Drawn by: GK	Report No.: PG6331-1
Checked by: YZ	Dwg. No.: PG6331-2
Approved by: FA	Revision No.: 5

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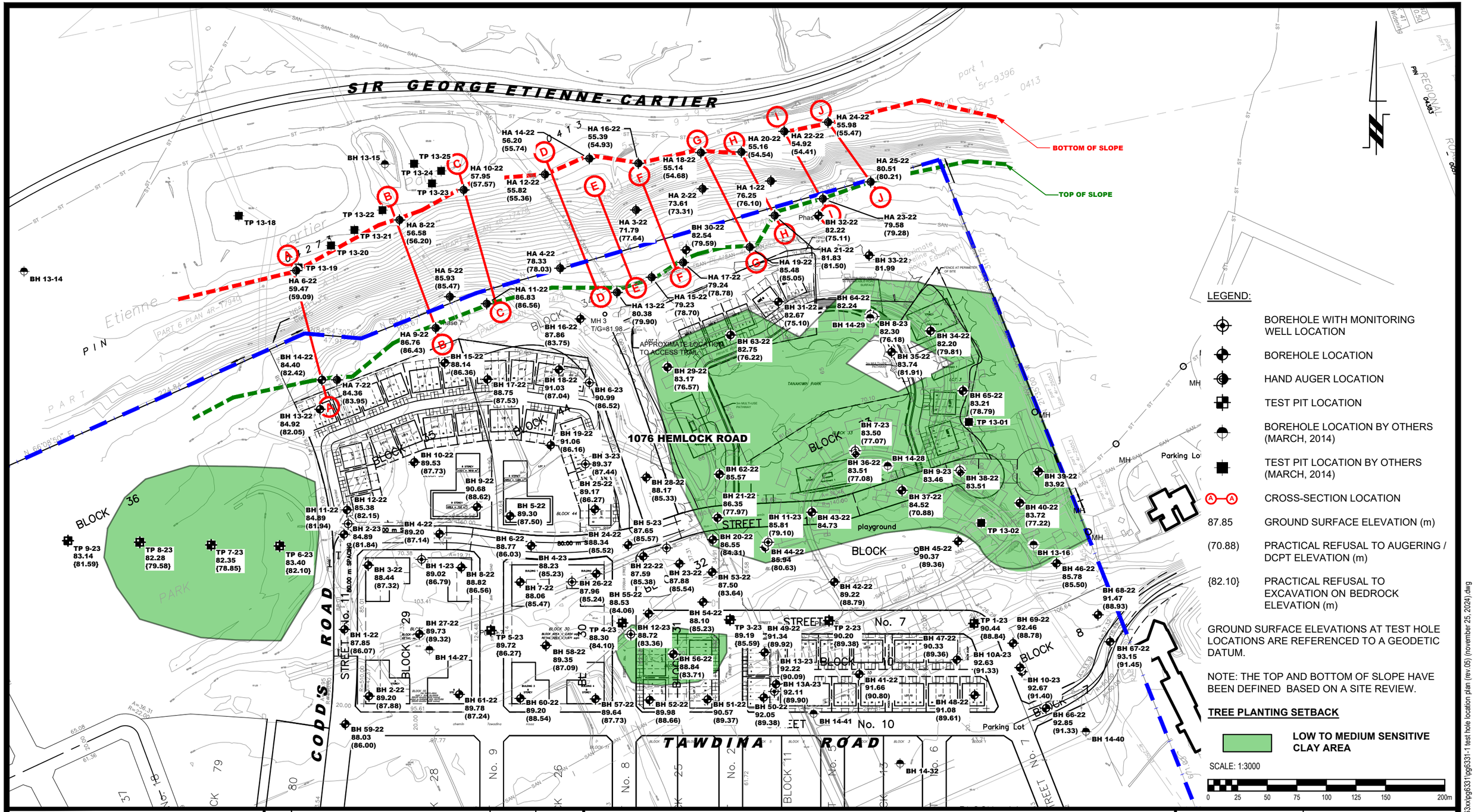

PATERSON GROUP
9 AURIGA DRIVE
OTTAWA, ON
K2E 7T9
TEL: (613) 226-7381

NO.	REVISIONS	DATE	INITIAL
5.	ADDED UPDATED CONCEPTUAL PLAN	25/11/2024	NP
4.	REVISED AS PER CITY COMMENTS	28/05/2024	FA
3.	ADDED 2023 TEST PITS LOCATION TP1-23 TO TP9-23 AND UPDATED TREE PLANTING SETBACK AREA	05/01/2024	YZ
2.	ADDED BOREHOLES AND TEST PITS LOCATION BY OTHERS AND UPDATED TREE PLANTING SETBACK AREA	05/12/2023	YZ
1.	ADDED 2023 MONITORING WELL BOREHOLE LOCATION TO PLAN	24/04/2023	YZ

CANADA LANDS COMPANY, C/O IBI GROUP

GEOTECHNICAL INVESTIGATION
PROPOSED DEVELOPMENT
WATERIDGE VILLAGE - PHASE 6, 7 AND 8

OTTAWA, ONTARIO

Title:

TREE PLANTING SETBACK PLAN

Scale: 1:3000	Date: 02/2023
Drawn by: GK	Report No.: PG6331-1
Checked by: YZ	Dwg. No.: PG6331-3
Approved by: FA	Revision No.: 5

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Stantec Consulting Ltd.
300 - 1331 Clyde Avenue
Ottawa ON K2C 3G4
stantec.com